Strengthening Teacher Quality in High-Need Schools—

Policy and Practice

Council of Chief State School Officers

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A report prepared under a grant from
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to the
Council of Chief State School Officers

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"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it is the only thing that ever has."

Margaret Mead

"The man who can make hard things easy is the educator."

Ralph Waldo Emerson

Foreward—

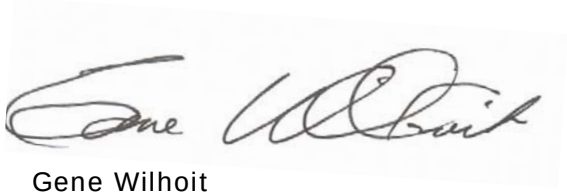
High quality teaching is more important than it has ever been as schools, districts and states face the critical challenge of educating ALL students at higher levels than ever before. Educators are feeling increased pressure to do more with a more diverse population. With generous support from The Joyce Foundation, the Council of Chief State School Officers is reflecting on the challenges of teachers in this document because there are great things going on all over the United States to improve learning for students. States, districts, cities, and schools are developing innovative programs and methods to overcome challenges in the classroom even before the teacher is hired. Others are doing great things to improve the professional development being offered to teachers and leaders, making it more relevant and timely. Still others are working to create environments in which great teaching can happen.

This report addresses four challenging topics—the first being understanding and evaluating teacher effectiveness. The final three chapters, devoted to topics within the context of high-need schools, are attracting mathematics and science teachers, special skills needed to teach diverse learners, and the role of leadership in attracting and retaining teachers.

Because we address high-need and high poverty schools, it is worth mentioning in the forward that we are using a general definition of these terms where the student populations are culturally diverse, or low-income, or have significant English language learning populations, or have significant numbers of students with individualized education plans.

Recognizing that no one report can review all of the good things happening in these topics, it is our goal to provide a resource by which the reader has examples of innovative practice, and also some suggestions about where to go (state or district) to get more information.

The goal of preparing students for the 21st century is our focus. The Council of Chief State School Officers believes today's teachers are up to the task, but they must have excellent support from leadership in their states, local education agencies, and schools. Our future depends on it.



Gene Wilhoit
Executive Director
Council of Chief State School Officers

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The Joyce Foundation supports efforts to protect the natural environment of the Great Lakes, to reduce poverty and violence in the region, and to ensure that its people have access to good schools, decent jobs, and a diverse and thriving culture.

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To learn more about The Joyce Foundation and its work in education and other fields, please visit www.joycefdn.org.

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Chapter 1

Recognizing and Enhancing Teacher Effectiveness: A Policy Maker's Guide

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Introduction

As the nation's attention is increasingly focused on the outcomes of education, policy makers have undertaken a wide range of reforms to improve schools, ranging from new standards and tests to redesigned schools, new curricula, and new instructional strategies. One important lesson from these efforts has been the recurrent finding that teachers are the fulcrum that determines whether any school initiative tips toward success or failure. Every aspect of school reform —the creation of more challenging curriculum, the use of ambitious assessments, the implementation of decentralized management, the invention of new model schools and programs—depends on highly-skilled teachers.

Reformers have learned that successful programs or curricula cannot be transported from one school to another where teachers do not know how to use them well. Raising graduation requirements has proved to be of little use where there are not enough qualified teachers prepared to teach more advanced subjects well. Mandates for more math and science courses are badly implemented when there are chronic shortages of teachers prepared to teach these subjects. Course content is diluted and more students fail when teachers are not adequately prepared for the new courses and students they must teach. In the final analysis, there are no policies that can improve schools if the people in them are not armed with the knowledge and skills they need. Furthermore, teachers need even more sophisticated abilities to teach the growing number of public school students who have fewer educational resources at home, those who are new English language learners, and those who have distinctive learning needs or difficulties. Clearly, meeting the expectation that all students will learn to high standards will require a transformation in the ways in which our education system attracts, prepares, supports, and develops expert teachers who can teach in more powerful ways.

An aspect of this transformation is developing means to evaluate and recognize teacher effectiveness throughout the career, for the purposes of licensing, hiring, and granting tenure; for providing needed professional development; and for identifying expert teachers who can be recognized and rewarded. A goal of such recognition is to keep talented teachers in the profession and to identify those who can take on roles as mentors, coaches, and teacher leaders who develop curriculum and professional learning opportunities, who redesign schools, and who, in some cases, become principals. Some policy makers are also interested in tying compensation to judgments about teacher effectiveness, either by differentiating wages or by linking such judgments to additional responsibilities that carry additional stipends or salary. An integrated approach connects these goals with a professional development system into a career ladder.

This paper draws upon research in outlining the issues associated with various approaches to ascertaining teacher effectiveness, and suggests a framework for policy systems that might prove productive in both identifying and *developing* more effective teachers and

teaching. A distinction is drawn between effective teachers and effective teaching that is important to consider if improvement in student learning is the ultimate goal.

Effective Teachers and Teaching

It is important to distinguish between the related but distinct ideas of teacher quality and teaching quality. ***Teacher quality*** might be thought of as the bundle of personal traits, skills, and understandings an individual brings to teaching, including dispositions to behave in certain ways. The traits desired of a teacher may vary depending on conceptions of and goals for education; thus, it might be more productive to think of teacher *qualities* that seem associated with what teachers are expected to be and do.

Research on teacher effectiveness, based on teacher ratings and student achievement gains, has found the following qualities important:

- Strong general intelligence and verbal ability that help teachers organize and explain ideas, as well as to observe and think diagnostically;
- Strong content knowledge–up to a threshold level that relates to what is to be taught;
- Knowledge of how to teach others in that area (content pedagogy), in particular how to use hands-on learning techniques (e.g., lab work in science and manipulatives in mathematics) and how to develop higher-order thinking skills;
- An understanding of learners and their learning and development–including how to assess and scaffold learning, how to support students who have learning differences or difficulties, and how to support the learning of language and content for those who are not already proficient in the language of instruction;
- Adaptive expertise that allow teachers to make judgments about what is likely to work in a given context in response to students' needs.[1]

Although less directly studied, most educators would include on this list a set of dispositions to support learning for all students, to teach in a fair and unbiased manner, to be willing and able to adapt instruction to help students succeed, to strive to continue to learn and improve, and to be willing and able to collaborate with other professionals and parents in the service of individual students and the school as a whole.

These qualities, supported by research on teaching, are embodied in the standards adopted by the National Board for Professional Teaching Standards and, at the beginning teacher level, by the states involved in the Interstate New Teacher Assessment and Support Consortium (INTASC), operating under the aegis of the Council of Chief State School Officers (CCSSO). This consortium of more than 30 states has taken a leading role in developing both new teacher standards and assessments and has led to the adoption of new licensing standards in most states. As these standards have been built into licensing and preparation requirements over the last decade, they have provided a means to develop a stronger foundation for effective teaching, making teacher qualifications a stronger predictor of teacher effectiveness.

Teaching quality has to do with strong instruction that enables a wide range of students to learn. Such instruction meets the demands of the discipline, the goals of instruction, and the needs of students in a particular context. Teaching quality is in part a function of teacher quality—teachers' knowledge, skills, and dispositions—but it is also strongly influenced by the context of instruction. Key to considerations of context are "fit" and teaching conditions. A "high-quality" teacher may not be able to offer high-quality instruction in a context where there is a mismatch in terms of the demands of the situation and his or her knowledge and skills; for example, an able teacher asked to teach subject matter for which he or she is not prepared may teach poorly; a teacher who is prepared and effective at the high school level may be unable to teach small children; and a teacher who is able to teach high-ability students or affluent students well may be quite unable to teach students who struggle to learn or who do not have the resources at home that the teacher is accustomed to assuming are available. Thus, a high-quality teacher in one circumstance may not be a high-quality teacher for another.

A second major consideration in the quality of teaching has to do with the conditions for instruction. If high-quality teachers lack strong curriculum materials, necessary supplies and equipment, reasonable class sizes, and the opportunity to plan with other teachers to create both appropriate lessons and a coherent curriculum across grades and subject areas, the quality of teaching students experience may be suboptimal, even if the quality of teachers is high. Many conditions of teaching are out of the control of teachers and depend on the administrative and policy systems in which they work.

Strong teacher quality may heighten the probability of strong teaching quality, but does not guarantee it. Initiatives to develop teaching quality must consider not only how to identify, reward, and use teachers' skills and abilities but how to develop teaching contexts that enable good practice on the part of teachers. Hiring knowledgeable teachers but asking them to teach out of field, without high-quality curriculum or materials, and in isolation from their colleagues diminishes teaching quality and student learning. Thus, the policies that construct the teaching context must be addressed along with the qualities and roles of individual teachers.

Means for Identifying Effective Teaching for Policy Purposes

In recent years, there has been growing interest in moving beyond traditional measures of teacher qualifications—for example, a score on a paper-and-pencil test or completion of a preparation program before entry, or years of experience and degrees for in-service teachers—to evaluate teachers' actual performance and effectiveness as the basis for making decisions about hiring, tenure, licensing, compensation, and selection for leadership roles. The recent report of the No Child Left Behind (NCLB) Commission called for moving beyond the designation of teachers as "highly-qualified" to an assessment of "highly-effective" teachers based on their students' gains on state tests. Other recent federal proposals (for

example, the TEACH Act) have suggested incentive pay to attract "effective" teachers to high need schools and to pay them additional stipends to serve as mentors or master teachers.

Some state and local policy makers have sought to develop career ladders or other compensation plans that take into account various measures of teacher effectiveness for designating teachers for specific roles or rewards. These have included measures such as National Board Certification and other performance-based evaluations, indicators like master's degrees and years of experience, and various measures of student learning. In addition, a few states have developed performance-based assessments for beginning teacher licensing as a means of determining effectiveness before teachers receive tenure or a professional license.

This paper reviews three categories of measures: 1) evidence of teacher performance; 2) evidence of teacher knowledge, skills, and practices associated with student learning; and 3) evidence of student learning, including value-added student achievement test scores. Most career ladder or performance-based compensation plans that have survived to date use a combination of all of these measures, which is discussed in the final section.

Also discussed is what is known in each category regarding both the validity of the measures and the influence of using certain measures or approaches on the improvement of teaching practice. The presumption underlying this discussion is that successful policies will seek to develop systems that both *assess* teacher effectiveness in valid ways and help to *develop* more effective teachers at both the individual and collective levels.

Evidence of Teacher Performance

There is growing evidence that some well-designed performance-based assessments of teaching detect aspects of teaching that are significantly related to teacher effectiveness, as measured by student achievement gains. These include standardized *teacher performance assessments* such as those used for National Board Certification and for beginning teacher licensure in states such as Connecticut and California, as well as *standards-based teacher evaluation systems* used in some local districts. The value of using such assessments is that they can both document broader aspects of teacher effectiveness and can be used to help teachers develop greater effectiveness, as participation in these assessments has been found to support learning both for teachers who are being evaluated and educators who are trained to serve as evaluators.

Teacher Performance Assessments. A standards-based approach to assessing teachers was initially developed and made systematic through the work of the National Board for Professional Teaching Standards, which developed standards for accomplished teaching in more than 30 teaching areas defined by subject matter and developmental level of students. The National Board then developed an assessment of accomplished teaching that assembles evidence of teachers' practice and

performance in a portfolio that includes videotapes of teaching, accompanied by commentary, lesson plans, and evidence of student learning. These pieces of evidence are scored by trained raters who are expert in the same teaching field, using rubrics that define critical dimensions of teaching as the basis of the evaluation. Designed to identify experienced accomplished teachers, a number of states and districts, including the ones noted earlier, use National Board Certification as the basis for salary bonuses or other forms of teacher recognition, such as selection as a mentor or lead teacher. California offers a $20,000 bonus, paid over four years, to Board-certified teachers who teach in high-need schools, which has helped to distribute these accomplished teachers to students who need them.

A number of recent studies have found that the National Board Certification assessment process identifies teachers who are more effective in raising student achievement than others who have not achieved certification.[2] Perhaps equally important, many studies have found that teachers' participation in the National Board certification process supports their professional learning and stimulates changes in their practice. Teachers note that the process of analyzing their own and their students' work in light of standards enhances their abilities to assess student learning and to evaluate the effects of their own actions, while causing them to adopt new practices that are called for in the standards and assessments.[3] Teachers report significant improvements in their performance in each area assessed — planning, designing, and delivering instruction, managing the classroom, diagnosing and evaluating student learning, using subject matter knowledge, and participating in a learning community — and observational studies have documented that these changes do indeed occur.[4]

National Board participants often say that they have learned more about teaching from their participation in the assessments than they have learned from any other previous professional development experience.[5] David Haynes' statement is typical of many:

> Completing the portfolio for the Early Adolescence/ Generalist Certification was, quite simply, the single most powerful professional development experience of my career. Never before have I thought so deeply about what I do with children, and why I do it. I looked critically at my practice, judging it against a set of high and rigorous standards. Often in daily work, I found myself rethinking my goals, correcting my course, moving in new directions. I am not the same teacher as I was before the assessment, and my experience seems to be typical.[6]

Following on the work of the National Board, a consortium of more than 30 states, working under the auspices of CCSSO, created the INTASC standards for beginning teacher licensing. Most states have now adopted these into their licensing systems. In some states, teacher performance assessments for new teachers, modeled after the National Board assessments, are being used either in teacher education, as a

basis for the initial licensing recommendation (California, Oregon), or in the teacher induction period, as a basis for moving from a probationary to a professional license (Connecticut).

These assessments require teachers to document their plans and teaching for a unit of instruction, videotape and critique lessons, and collect and evaluate evidence of student learning. Like the National Board assessments, beginning teachers' ratings on the Connecticut BEST (Beginning Educator Support and Training) assessment have been found to significantly predict their students' value-added achievement on state tests.[7] This finding is especially significant since the lowest-scoring candidates who do not pass the assessment are not allowed to gain a professional license or gain tenure in Connecticut, so the analysis had to deal with a truncated range that did not include most of those teachers. (Those who do not pass have the opportunity to attempt the assessment, but must pass by their third year in teaching to remain in the profession.) About 10 percent of candidates in Connecticut do not pass the assessment. A study of predictive validity is currently underway for the Performance Assessment for California Teachers (PACT), which is discussed below.

These assessments have also been found to help teachers improve their practice. Connecticut's process of implementing INTASC-based portfolios for beginning teacher licensing involves virtually all educators in the state in the assessment process, either as beginning teachers taking the assessment or as school-based mentors who work with beginners, as assessors who are trained to score the portfolios, or as expert teachers who convene regional support seminars to help candidates learn about the standards. Educators throughout the system develop similar knowledge about teaching and learn how principles of good instruction are applied in classrooms. These processes can have far-reaching effects. By the year 2010, an estimated 80 percent of elementary teachers, and nearly as many secondary teachers, will have participated in the new assessment system as candidates, support providers, or assessors.[8]

A beginning teacher who participated in the assessment described the power of the process, which requires planning and teaching a unit, and reflecting daily on the day's lesson to consider how it met the needs of each student and what should be changed in the next day's plans. He noted: "Although I was the reflective type anyway, it made me go a step further. I would have to say, okay, this is how I'm going to do it differently. It made more of an impact on my teaching and was more beneficial to me than just one lesson in which you state what you're going to do.... The process makes you think about your teaching and reflect on your teaching. And I think that's necessary to become an effective teacher."

The same learning effects are recorded in research on the similar PACT assessment used in California teacher education programs. The assessment requires student teachers or interns to plan and teach a week-long unit of instruction mapped to the state standards; to reflect daily on the lesson they've just taught and revise plans for

the next day; to analyze and provide commentaries of videotapes of themselves teaching; to collect and analyze evidence of student learning; to reflect on what worked, what didn't and why; and to project what they would do differently in a future set of lessons. Candidates must show how they take into account students' prior knowledge and experiences in their planning. Adaptations for English language learners and for students with special needs must be incorporated into plans and instruction. Analyses of student outcomes are part of the evaluation of teaching.

Faculty and supervisors score these portfolios using standardized rubrics in moderated sessions following training, with an audit procedure to calibrate standards. Faculties use the PACT results to revise their curriculum. In addition, both the novice teachers and the scoring participants describe benefits for teacher education and for learning to teach from the assessment and scoring processes. For example:

> *A prospective teacher noted—* For me the most valuable thing was the sequencing of the lessons, teaching the lesson, and evaluating what the kids were getting, what the kids weren't getting, and having that be reflected in my next lesson...the "teach-assess-teach-assess-teach-assess" process. And so you're constantly changing—you may have a plan or a framework that you have together, but knowing that that's flexible and that it has to be flexible, based on what the children learn that day.
>
> *A Teacher education faculty member*—This [scoring] experience…has forced me to revisit the question of what really *matters* in the assessment of teachers, which—in turn—means revisiting the question of what really *matters* in the *preparation* of teachers.
>
> *A Cooperating teacher*— [The scoring process] forces you to be clear about "good teaching;" what it looks like, sounds like. It enables you to look at your own practice critically, with new eyes.
>
> *An Induction program coordinator*— As an induction program coordinator, I have a much clearer picture of what credential holders will bring to us and of what they'll be required to do. We can build on this.

When assessments both predict teacher effectiveness and support individual and institutional learning, they can help to create an engine for stimulating greater teacher effectiveness in the system as a whole. The TEACH Act contains a provision to develop a nationally available beginning teacher performance assessment, based on these models, which could provide a useful measure of effectiveness for new teachers and could leverage stronger accountability and improvement in teacher education.

Standards-Based Evaluations of Teaching. Similarly, standards-based teacher evaluations used by some districts have been found to be significantly related to student achievement gains for teachers and to help teachers improve their practice and effectiveness.[9] Similar to the teacher performance assessments described above, these systems for observing teachers' classroom practice are based on professional teaching standards grounded in research on teaching and learning. They use systematic observation protocols to examine teaching along a number of dimensions. All of the career ladder plans noted earlier use such evaluations as part of their systems and many use the same or similar rubrics for observing teaching. The Denver compensation system, which uses such an evaluation system as one of its components, describes the features of its system as including: well-developed rubrics articulating different levels of teacher performance; inter-rater reliability; a fall-to-spring evaluation cycle; and a peer and self-evaluation component.

In a study of three districts using standards-based evaluation systems, researchers found positive correlations between teachers' ratings and their students' gain scores on standardized tests.[10] In the schools and districts studied, assessments of teachers are based on well-articulated standards of practice evaluated through evidence including observations of teaching along with teacher interviews and, sometimes, artifacts such as lesson plans, assignments, and samples of student work.

The Teacher Advancement Program (TAP) offers one well-developed example of a highly-structured teacher evaluation system that was developed based on the standards of the National Board and INTASC and the assessment rubrics developed in Connecticut and Rochester, New York, among others.[11] In the TAP system of "instructionally-focused accountability," each teacher is evaluated four to six times a year by master/mentor teachers or principals who are trained and certified evaluators using a system that examines designing and planning instruction, the learning environment, classroom instruction, and teacher responsibilities. The training is a rigorous four-day process, and trainers must be certified based on their ability to evaluate teaching accurately and reliably. Teachers also study the rubric and its implications for teaching and learning, look at and evaluate videotaped teaching episodes using the rubric, and engage in practice evaluations. After each observation, the evaluator and teacher meet to discuss the findings and to make a plan for ongoing growth. As in other well-developed career ladder systems, TAP provides ongoing professional development, mentoring, and classroom support to help teachers meet these standards. Teachers in TAP schools report that this system, along with the intensive professional development offered, is substantially responsible for improvements in their practice and the gains in student achievement that have occurred in many TAP schools.[12] As described later, data from this extensive teacher evaluation and development system is combined with evidence about school-wide and individual teacher student achievement gains in making

judgments about teachers' appointment to specific roles in the career ladder.

The set of studies on standards-based teacher evaluation suggest that the more teachers' classroom activities and behaviors are enabled to reflect professional standards of practice, the more effective they are in supporting student learning—a finding that would appear to suggest the desirability of focusing on such professional standards in the preparation, professional development, and evaluation of teachers. These kinds of results led Hassell[13] to conclude in his review of teacher pay systems that tying teachers' advancement and compensation to their knowledge and skills and using evaluation systems that help develop those skills, as these systems do, may ultimately produce more positive change in practice than evaluating teachers based primarily on student test scores.

Standards-based evaluation systems have also been used to evaluate beginning teachers for continuation and tenure and to identify struggling teachers for additional assistance and potential dismissal. The most long-standing evaluation systems that have successfully supported evaluation and personnel actions for both beginning and veteran teachers are those that have used Peer Assistance and Review Programs that rely on highly expert mentor teachers to conduct evaluations and provide assistance to teachers who need it. The systems in Rochester, New York; Cincinnati, Columbus, and Toledo, Ohio; and Seattle, Washington, have all been studied and found successful in identifying teachers for continuation and tenure as well as intensive assistance and personnel action (see, e.g., NCTAF, 1996)[14].

Key features of these systems include not only the instruments used for evaluation but also the expertise of the evaluators – skilled teachers in the same subject areas and school levels who have released time to serve as mentors to support their fellow teachers – and the system of due process and review that involve a panel of both teachers and administrators in making recommendations about personnel decisions based on the evidence presented to them from the evaluations.

In these systems, beginning teachers have been found to stay in teaching at higher rates because of the mentoring they receive, and those who leave (generally under 5 percent) are usually those the district has chosen not to continue rather than those who have quit. Among veteran teachers identified for assistance and review (usually 1-3 percent of the teaching force), generally about half improve sufficiently with intensive mentoring to be removed from intervention status and about half leave by choice or by district request. Because teacher associations have been closely involved in designing and administering these programs in collaboration with the district, the union does not bring grievances when a teacher is discontinued.

Evidence about Teachers' Knowledge, Skills, and Practices

For a variety of reasons, it can be important to document and reward in a teacher evaluation and compensation system aspects of teachers' knowledge

and skills—as well as their practices—that are associated with student learning. Schools need a mix of knowledge, skills, and abilities among their faculties to inform curriculum decisions and to meet the needs of their students. For example, aside from the knowledge of content and pedagogy teachers generally acquire in their certification area, specialized knowledge about the teaching of English language learners or the teaching of students with special needs may be highly desirable in many school contexts. Knowledge of the home languages students speak is also essential for communicating with parents as well as students. Proficiency in using specific educational techniques, such as Reading Recovery or Cognitively Guided Instruction in mathematics, may be important in certain contexts.

The two-fold rationale for knowledge and skills-based compensation is that there should be incentives for teachers to continue to develop their abilities in ways that are important for student success, and there should be encouragement for teachers to use practices that have been found to be effective. As schools seek to offer a more coherent approach to instruction, encouragement for shared practices among teachers is also important. The kinds of knowledge, skills, and practices to be documented and recognized should be those known to be associated with greater individual and organizational effectiveness. As Odden and colleagues note:

> Knowledge- and skills-based compensation systems provide a mechanism to link pay to the knowledge and skills (and by extension, performance) desired of teachers.... The concept of knowledge- and skills-based pay in education was adapted from the private sector, where it was developed to encourage workers to acquire new, more complex, or employer-specific skills. Knowledge- and skills-based pay was also intended to reinforce an organizational culture that values employee growth and development and to create a clear career path linked to increasing professional competence.[15]

Evidence that particular kinds of knowledge and skills impact student achievement can guide decisions about what should be documented and recognized. For example, there is evidence that a master's degree in the field to be taught (e.g., mathematics or mathematics education) is associated with greater effectiveness,[16] as is training in how to work with diverse student populations (training in cultural diversity, teaching limited English proficient students, and teaching students with special needs).[17] In addition, some specific practices, such as the use of formative assessment to provide feedback to students and opportunities for them to revise their work, have been found in many dozens of studies to have large effect sizes on student learning gains.[18] Teachers who teach students specific meta-cognitive strategies for reading, writing, and mathematical problem solving have been found to produce increased student learning of complex skills.[19]

In some systems, teachers receive recognition for demonstrating that they

have implemented particular new practices like these associated with school-wide or district-wide goals, such as the use of common literacy practices across classrooms, or the use of formative assessments in planning and modifying instruction, or the implementation of a new system of writing instruction. Where possible, these practices are documented along with evidence of how the changes have affected student participation and learning. The rationale for using these measures of effective teaching practices is that they support teacher development and school-wide change initiatives, and are related to improvements in the conditions for student learning.

Odden and colleagues offer several examples of knowledge- and skills-based evaluation and compensation plans.[20] For example, Coventry, Rhode Island provides stipends for National Board Certification and for teachers to develop their skills in authentic pedagogy, self-reflection, differentiated instruction, and family and community involvement – all of which are strategies that have been linked through research to student achievement. Douglas County, Colorado offers compensation for completing blocks of courses associated with district goals, such as assessment or teaching diverse learners. Vaughan Learning Center, a charter school in Los Angeles, California, offers compensation for relevant degrees and certification, as well as for specific knowledge and skills relevant to the school's mission, such as literacy training, training for teaching English as a second language, special education inclusion, and technology.

Teacher proficiencies can be documented through systematic collection of evidence about planning and instruction, work with parents and students, and contributions to the school. This can be accomplished both through observations of practice, documentation of training or proficiencies, and a portfolio of teacher evidence about practices both in and beyond the classroom. In addition to specific teaching practices, a teacher might document how he or she increased student attendance or homework completion through regular parent conferences and calls home and show evidence of changes in these student outcomes, as well as other outcomes associated with them, such as improved grades, graduation, and college going. Odden and colleagues note that a teacher portfolio in such a system "may include artifacts such as scholarly papers in the content area written by the teacher, new curricula the teacher has developed, logs of parental involvement, samples of tests and assignments, lesson plans, and essays reflecting on the teacher's practice."[21]

Evidence of Student Learning

Interest in including evidence of student learning in evaluations of teachers has been growing. After all, if student learning is the primary goal of teaching, it appears straightforward that it ought to be taken into account in determining a teachers' competence. At the same time, the literature includes many cautions about the problems of basing teacher evaluations substantially on student test scores. In addition to the fact that curriculum-specific tests that would allow gain score analyses are not typically available in many teaching

areas, these include concerns about overemphasis on teaching "to the test" at the expense of other kinds of learning; problems of attributing student gains to specific teachers; and disincentives for teachers to serve high-need students, for example, those who do not yet speak English and those who have special education needs (and whose test scores therefore may not accurately reflect their learning). This could inadvertently reinforce current practices in which inexperienced teachers are disproportionately assigned to the neediest students or schools and may discourage high-need students from entering or staying. At the same time, some innovative career ladder and compensation programs (in Rochester, New York, and Denver, Colorado, for example, as well as the TAP system described earlier) have found valid ways to include evidence of student learning in teacher evaluations. These are discussed below.

The Use of Value-Added Achievement Test Scores to Evaluate Teachers. Because of a desire to recognize and reward teachers' contributions to student learning, a prominent proposal is to use ***value-added student achievement test scores*** from state or district standardized tests as a key measure of teachers' effectiveness. The value-added concept is important, as it reflects a desire to acknowledge teachers' contributions to students' progress, taking into account where students begin. Furthermore, value-added methods are proving valuable for research on the effectiveness of teachers of specific populations (for example, those who are National Board Certified or those who have had particular preparation or professional development experiences) and on the outcomes of various curriculum and teaching interventions.

However, there are serious technical and educational challenges associated with using this approach to make strong inferences about *individual* teacher effectiveness, especially for high-stakes purposes, as opposed to studying the effectiveness of *groups* of teachers in a research context. Among other things, for example, when researchers are aggregating data about large groups of teachers for research rather than decision-making purposes, they make various assumptions about how to treat missing student data, which students to include, or how to choose among models using different statistical controls that change the results of their estimates. Researchers may be concerned from an intellectual perspective about whether their models are indeed capturing teacher effects (as opposed to student variables or testing artifacts or the results of school practices outside the classroom), but they need not worry about whether their decisions disadvantage particular teachers in the way they would need to if these analyses were to be used to make individual personnel decisions.

Indeed, the emergent strategies being used to analyze student learning data to assess potential teacher effectiveness produce very different results depending on the different decisions researchers make about how to handle the data (for example, whether or not to control for student demographic characteristics or school effects, whether and how to

interpolate missing data for students, whether to include or exclude special needs learners or new English language learners, whether to use tests that do not measure the specific curriculum a teacher teaches). Leading researchers agree that, while it is useful for research purposes, value-added modeling (VAM) is not appropriate as a primary measure for evaluating individual teachers. Summarizing the results of many studies, including a recent wide-ranging review by the RAND Corporation, Henry Braun of the Educational Testing Service concluded:

> VAM results should not serve as the sole or principal basis for making consequential decisions about teachers. There are many pitfalls to making causal attributions of teacher effectiveness on the basis of the kinds of data available from typical school districts. We still lack sufficient understanding of how seriously the different technical problems threaten the validity of such interpretations.[22]

The career ladder or compensation systems that do use student achievement data include it only as component of a broader system that incorporates evidence from standards-based evaluation systems, teacher performance assessments, or other evidence about teacher qualifications and practices. Often these data come from classroom, school, or district assessments rather than state tests, for reasons discussed further below. These data are triangulated and interpreted to understand a teachers' practice in a multi-faceted way, rather than using a single measure to draw inferences that may be problematic.

The problems researchers have identified with using value-added testing models as a primary determinant of teacher effectiveness, especially those drawing on once-a-year large-scale assessments, include the following:

- *Teachers' ratings are affected by differences in the students who are assigned to them.* Students are not randomly assigned to teachers – and statistical models cannot fully adjust for the fact that some teachers will have a disproportionate number of students who may be exceptionally difficult to teach (students with poor attendance, who are homeless, who have severe problems at home, etc.) and whose scores on traditional tests are problematic to interpret (e.g., those who have special education needs or who are English language learners). This can create both misestimates of teachers' effectiveness and disincentives for them to want to teach the students who have the greatest needs.
- *VAM requires scaled tests, which most states don't use. Furthermore, many experts think such tests are less useful than tests that are designed to measure specific curriculum goals.* In order to be scaled, tests must evaluate content that is measured along a continuum from year to year. This reduces their ability to measure the breadth of curriculum content in a particular course or grade level. As a result, most states have been moving away from scaled tests and toward tests that measure standards based on specific curriculum content, such as end-of-course tests in high school that evaluate standards more comprehensively (e.g., separate tests

in algebra, geometry, algebra 2, and in biology, chemistry, and physics). These curriculum-based tests are more useful for evaluating instruction and guiding teaching, but do not allow value-added modeling. Entire state systems of assessment that have been developed over many years—such as the New York State Regents system and systems in California, Washington, Massachusetts, Maine, Connecticut, Kentucky, and many more—would have to be dismantled to institute value-added modeling.

- *VAM models do not produce stable ratings of teachers.* Teachers look very different in their measured effectiveness when different statistical methods are used. Different teachers appear effective depending on whether student characteristics are controlled, whether school effects are controlled, and what kinds of students teachers teach (for example, the proportion of students with special needs or English language learners). In addition, a given teacher may appear to have differential effectiveness from class to class and from year to year, depending on these things and others. Braun notes that ratings are most unstable at the upper and lower ends of the scale, where many would like to use them to determine high or low levels of effectiveness.
- *Most teachers and many students are not covered by relevant tests.* Scaled annual tests with previous year test results are not available in most states for teachers of science, social studies, foreign language, music, art, physical education, special education, vocational/technical education, and other electives in any grades, or for teachers in grades K-3 and nearly all teachers in grades 9-12. Furthermore, because the scores are unstable, experts recommend at least three years of data for a given teacher to smooth out the variability. With many grades and subjects not addressed by scaled tests, and with three years of data needed to get a reasonably stable estimate for a teacher (thus excluding first and second year teachers), at best only about 30 percent of elementary teachers and 10 percent of high school teachers would be covered by databases in most states.
- *Missing data threatens the validity of results for individual teachers.* Once teacher and student mobility are factored in, the number of teachers who can be followed in these models is reduced further. In low-income communities, especially, student mobility rates are often extremely high, with a minority of students stable from one year to the next. Although researchers can make assumptions about score values for missing student data for research purposes, these kinds of adjustments are not appropriate for the purposes of making individual teacher judgments.
- *Many desired learning outcomes are not covered by the tests that are widely used.* Tests in the United States are generally much narrower than assessments used in other high-achieving countries (which feature a much wider variety of more ambitious written, oral, and applied tasks), and scaled tests are narrower than some other kinds of tests. For good or for ill, research finds that

high-stakes tests drive the curriculum to a substantial degree. Thus, it is important that measures used to evaluate teacher effectiveness find ways to include the broad range of outcomes valued in schools. Otherwise, teachers will have little incentive to continue to include untested areas such as writing, research, science investigations, social studies, and the arts, or skills such as data collection, analysis, and synthesis, or complex problem solving, which are generally untested.

- *It is impossible to fully separate out the influences of students' other teachers, as well as school conditions, on their apparent learning.* Prior teachers have lasting effects, for good or ill, on students' later learning, and current teachers also interact to produce students' knowledge and skills. For example, the essay writing a student learns through his history teacher may be credited to his English teacher, even if she assigns no writing; the math he learns in his physics class may be credited to his math teacher. Specific skills and topics taught in one year may not be tested until later years. A teacher who works in a well-resourced school with specialist supports may appear to be more effective than one whose students don't receive these supports. A teacher who teaches large classes without adequate textbooks or materials may appear to be less effective than one who has a small class size and plentiful supplies. As Braun notes, "it is always possible to produce estimates of what the model designates as teacher effects. These estimates, however, capture the contributions of a number of factors, those due to teachers being only one of them. So treating estimated teacher effects as accurate indicators of teacher effectiveness is problematic." To understand the influences on student learning, more data about teachers' practices and context are needed.

Thus, while value-added models are useful for looking at groups of teachers for research purposes – for example, to examine the results of preparation or professional development programs or to look at student progress at the school or district level – and they may provide one measure of teacher effectiveness among several, they are problematic as the primary or sole measure for making evaluation decisions for individual teachers. In the few systems where such measures are used for personnel decisions such as performance pay, they are often used for the entire group of teachers in a school, rather than for individuals. Where they are used, they need to be accompanied by an analysis of the teachers' students and teaching context, and an evaluation of the teachers' practices.

Using Other Evidence of Student Learning. The fact that value-added analysis of test score data in large-scale testing systems is not always appropriate or available as a tool for evaluating individual teachers does not mean that states or districts cannot recognize and reward excellent teachers who produce strong student learning, or create incentives for them to help other teachers and serve the neediest students. It is possible to use other measures of student learning in evaluations of teaching, sometimes pre-

and post-tests of learning conducted by districts or schools, or even learning evidence that is assembled by the teacher him or herself. Such evidence can be drawn from classroom assessments and documentation, including pre- and post-test measures of student learning in specific courses or curriculum areas, evidence of student accomplishments in relation to teaching activities, and analysis of standardized test results, where appropriate. The evidence can be assembled in a teaching portfolio by the teacher, demonstrating and explaining the progress of students on a wide range of learning outcomes in ways that take students' starting points and characteristics into account.

In some schools, teachers use their own fall and spring classroom assessments (or pre- and post-unit assessments) as a way of gauging student progress. These measures can also be tailored for the learning goals of specific students (for example, students with special needs or English language learners.) As part of a portfolio of evidence, these measures can document teacher effectiveness in achieving specific curriculum goals. Measures of student learning in specific subject areas may be scored writing samples or reading samples, mathematics assessments, assessments of science or history knowledge, or even musical performances. These typically provide better measures of classroom learning in a specific course or subject area because they are curriculum-specific and can offer more authentic measures of student learning. They are also more likely to capture the effects of a particular teacher's instruction and be available for most or all students. Teachers might even document the Westinghouse science competition awards they helped students win, or specific break-throughs achieved by their students with special needs, with evidence of their role in supporting these accomplishments.

In Denver's *Procomp* system,[23] for example, teachers set two goals annually in collaboration with the principal, and document student progress toward these goals using district, school, or teacher-made assessments to show growth. In Rochester's career ladder, evidence of student learning, determined by the teacher, is assembled in the teachers' portfolio. Arizona's career ladder program—which encourages local districts to design their own systems—requires the use of various methods of student assessment to ascertain teachers' effectiveness.

One study of the Arizona career ladder programs found that, over time, participating teachers demonstrated an increased ability to create locally-developed assessment tools to assess student learning gains in their classrooms; to develop and evaluate pre- and post-tests; to define measurable outcomes in "hard to quantify areas" like art, music, and physical education; and to monitor student learning growth in their action plans. They also showed a greater awareness of the importance of sound curriculum development, more alignment of curriculum with district objectives, and increased focus on higher quality content, skills, and instructional strategies.[24] Thus, the development and use of student learning evidence seemed to be associated with

improvements in practice. In all of these career ladder systems, evidence of student learning is combined with evidence from standards-based teaching evaluations conducted through classroom observation, and evidence of teachers' skills or practices, as described below.

Implications for Policy

Efforts to recognize teacher competence and effectiveness as the basis for personnel decisions are not new in the policy arena, but recent initiatives have provided some potential break-throughs. Efforts to institute versions of merit pay or career ladders in education have faltered many times before – in the 1920s, the 1950s, and most recently in the 1980s, when 47 states introduced versions of merit pay or career ladders, all of which had failed by the early 1990s.[25] The reasons for failure have included faulty evaluation systems, concerns about bias and discrimination, pitfalls of strategies that rewarded individual teachers while undermining collaborative organizational efforts, dysfunctional incentives that caused unintended negative side-effects for serving all children, and lack of public will to continue increased compensation.

The initiatives detailed in this paper demonstrate that systems can provide recognition for demonstrated knowledge, skill, and expertise that move the mission of the school forward and reward excellent teachers for continuing to teach, without abandoning many of the important objectives of the current salary schedule — equitable treatment, incentives for further learning, and objective means for determining pay.

Promising beginnings have been made in some states and local districts that have developed new approaches to examining teacher performance and building career ladders. These approaches use multiple measures of performance, typically considering three kinds of evidence in combination with one another:

- Teachers' *performance on teaching assessments* measuring standards known to be associated with student learning (including national assessments, such as National Board Certification, and locally-managed standards-based teacher evaluations);
- Evaluation of *teaching practices* that are associated with desired student outcomes and achievement of school goals, through systematic collection of evidence about teacher planning and instruction, work with parents and students, and school contributions; and
- Contributions to *growth in student learning* (from classroom assessments and documentation as well as standardized tests, when appropriate).

All three of these strategies are used in the Denver, Colorado Procomp system of teacher compensation based on knowledge, skills, and performance; Rochester's Career in Teaching program; and Minnesota's Alternative Professional Pay System,[26] which were developed in collaboration with local or state teachers associations. Beyond recognizing teachers with new roles or compensation, these systems demonstrate that rewarding teachers for deep knowledge of subjects, additional knowledge in meeting special kinds of student and school needs, and high levels of

performance measured against professional teaching standards can encourage teachers to continue to learn needed skills and enhance the expertise available within schools.

State and Local Initiatives

The work that has been done over the last decade to develop and assess teaching standards and to build new models of evaluation and recognition in school districts holds promise for creating more systematic means for developing teacher and teaching quality. Policies for identifying and supporting teacher and teaching effectiveness can be considered for both the beginning of the teaching career (for licensing, hiring, and tenure decisions) and for later stages of teacher development (for compensation and advancement decisions).

Identifying and Developing Beginning Teacher Effectiveness. It is important to be able to make licensing decisions based on greater evidence of teacher competence than merely completing a set of courses or surviving a certain length of time in the classroom. Since the 1980s, the desire for greater confidence in licensing decisions has led to the introduction of teacher licensing tests in nearly all states. However, these tests—generally multiple-choice tests of basic skills and subject matter—are not strongly predictive of teachers' abilities to effectively teach children. Furthermore, in many cases these tests evaluate teacher knowledge *before* they enter or complete teacher education, and hence are an inadequate tool for teacher education accountability. Even paper-and-pencil tests of teaching knowledge, used in a few states, provide little evidence of what teachers can actually *do* in the classroom.

In the coming years, states will be able to benefit from the development of teaching performance assessments that evaluate teachers' practices related to student learning and have been found to be predictive of teachers' effectiveness. States now have the possibility of beginning to examine teacher performance as a basis for granting the initial probationary or later professional license, building on the work that has been done by some states and universities to build reliable and valid assessments that predict teacher effectiveness. Their work demonstrates that on-the-job performance assessments of beginning teachers can be used during teacher education (at the end of an internship or student teaching) as the basis for a licensure recommendation. Systematically scored portfolios including direct evidence of teaching have been developed with state encouragement or requirement by universities in Vermont, Maine, Wisconsin, Oregon, and California. Oregon's teacher Work Sampling System provides pre- and post-test evidence of teachers' contributions to student learning, constructed by teachers themselves. California's teacher performance assessment, described earlier, which also includes evidence of student learning in relation to a unit of teaching, will be a funded, statewide requirement by 2008.

Some states have also used performance assessments of first- or second-year teachers (during their probationary period) as the basis for granting a

professional license (usually acquired in the third year of practice) and, by implication, setting a clear bar for the tenure decision. Connecticut's system is most highly developed and reliably scored, but initiatives have also been undertaken in North Carolina and California as part of state induction programs.

All of these initiatives have been based on the beginning teacher licensing standards developed by INTASC. An effort by this consortium to fine-tune and pilot this work more broadly could give momentum to an effort to better evaluate teacher competence and effectiveness at the beginning of the teaching career.

States can also encourage and support localities in developing stronger evaluation of beginning teachers in the early years prior to tenure, tied to effective mentoring from highly accomplished veterans that will help novices meet the standards. Most states now require an induction program of some sort and many also provide some level of funding. However, the activities that are to occur during the induction process and the type of teaching to be developed are often not specified, so programs are frequently less powerful than they could be.

Connecticut wraps its required mentoring of beginning teachers around the teacher performance assessment so that the standards of performance are clear. High-quality local standards-based evaluations, such as those described earlier, can also be used for this purpose. Organizing mentoring around clear standards of practice that have been tied to teacher effectiveness focuses the mentor's and novice's efforts on what matters most for teaching success. Of course, this strategy also requires highly-skilled mentors who are themselves effective teachers. This leads to the question of how to identify and select such leaders.

Identifying and Developing Teacher Effectiveness throughout the Career. If teachers are better supported and selected for tenure in the early years of the career, the prospects for developing a highly effective teacher corps will be much enhanced. As noted, progress has been made in developing career development systems that can recognize excellent teaching and both reward it and tap the knowledge of such teachers on behalf of broader school improvements. These initiatives generally have several features in common. All require teacher participation and buy-in to be implemented. Typically, evaluations occur at several junctures as teachers move from their *initial license*, through a period as a *novice or resident teacher* under the supervision of a mentor, to designation as *professional teacher* after successfully passing an assessment of teaching skills. *Tenure* is a major step tied to a serious decision made after rigorous evaluation of performance in the first several years of teaching, incorporating administrator and peer review by expert colleagues. *Lead teacher status*—which triggers additional compensation and access to differentiated roles—may be determined by advanced certification from the National Board for Professional Teaching Standards and other evidence of performance through standards-based

evaluation systems. Such systems both encourage and measure effective teaching, and can be combined with other evidence of desirable teacher practices and student learning to identify accomplished teachers.
Where this has been done, it has proved critically important to design evaluation systems that provide a comprehensive picture of what teachers do and with what results, to be sure that evaluations are conducted reliably and validly by skilled assessors, and to be confident that evidence about student learning is carefully interpreted and properly attributed to the teacher.

Beyond the features of the evaluation systems, there are important lessons about the features of the policy systems in which they operate. For example, the system should be designed to operate so that teachers are not penalized for teaching the students who have the greatest educational needs. This requires sensitivity to student and classroom characteristics in the evaluation system. Furthermore, incentives should operate to support collegiality by recognizing all the teachers who reach specific criteria, rather than pitting teachers against each other in a situation in which one teacher's gain is another's loss.

The challenges to be overcome in designing productive systems for recognizing and rewarding teacher effectiveness were vividly illustrated by the testimony of an expert veteran teacher in Springfield, Massachusetts last year – a district being asked to put in place a system of merit pay based on value-added student achievement test scores. Springfield is a severely under-resourced district serving a predominantly minority, low-income student population. Fiscal woes had prevented salary increases for three years, and about half of the 2,600 teachers in the district had left over this time. Nearly 25 percent of the teaching force was uncertified and inexperienced.

Susan Saunders, a Springfield native with more than 20 years of experience, was one of the local heroes who had stayed and worked tirelessly to assist the revolving door of beginning teachers, who shared the few updated textbooks with these teachers, and who took on the highest need special education students (comprising more than half of her class of 32 students). When asked how she would feel about working in this new system of test-based merit pay, Saunders said the introduction of the system would force a teacher like herself either to leave or change her approach entirely – to keep the best materials for herself, stop taking on the students with special needs, and stop helping the other teachers in her building (since one teacher's greater success would come at the expense of another teacher's rating).

The Springfield system was not adopted because an arbitrator deemed the technical validity of the proposed system inadequate to carry the weight of personnel decision making. This example suggests how important it is to exercise care in developing systems of rewards for teachers so they do not create incentives that would discourage teachers from working collaboratively with each other and taking on the most challenging students. Since any measures used are likely to drive instruction, it is also critically important

that the assessments used to evaluate student learning cover the broad goals of learning that are valued and are valid for the students whose results would be considered.

State encouragements for local career ladders and innovative compensation systems, like those in Minnesota and Arizona, can be designed to ensure that several important features are in place. These would include:

- Teacher collaboration and buy-in in developing the system;
- Recognition and encouragement of collegial contributions to overall school success and clear criteria for accomplishment that all eligible teachers can achieve, rather than a quota system that pits teachers against each other;
- Valid evidence of teacher effectiveness based on multiple measures, including:
  - Standards-based evaluation of practice, such as National Board Certification, a valid state teacher performance assessment or local evaluations of teacher performance;
  - Evidence of practice based on multiple classroom observations and examination of other classroom evidence (e.g., lesson plans, student assignments and work samples) by multiple evaluators using a standards-based evaluation instrument that examines planning, instruction, the learning environment, and student assessment;
  - Evidence of learning of the teacher's students on valid assessments that appropriately evaluate the curriculum the teacher teaches;
- Consideration of the needs of the students the teacher serves and valid and appropriate assessment of all students included in the analysis, including students with special learning needs and new English language learners;
- Ongoing, high-quality professional learning opportunities to enable teachers to learn to meet the standards.

The Federal Role

Given the challenges to be surmounted in designing and implementing new systems for identifying and recognizing teacher effectiveness, the federal role should be a supportive rather than a directive one. There are many things to be learned about how to measure teacher effectiveness in ways that are accurate and valid, that create knowledge and incentives for strong collegial work and for teaching all students well. Only a few dozen districts have been able to launch career ladders that have worked and lasted for more than a few years. Any effort to stimulate more productive work in this area should initially provide incentives to state and local initiatives that can garner support and develop models with potential for scale-up.

Federal support could be particularly helpful in the following three areas.

1) To develop and measure beginning teacher effectiveness, fund research and development to make available a beginning teacher performance assessment, along with support for

beginning teacher mentoring. Initial teacher competence and effectiveness could be better ascertained, and preparation and mentoring could be strengthened, if they were guided by a high-quality, nationally-available teacher performance assessment, which measures actual teaching skill in the content areas, and which can guide teacher learning and help to develop sophisticated practice as part of licensing and ongoing career advancement.

INTASC has already created teacher licensing standards adopted by most states[27] and has piloted performance assessments tied to the standards; several states, including Connecticut and California, have incorporated such performance assessments in the licensing process. As proposed in the TEACH Act, federal support to a consortium of states in concert with appropriate professional associations could further refine and pilot these assessments to provide a useful tool for accountability and improvement that would also facilitate teacher mobility across states by supporting license reciprocity.

Ideally, such a tool would be accompanied by a federally-funded incentive to states and districts to create strong mentoring programs for all beginning teachers. A matching grant program could ensure support for every new teacher in the nation through investments in state and district mentoring programs. Based on the funding model used in California's Beginning Teacher Support and Assessment Program, for example, a federal allocation of $4,000 for each beginning teacher, matched by states and/or local districts, could fund mentoring for every novice teacher (about 125,000 annually) [28] for an investment of $500 million a year. If even half of the early career teachers who currently leave teaching were to be retained, the nation would save at least $600 million a year in replacement costs while gaining more competent teachers.

2) Provide incentive funds for states and localities to develop systems that recognize and tap teacher expertise, and to reward accomplished teachers who take leadership roles in high-need schools. The federal government could encourage districts to develop systems that recognize effective teachers and create career ladders that tap their skills through a competitive grants program. To build teacher effectiveness, such initiatives would incorporate beginning teacher mentoring as well as other programs suitable for later career stages, enabling a broader range of roles for expert teachers. They would be accompanied by performance-based teacher evaluation systems that provide information about teacher effectiveness through standards-based teacher evaluations as well as systematic collection of evidence about teachers' practices and student learning. Such systems should include evidence of high-quality professional learning opportunities and school designs that provide time for teachers to work and learn together during the school day. They should also be designed to build incentives for collaboration and to recognize and support teachers who teach the highest-need students.

A federal initiative could include additional incentives for the design of innovative approaches to attract and keep accomplished teachers in priority low-income schools, through compensation for accomplishment and for additional responsibilities, such as mentoring and coaching. For example, $500 million would provide $10,000 in additional compensation for 50,000 teachers annually, to be allocated to expert teachers in high-need schools through state- or locally-designed incentive systems. Matched by state and local contributions, this program would provide incentives to attract 100,000 accomplished teachers to high-poverty schools.

Teacher expertise could be recognized through such mechanisms as National Board Certification, state or local standards-based evaluations, and carefully assembled evidence of contributions to student learning. Incentives might also be structured to encourage such highly effective teachers, as part of a group of teachers, to take on redesigning and reconstituting failing schools so that they become more effective.

3) Support research on value-added modeling and other means for examining student learning growth. Given the interest in using student learning data in evaluations of teachers, and the challenges of doing so, it would be productive for the federal government to fund an impartial group of experts, through the National Academy of Sciences or the National Academy of Education, to examine the data systems and methodologies needed to use student learning data appropriately in systems that assess teaching.

Conclusion

Initiatives to measure and recognize teacher effectiveness appear to be timely, as the press for improved student achievement is joined to an awareness of the importance of teachers in contributing to student learning. Such initiatives will have the greatest pay-off if they are embedded in systems that also *develop* greater teacher competence through mentoring and coaching around the standards and through roles for teachers to help their colleagues and their schools improve. Initiatives will have a greater likelihood of survival and success if they also build confidence in the validity of the measures and create incentives for teachers to work with colleagues and teach the neediest students. Federal, state, and local partnerships to create increasingly valid measures of teacher effectiveness and to support the development of innovative systems for recognizing and using expert teachers can make a substantial difference in the recruitment and retention of teachers in the schools in which they are most needed and, ultimately, substantially improve student learning.

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Chapter 2

Strengthening Mathematics and Science Teacher Quality

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Introduction

Calls to strengthen U.S. student achievement in mathematics and science are currently attracting a great deal of attention from state and federal policymakers, educators, and the philanthropic and business communities. In October 2005, a National Academies panel of leading scientists, educators, and business leaders released a report warning that increasing foreign competition could threaten the nation's economic future and national security unless the United States took immediate steps to regain its scientific competitiveness.[1] The report pointed to U.S. students' weak performance on international mathematics and science assessments, and it stressed that countries such as China and India were actively increasing scientific education and research and graduating far more students prepared to fill high-skill, high-wage jobs of the future.

To reverse these trends, the report called for vast improvements in mathematics and science education by creating scholarships to recruit 10,000 new math and science teachers each year; providing additional professional development to current teachers; and dramatically increasing the numbers of students who take Advanced Placement (AP) and International Baccalaureate science and mathematics courses. The report also called for increased federal investments in basic research; scholarships and fellowships to attract talented students to mathematics, science, and engineering degree programs; and incentives to increase spending on research and development and encourage private investment in innovation.

In January 2006, the issue gained even greater prominence when President Bush in his State of the Union Address emphasized the need to improve U.S. mathematics and science education.[2] As part of a new American Competitiveness Initiative, the president advocated spending $380 million in fiscal year 2007 to increase the rigor of mathematics and science instruction, especially in high schools. Part of the money would be used to train 70,000 new high school teachers over five years to teach Advanced Placement math and science courses. The money would also be used to promote research-based mathematics instruction at the elementary and middle school levels and to recruit 30,000 math and science professionals over eight years to become adjunct high school teachers.

Since then, attracting and retaining more mathematics and science teachers has remained at the top of the policy agenda for federal and state lawmakers. So many states were considering reform efforts, the Board of Directors of the Council of Chief State School Officers (CCSSO), an organization representing state education agencies, commissioned the creation of a mathematics and science education task force to address a common set of concerns regarding mathematics and science education in the United States. Chief state school officers, deputies, and state content specialists partnered with representatives from national science and mathematics organizations and the research and business communities to examine policy and practice to improve mathematics and science education across the P-12 system. As recently as February, the National Governors Association launched "Innovation America" as the 2006-2007 chair's platform. Soon after, governors announced their plans to support science and mathematics education within their states.

From 2005 to 2007, the following plans within states have been proposed, launched, or expanded across the United States:

- In February 2007, Alabama Governor Bob Riley announced that the highly successful Alabama Math, Science, and Technology Initiative would be expanding to an additional 154 schools. The three-fold program focuses on professional development, equipment and materials, and on-site support by math and science specialists at no cost to the school. Each school is supported by an AMSTI site that houses and refurbishes the equipment and materials used to engage classrooms in hands-on learning of math and science. To qualify to receive the resources, schools must send every math and science teacher, as well as school administrators, to two consecutive two-week summer institutes. Schools to participate under a competitive process.[3]
- In June 2005, California Governor Arnold Schwarzenegger announced a plan to produce 1,000 new math and science teachers annually for California classrooms by the year 2010. The 23-campus California State University system, which produces roughly 60 percent of California's teachers, will double its output, and the 10-campus University of California system will quadruple its output. In addition to stepped-up recruiting, the "California Teach" program will create accelerated teacher preparation programs so that students can graduate with a bachelor's degree in mathematics, science, or engineering, as well as a teaching credential, in four years. With funding from major California business partners, such as Intel and SBC, the program will provide a yearlong paid teacher internship, summer internships in private industry, and up to $19,000 in loan forgiveness for students who teach mathematics or science in California public schools for four years.[4]
- In February 2007, Kentucky Governor Ernie Fletcher named improving mathematics achievement his top education priority for 2007, proposing an extra $7 million for the state's Math Achievement Fund, which supports schools' efforts to diagnosis students' math deficiencies and to intervene to improve their achievement.[5]
- In September 2005, Massachusetts then-Governor Mitt Romney announced a plan to create an elite corps of math and science teachers in Massachusetts and attract more individuals with math and science backgrounds into teaching. His plan, which eventually failed to win approval from the state legislature, included $5,000 end-of-year bonuses to recruit 1,000 new math and science teachers each year, and up to $5,000 in bonuses for teachers of AP biology, calculus, chemistry, and physics, if the majority of their students scored high enough on AP tests to earn college credit. When coupled with a proposed pay-for-performance plan for teachers of all subjects, successful math and science teachers could have earned an additional $15,000 per year.[6]
- In June 2006, the Ohio superintendent for public instruction, Susan Tave Zelman, announced an award of more than $4 million in competitive grants to provide mathematics and science professional development to teachers in high-need school districts. The grants will help 1,800 teachers in high-need school districts to increase their knowledge of mathematics and science. "Our students must have

strong science and mathematics achievement, and their teachers must have the best training in those fields," she said. Ohio awarded 10 grants to partnerships between Ohio colleges, universities, and more than 100 high-need and/or neighboring school districts.[7]

- In September 2005, Rhode Island Governor Donald Carcieri released a report of a blue-ribbon panel of education and business leaders, co-chaired by the governor and the vice president of Raytheon Integrated Defense Systems and assembled to address challenges in math and science education. Rhode Island students' math and science scores were the lowest in New England, and the number of emergency teaching credentials issued by the state in math had jumped from 14 to 87 in three years and doubled in science, from 25 to 51.[8] Among the 12 recommendations advanced by the panel were more rigorous math and science teacher preparation; development and funding of a system of financial incentives to recruit and retain skilled teachers; targeted investments in professional development; the development of a network of science, technology, engineering, and mathematics (STEM) professionals and industry leaders to serve as mentors and adjunct teachers; and the development of an alternative route pilot program to attract more engineers and scientists to teaching.[9]
- In September 2005, IBM announced it would pay salaries, benefits, and tuition for employees interested in a second career as a secondary math or science teacher.[10] By April 2006, hundreds of IBM scientists and engineers had applied for 100 slots in pilot programs launched in New York and North Carolina.[11]
- In December 2005, the Business Council of New York State called for the creation of a $50 million state scholarship fund that would provide up to 500 scholarships a year to prospective math and science teachers who agreed to teach in New York schools for at least five years.[12]
- In the following month, New York Governor George Pataki announced a plan in his 2006 State of the State Address to offer free tuition at State (SUNY) or City University of New York (CUNY) campuses for math and science majors who pledged to become New York teachers.[13]
- In February 2006, Connecticut Governor Jodi Rendell called for the creation of a $1.5 million loan forgiveness program for math and science teachers who pledged to teach in Connecticut schools for at least five years.[14]
- In July 2006, Tennessee established a new lottery-funded scholarship program that provides up to $10,000 to help teachers earn an advanced degree in mathematics or science. For each year of scholarship support received, teachers must teach two years in a Tennessee public school.[15]
- In the same month, Oklahoma's Teacher Shortage Employment Incentive Program awarded bonuses of more than $10,000 to 35 math and science teachers who fulfilled a commitment they made in college to remain in the state and teach for five years after graduation.[16]
- In September 2006, the nonprofit Iowa Student Loan company announced the creation of a $10 million student loan forgiveness program for Iowa teachers of mathematics, science, and other hard-to-fill subjects. The program enables

new teachers to reduce their loan indebtedness by $9,000 over five years of teaching. When combined with two existing federal and state teacher loan forgiveness programs in Iowa, math and science teachers can potentially receive up to $30,500 in loan repayment assistance.[17]

While each of these proposals demonstrates an impressive commitment of political will and resources, few of these plans to expand the pool of skilled math and science teachers address what will be done to ensure the equitable distribution of teachers for poor and minority students. Research indicates that teacher knowledge of subject matter, particularly in mathematics and science, is strongly associated with student achievement gains.[18] Yet schools with the lowest levels of student achievement and the highest concentrations of poor and minority students are most likely to employ teachers who are inexperienced, uncertified, and teaching courses that they are not fully qualified to teach. These schools have a much harder time attracting and retaining teachers, particularly in hard-to-fill subject areas and specializations, in which supply is limited and demand is high.

In addition to strategies to increase the supply and retention of math and science teachers, state and local education leaders need targeted strategies to direct more highly skilled math and science teachers to high-poverty, low-performing, and hard-to-staff schools, where the need for effective teachers is greatest. Failure to do so will have serious repercussions, not only for individual students, but for the economy. Business and education leaders in Connecticut were warned at a recent conference that "within 15 years, about 40 percent of new workers will come from the state's poorest cities, where tests scores in math and science are low and dropout rates among the mostly black and Hispanic student populations are high."[19]

To that end, this paper addresses the following questions:

1. What challenges make it particularly difficult to attract and retain math and science teachers, especially in high-need schools?
2. What strategies are likely to attract and retain math and science teachers in schools that are the most difficult to staff?
3. What are states and districts doing to ensure the equitable distribution of experienced, effective math and science teachers to high-need schools?
4. What lessons have been learned from previous efforts?

Challenges that make math and science positions particularly difficult to fill

A number of researchers have noted that despite alarms about nationwide shortages of teachers, there are more than enough teachers in the workforce and in the reserve pool to meet demand, with the exception of shortages in certain geographic areas and in certain hard-to-fill subject areas and specializations. In addition to special education, some foreign languages, and bilingual education/English as a second language, math and science stand out as subjects in which demand clearly outweighs supply.

There are several reasons why it is particularly difficult for schools to find sufficient numbers of math and science teachers. First, graduates with strong backgrounds in mathematics, science,

and technology tend to have not only more career choices, but more lucrative career choices. The differential between teacher salaries and private sector salaries is much greater for teachers of mathematics and science than it is for teachers in other fields. Citing 2001 and 2002 salary comparisons produced by the National Association of Colleges and Employers and the American Federation of Teachers, Anthony Milanowski of the Consortium for Policy Research in Education notes that median annual salary offers to individuals with elementary and secondary education majors were in the range of $10,000 to $20,000 less than median offers to individuals with majors in mathematics, accounting, some sciences, engineering, and computer science. His research on the pay levels needed to attract more STEM students to teaching suggests that an increase in entry-level salaries for math and science teachers of about 25 percent would be needed to motivate about 20 percent of students majoring in mathematics, science, and technology to consider a career in K-12 teaching.[20]

Paying higher salaries to teachers whose skills are in greater demand is one obvious policy remedy to shortages of math and science teachers. But union opposition to differential pay by subject area has made it difficult for most school districts to consider market-based strategies as feasible options. Instead, districts and states tend to offer bonuses or other forms of incentives in addition to regular salaries to reduce disparities between math and science teacher salaries and those of individuals with similar skills and training in the private sector.

Money, of course, is not the only issue that matters. Milanowski also found that expectations about job demands, as well as personal interests and abilities, influenced the likelihood that STEM majors would consider K-12 math and science teaching jobs. While some of his focus group participants commented on the opportunity for continuous learning as a teacher, others "appeared to feel that teaching at the K-12 level was an intellectual dead end."[21] This suggests that a perceived lack of professional development opportunities in math and science teaching, in comparison to professional development opportunities offered by private industry, could be a powerful deterrent.

Some evidence suggests that higher rates of job dissatisfaction contribute to the scarcity of math and science teachers. Richard Ingersoll (2000) found that math and science teachers were significantly more likely than other teachers to report job dissatisfaction as a reason for moving or leaving (40 percent of math/science teachers compared to 29 percent for all teachers).[22] He also found a slightly higher turnover rate for math and science teachers (16 percent) than for all teachers (14.3 percent), although this difference was not statistically significant. In short, the data showed that math and science teachers were not more likely to leave the profession than other teachers but were more likely to change schools. Migration patterns for teachers across all subject areas show that teachers tend to migrate from less desirable to more desirable teaching jobs, which offer better pay and working conditions, fewer student discipline problems, and more teacher input into school decision making.

Overall, Ingersoll found that retirement accounts for only a small portion of teacher turnover. Teacher attrition is highest during the first five years of teaching, and, for this reason, Ingersoll stresses that programs which simply recruit more teachers into the profession will not solve teacher shortages if they do not also seek to improve retention rates among beginners. However, math and science teachers are on average older than teachers of other subjects, and large numbers are nearing retirement, at which time teacher attrition rates will rise once again.[23]

More worrisome is that few states have enough teachers in the pipeline to replace those retiring, because only a small minority of teachers seeks certification in math and science, a problem that states and districts have struggled with for years. In a 2000 survey of large urban districts conducted by the Council of the Great City Schools, nearly all respondents reported an immediate demand for science teachers (98 percent) and math teachers (95 percent). However, in a parallel survey of urban colleges of education, 44 percent reported that students had low interest in pursuing a teaching career in science, and 56 percent reported that students had low interest in pursuing a teaching career in math.[24]

In a more recent example, Maryland higher education institutions in 2005 produced only 13 chemistry teachers, 11 physics teachers, and 1 physical science teacher. At the same time, Maryland schools had vacancies for 59 chemistry teachers, 29 physics teachers, and 12 physical-science teachers.[25] In Iowa, 75 high school physics teachers were eligible to retire this past June, but only 12 potential replacements were enrolled in physics teacher preparation programs in Iowa colleges and universities.[26]

In California, fewer than 7 percent of the teaching credentials awarded in 2002-03 were in mathematics and science.[27] California needed 2,131 new math teachers alone in 2003-04, but the total number of degrees awarded in math by all colleges in the state was 1,389, and only a small portion of those math graduates were expected to become teachers.[28] The California State University system produced a total of 13,000 new teachers in that year, but only 1,466 were credentialed in mathematics or science.[29] The University of California system, which awards nearly 10,000 degrees in mathematics, science, and engineering annually, graduates only 200 to 250 math and science teachers per year.[30]

Compounding the problem is that increasing numbers of states are raising high school graduation standards and requiring additional years of mathematics and science study, which creates demand for even more math and science teachers to teach the required courses. In 2004, Oregon was criticized in a report issued by Achieve, a Washington-based organization that advocates for increased academic rigor in public schools, for having some of the nation's most lenient high school graduation requirements. Achieve argued that every student should take at least four years of rigorous mathematics, but Oregon mandated only two years of math and did not specify particular courses to be taken.[31] When legislation was introduced the following year to increase graduation requirements, the Oregon Department of

Education raised serious concerns about the measure—not because the department opposed higher graduation standards, but because the state would not have had enough math teachers if three years of math were required for all students.[32] Oregon, like many other states, is actively working to find solutions to this dilemma, because diploma requirements will increase to three credits in mathematics after June 2009.[33]

Also in 2004 the Indiana legislature was considering a measure that would require students to complete a more challenging high school curriculum, including three years each of mathematics and science. The Core 40 diploma was eventually adopted, but Indiana legislators were warned by teacher union representatives and local school superintendents that finding enough math and science teachers would be extremely difficult. Equally daunting was the predicted cost of hiring the additional teachers that would be needed. The Indiana Urban Schools Association estimated the cost at $47 million per year if 85 percent of high school students enrolled in the Core 40 curriculum.[34]

Shortages of math and science teachers make education reform at the local level equally difficult. A shallow reserve pool makes it hard for districts to remove ineffective or unqualified teachers, because there are few qualified candidates to replace them. In Washington, D.C., 370 teachers were dismissed at the end of the 2005-06 school year because they had failed to complete the necessary coursework or other requirements to become fully certified. However, the two largest groups of teachers who were dismissed taught subjects that the district already had great difficulty filling—special education (41 teachers) and the sciences (20 teachers). In addition, about 15 of the teachers who were terminated taught math. The district predicted that the combination of teacher terminations and teacher retirements would result in as many as 750 vacancies to be filled over the summer, nearly double the usual amount.[35]

Policymakers are deeply concerned that shortages of qualified math and science teachers will lead to even sharper declines in the numbers of well-prepared students entering the STEM fields. In Connecticut, only 360 students earned mathematics degrees from all public and private colleges and universities in the state during the 2003-04 school year, compared to 473 ten years earlier.[36] In California, the chairman of Intel and the chancellor of the University of California-Santa Cruz have raised alarms that "only 4 percent of ninth graders in California schools now go on to complete a bachelor's degree in science, mathematics, or engineering, providing barely half of California's workforce needs in science- and technology-based industries."[37]

Additional staffing challenges in high-need schools

Although math and science teaching positions are difficult to fill in nearly all schools, shortages are acute in schools with the highest levels of poverty and the lowest levels of achievement. By any measure—certification, grades, test scores, or highly qualified teacher status—teaching quality in math and science is weakest in schools which serve students with the greatest academic needs:

- During the 2004-05 school year, 35 percent of the elementary education majors at California State University at Northridge, which is the Los Angeles Unified School District's primary source of new teachers, received a grade of D or F in their first college-level mathematics classes.[38]
- In 2004, roughly 80 percent of Boston's middle and high school science teachers were not fully certified to teach science.[39]
- In California, the number of underprepared teachers has steadily declined in recent years, but they are still concentrated in the lowest-achieving schools. In schools with the lowest passing rates in mathematics on the state exit exam during 2003-04, 22 percent of teachers lacked full credentials, compared to only 7 percent in schools with the highest passing rates. [40]
- About half of Philadelphia's middle school teachers tested in September and November 2003 failed state teacher tests in mathematics, English, social studies, or science. Only about one quarter of middle school teachers in the rest of the state were unable to pass the tests. Mathematics proved to be the biggest hurdle, which nearly two thirds of the Philadelphia teachers failed.[41]

Schools that cannot find enough certified math and science teachers often resort to assigning teachers out of field, even though they do not have the appropriate qualifications and training to teach these subjects. This practice is most prevalent in high-poverty, low-performing schools, which have the greatest difficulty attracting and retaining teachers of any subject, let alone subjects for which there is widespread demand.[42] Only 21 states have a ban or cap on the number of out-of-field teachers, and only New Mexico prohibits failing schools and Title I schools from employing teachers with out-of-field permits or emergency licenses.[43]

In California, where completion of algebra is a statewide requirement for graduation, the Center for the Future of Teaching and Learning found that 73,000 middle school students were being taught algebra by out-of-field teachers who had either not completed a teacher preparation program or were not fully certified to teach the subject in 2005.[44] Knowledge of algebra is also required to pass the state's high school exit exam. Students in high schools with the lowest pass rates on the exam were three times more likely to be taught by underprepared teachers than were students in schools with the highest pass rates.[45]

Yet assigning teachers out of field is not even the worst alternative that some hard-to-staff schools employ:

- Two months after the start of the 2004-05 school year, 80 teaching positions in the Baltimore public schools remained unfilled. Of the 80 vacancies, 25 were in mathematics and science. Many of the classes without permanent teachers were advanced-level courses needed by students to graduate. One Baltimore high school that still had no teacher for Algebra II and geometry cancelled the classes partway through the semester and reassigned students to other subjects.[46]
- In 2004, one Oakland high school student (on whose behalf the American Civil Liberties Union sued the State of California in a class-

action lawsuit over inequities in school and teacher quality) testified that his freshman science class kept changing subjects mid-year, depending on the availability of teachers: "It was biology.... Our so-called permanent substitute teacher left. As soon as the teacher left, the biology class became chemistry. We don't know why. Then that substitute left, and it became biology again."[47]

- At a May 2004 hearing sponsored by the Philadelphia Student Union, one student testified that he had no geometry teacher for four weeks. A student from another high school testified that her biology class had no permanent teacher for an entire semester. A freshman from a third Philadelphia high school testified that he and his classmates actually played basketball for two weeks during math class. The principal's explanation was that it was likely the only teacher available to cover the class was a physical education teacher.[48]

Analyses conducted by the National Center for Education Statistics suggest that science teachers in high-need schools are more likely to be teaching out of field.[49] Nationally, 25 percent of all high school biology students were taught by teachers without state certification in biology in 1999-2000. Only 17 percent of students in the most affluent schools were taught by teachers without full certification in biology, compared to 37 percent in the highest-poverty schools.

In addition, about 40 percent of all high school biology students were taught by teachers who did not have biology majors or minors. In the wealthiest schools, the majority of these teachers (58 percent) majored or minored in another natural science; however, in the highest-poverty schools, only 26 percent majored or minored in another natural science—instead, almost half majored or minored in elementary education.

At first glance, this finding may not seem particularly troubling. However, survey research conducted for the Bayer Corporation in 2004 suggests that elementary education programs are not adequately preparing teachers to teach elementary school science, let alone advanced science courses at the high school level. Fewer than two thirds of elementary teachers with three to five years of experience (61 percent) reported that they were very qualified to teach science, and 71 percent reported that they were "only somewhat, a little, or not at all science literate." Beginning teachers rated their science preparation much lower than their preparation in English and math, and only 18 percent gave their college or university a grade of A in this area. Although deans of teacher preparation institutions rated their programs more favorably than did teacher graduates, the deans were also less likely to give A grades to science teacher preparation than to English and math preparation at their institutions. Deans reported that their elementary teacher graduates were more qualified to teach English (90 percent), math (78 percent), and social studies (69 percent), than they were to teach science (60 percent). Moreover, less than one third of the deans surveyed (31 percent) believed their elementary teacher graduates were comfortable answering questions about science.[50]

Working conditions also contribute to staffing challenges in high-need schools. Poor working conditions, including poor

physical conditions of school buildings and equipment, are frequently cited as a chief reason teachers tend to avoid high-poverty, low-performing schools. In one 2004 survey of K-12 teachers in Washington, D.C., the quality of school facilities was found to predict the likelihood that teachers would leave their current school assignment.[51] The quality of school facilities may be particularly important to STEM teachers, since outdated laboratory facilities and insufficient equipment are not merely inconvenient or unattractive, they may actually prevent teachers from doing their jobs. Milanowski (2003) noted that focus groups of undergraduates majoring in mathematics, science, and technology, who were asked about characteristics of teaching which reduce its attractiveness as a career option, mentioned low pay most often as the reason they were not interested in a teaching career. However, other requirements or characteristics of the job were also mentioned in focus group discussions. A common theme expressed primarily by students with computer-related majors was lack of up-to-date equipment in schools.[52]

For some math and science teachers in the nation's highest-need schools, lack of up-to-date equipment is only the tip of the iceberg. Jason Kamras, the 2005 National Teacher of the Year, teaches seventh grade math at a middle school in Washington, D.C., where, he says, entire classrooms have no working electrical outlets and he has had to teach children in the library when plumbing leaked raw sewage into his classroom.[53] A series of articles published by the *Providence Journal* on one urban middle school in Rhode Island painted a vivid picture of working conditions for one veteran science teacher who eventually quit:

> Scott Gray is used to making do.
> As a science teacher at Woonsocket Middle School, he teaches introductory biology and chemistry with no lab, no Petri dishes, not even running water.
> For 18 years he's crossed the hall, fetching buckets of water from a slop sink in a broom closet so he can teach seventh graders basic science.
> He rarely complains about the lack of resources and he admits he even manages to have a little fun along the way.
> But after nearly two decades of making do, he says he's fed up.
> He's not alone.[54]

Surveys of principals in New Jersey and science teachers in Wisconsin and New York show consistent disparities in the quality of science equipment and facilities between high-poverty schools and those in more affluent areas of the states. Nearly 3 in 10 New Jersey principals in the poorest districts (27 percent) rated their schools as either somewhat or very inadequate for teaching science, compared to only 8 percent of principals in the state's wealthiest districts.[55] The National Commission on Teaching and America's Future found that half of the science teachers in high-risk schools in Wisconsin (51 percent) reported that their schools had inadequate equipment and materials for science lab work, compared to only one third of science teachers in low-risk schools (33 percent). In New York, the gaps were even greater. Nearly 7 in 10 science teachers in high-risk New York schools (68 percent) reported shortages of science lab equipment and materials, compared to only 3 in 10 science

teachers in low-risk schools (27 percent). Shortages were most severe in urban areas. In New York City suburbs, 22 percent of science teachers in high-risk schools reported insufficient science materials and equipment, compared to 35 percent in other towns upstate, 50 percent in major cities upstate, and 54 percent in New York City.[56]

Potential state and district solutions

As shown in the policy and program descriptions that follow, the strategies that states, districts, and the federal government are using to improve math and science teaching quality in the highest-need schools can be grouped under four approaches. The first two approaches aim to increase the supply of math and science teachers for high-need schools, while the second two approaches aim to reduce demand for new math and science teachers in these schools.

Approach 1 is to create new pipelines of math and science teachers specifically for high-need schools, either via traditional means, such as scholarships, loans, and loan forgiveness programs, or nontraditional means, such as alternative route teacher preparation programs that target mid-career STEM professionals interested in a second career in teaching.

Approach 2 is to redistribute the existing pool of math and science teachers so that schools with high concentrations of poor and minority students get a greater share of them. Financial incentives and policies which permit districts to rehire retired math and science teachers without loss of pension benefits, if they agree to teach in high-need schools, are two of the ways that this can be done.

Approach 3 is to provide intensive professional development, mentoring, and coaching to strengthen the skills of math and science teachers who are already working in high-need schools. Strategies include identifying teachers who have not passed required state assessments, so that districts can provide additional test preparation assistance, and establishing higher education partnerships that target intensive professional development to teachers in the highest-need schools.

Approach 4 is to improve the working conditions which cause teachers to avoid or leave high-need schools, including inadequate laboratory facilities, equipment, and resources which make it difficult or impossible for math and science teachers in high-poverty schools to do their jobs well.

The following sections of this paper describe some of the most promising strategies that states and districts are using to attract or develop greater numbers of quality math and science teachers in high-need schools, and lessons that have been learned from these efforts.

Approach 1: Create new pipelines of math and science teachers specifically for high-need schools

A. Scholarships

Mississippi. Mississippi's Critical Needs Teacher Loan/Scholarship Program provides tuition plus living expenses to prospective teachers willing to teach in a subject shortage area or work in a public school in a region of the state determined to have a critical shortage of teachers. Subject shortage areas include mathematics and science (chemistry,

physics, biology), as well as foreign languages (French, German, Spanish) and special education. However, teachers of the designated subjects can repay their obligation by teaching in any Mississippi public school; they need not, for example, teach math *and* teach in a high-need school. One year of assistance is forgiven for each year of full-time teaching, regardless of whether teachers meet one or both conditions. Recipients must agree to begin employment as a full-time teacher in a Mississippi public school upon graduation. Students seeking an alternative route Mississippi teacher license are eligible for similar assistance under the state's Critical Needs Alternative Route Teacher Loan/Scholarship Program, if they commit to the same service obligations.[57]

Federally-funded scholarships. The National Science Foundation's Robert Noyce Scholarship program provides funds to institutions of higher education, rather than to individuals. Its purpose is to help attract professionals and undergraduate students majoring in STEM subjects to teaching careers in high-need schools. Program funds enable colleges and universities to develop teacher preparation programs and offer scholarships to juniors and seniors majoring in STEM subjects, as well as stipends to STEM professionals who are interested in becoming teachers. A portion of the funds may also be used to provide support for the new teachers as they enter the classroom.

Recipients of Noyce scholarships must commit to teach in a high-need school district for two years for each year of scholarship or stipend support they receive. Target districts include those which have at least one school with high percentages of students in poverty, high rates of teacher turnover, or high percentages of teachers assigned out of field. Undergraduate recipients may receive up to $10,000 in scholarship support for up to two years, while STEM professionals receive a one-time stipend of up to $10,000. One of the goals of the program is to recruit candidates with strong backgrounds in the STEM subjects who otherwise might not have considered becoming a teacher. Recent grant awards were made to institutions of higher education in 22 states and the District of Columbia.[58]

B. Loan forgiveness

Federal loan forgiveness for teachers. The Taxpayer-Teacher Protection Act, enacted by Congress in October 2004, was established to put an end to an unusual loophole that allowed lending agencies to collect as much as 9.5 percent in interest from the U.S. government on student loans, even though students were paying only 3.5 percent interest at the time. Closing the loophole and adjusting the interest rate to the current market value saved an estimated $250 million to $285 million, which was redirected to a federal teacher loan forgiveness program. Prior to the act, teachers were eligible to have up to $5,000 in federal Stafford loans forgiven, if they worked in high-poverty Title I schools. The Taxpayer-Teacher Protection Act more than tripled the maximum amount of debt cancellation for certain teachers, increasing the limit to $17,500 for eligible secondary school math and science teachers and for special education teachers at both the elementary and secondary levels.[59] The program was made permanent with the enactment of the Higher Education Reconciliation Act in February 2006. All applicants for the federal teacher loan

forgiveness program must have taught in eligible low-income schools for five years. Public school teachers of subjects other than mathematics, science, and special education, as well as teachers in nonprofit private schools, are also eligible for some program benefits.[60]

California. California also offers a student loan forgiveness program to encourage teachers of mathematics and science to work in schools that have the greatest difficulty filling teacher vacancies. California's Assumption Program of Loans for Education assumes up to $11,000 of student loans, if teachers work full time in a designated high-need school or teach hard-to-fill subjects and specializations (including reading specialists and foreign language teachers). A high-need school may be one that serves a high-poverty or rural area, has a high percentage of emergency permit teachers, or ranks academically in the bottom half of California schools. The state will assume $2,000 of the teacher's loans after the first year of successful teaching, and an additional $3,000 per year thereafter for the next three years, for a total of $11,000.

However, the incentive is increased by $4,000 ($1,000 more per year) if the teacher teaches math, science, or special education, and by yet another $4,000 if the teacher teaches full time for at least four years in one of the state's lowest-performing schools (i.e., those ranking among the lowest 20 percent academically). For teachers who meet these conditions, the total amount of student loans assumed by the state increases to $19,000.[61]

C. Targeted teacher preparation

New York City. In 2004, the nonprofit Math for America Foundation launched a targeted teacher preparation program to train individuals with exceptional mathematics skills to teach in New York City public high schools. Queens College and New York University (NYU) were chosen as partner universities to provide training for new college graduates or mid-career professionals who are selected as Newton Fellows. Applicants for the fellowships must meet rigorous standards for mathematical ability and show promise of becoming an effective teacher. The fellows receive $65,000 in stipends and full scholarships for an intensive graduate education program leading to permanent teacher certification and a master's of science degree in mathematics education.

During the first year of the five-year program, fellows complete teacher preparation and mathematics course work, fieldwork, and student teaching, and they earn initial teacher certification. They then begin four years of teaching in New York City public high schools in Manhattan and the Bronx, where they receive mentoring and support services. During the fifth year of the program, fellows complete additional course work leading to a master's degree and permanent certification. Math for America covers tuition, fees, and health insurance, provides a $25,000 stipend while fellows study full time during the first year, and provides a $10,000 annual stipend during the next four years in addition to the regular salaries the fellows earn as classroom teachers. In spring 2004, more than 60 individuals applied for 13 slots in the first class of fellows. The expectation is that the Newton Fellowship program will add 40 to 45 new participants each year

and will produce more than two hundred highly skilled and committed secondary mathematics teachers for New York City by 2008.[62]

The Math for America Foundation also provides $50,000 Newton Master Teacher Fellowships to a small number of outstanding secondary math teachers in New York City. The teacher recognition program offers $12,500 in annual stipends for four years and provides additional professional development and opportunities for fellows to collaborate with peers. Awards were made to 16 outstanding teachers in 2006.[63]

In addition to Math for America's program, the New York City Department of Education, CUNY, and NYU partnered to form a Teacher Academy to recruit and prepare math and science teachers for New York City public schools. The Teacher Academy recruits college freshmen interested in becoming math or science teachers and provides funding and support to enable them to earn an undergraduate degree and teacher certification. The program operates at all CUNY campuses and NYU, and provides free tuition and a stipend. In exchange, participants agree to teach in New York City public schools for at least two years upon graduation. More than 100 students are currently participating in the program.[64]

Ohio. With financial assistance from Toyota, the University of Cincinnati established a new program in 2004 for the express purpose of recruiting, preparing, and retaining African American students as mathematics and science teachers in urban schools. The African American Initiative for Math/Science (AAIMS) was designed to provide full scholarships for the duration of the five-year undergraduate program, plus housing support during a student's first year. In exchange for full scholarships, AAIMS participants pledge to teach in an urban school for at least five years upon completion of the program. Participants admitted to AAIMS enroll in an intensive summer program to prepare them for freshman mathematics and science courses, receive support and mentoring from faculty and fellow students, and interact with engineering students in the university's Emerging Ethnic Engineers program. Students earn both a bachelor's degree and an Ohio teaching certificate upon completion. Ninety-five African American high school seniors from across Ohio applied for 25 slots for the initial 2004-05 school year.[65]

Maryland. A recent $5 million gift to the University of Maryland, Baltimore County (UMBC), is being used to fund the Sherman STEM Teacher Training Program, which will provide scholarships for math and science teachers-in-training who agree to work in at-risk schools in Baltimore and in other urban Maryland districts. The program will provide scholarships for undergraduates and transfer students and fellowships for recent college graduates and mid-career changers seeking a master's of arts degree in teaching. The program will recruit its first group of teacher candidates from current UMBC students majoring in STEM subjects. Within five years, the university expects to enroll 50 undergraduate and 10 graduate students in the STEM Teacher Training Program each year.[66]

Florida. As a way of attracting graduate students with backgrounds in mathematics, science, and engineering into the teaching profession, the Florida

Teaching Fellows program will waive fees and tuition at any public college or university in the state, so that candidates can complete required course work for a teaching credential. All Teaching Fellows receive a $5,000 annual stipend and a $5,000 signing bonus; the signing bonus is doubled to $10,000 for fellows who teach in one of the state's lowest-performing D- or F-rated schools.[67] Further steps to attract teachers of critical shortage subjects to high-need schools were taken in June 2006, when Florida legislators approved a new education reform package to strengthen education at the middle and high school levels. Florida's A++ Plan for Education includes provisions for additional pay for experienced teachers who work in low-performing schools and teach hard-to-fill subjects and specializations, such as mathematics, science, and special education.[68]

D. Alternative routes to teaching

Teach for America. Alternative route teacher preparation programs are an increasingly common way for individuals to enter the teaching profession, particularly in hard-to-fill subjects such as math and science. Of these programs, the most widely recognized is Teach for America, which recruits graduates of top-tier colleges and universities to teach for two-year stints in more than 1,000 hard-to-staff urban and rural schools across the country. Although some researchers have voiced concerns about the effectiveness of teachers trained by Teach for America, a recent study conducted by Mathematica Policy Research, Inc., found that elementary students of Teach for America graduates in eight cities made greater gains in math in one school year than students taught by traditionally trained teachers, with similar gains made in reading.[69] Other studies, however, have found that students learn more from traditionally certified teachers than from alternatively trained teachers, including Teach for America graduates.[70]

Although research yields mixed results on the effects that these teachers have on student learning, it is highly likely that Teach for America will continue to be a critical source of new math and science teachers. Nearly one in five of the 19,000 individuals who applied for 2,400 spots this year had completed majors in mathematics, science, or engineering. The proportion of STEM graduates who applied to Teach for America was unusually high at certain schools. At Notre Dame, for example, one third of the university's mathematics, science, and engineering graduates applied. At the California Institute of Technology, 8 percent of the entire graduating class applied.[71] Teach for America's push to produce more STEM teachers includes a five-year partnership with the Amgen Foundation to double the percentage of math and science majors who join Teach for America by 2010, to 40 percent. The foundation will support the recruitment, training, and professional development for 50 new Amgen Fellows each year and will pay each a $2,000 signing bonus.[72]

Troops to Teachers. Another critical source of math and science teachers for high-need schools is Troops to Teachers. A 2005 survey revealed that Troops teachers are more likely to work in high-need urban districts and are more likely to teach critical shortage subjects than are other teachers. Only 7 percent of all teachers teach math, for example, compared to 27 percent of Troops to

Teachers graduates. In addition, only 18 percent of all teachers teach science, compared to nearly half (46 percent) of Troops teachers. Nearly one third of Troops teachers (31 percent) teach in large cities, and nearly one fourth (24 percent) teach in medium-sized cities, compared to 15 percent and 17 percent of all K-12 public school teachers, respectively.[73]

Not all alternative route teacher preparation programs have been as successful at boosting the numbers of teachers of high-demand subjects. In Indiana, the law that established the state's alternative route Transition to Teaching program did not restrict participation to candidates pursuing teacher licenses in the state's most critical subject shortage areas. Consequently, a 2005 analysis found that three out of four program participants were pursuing teacher licenses in subjects other than math, science, and special education. Nearly half of the participants were pursuing certification as elementary teachers, even though the state already produced more elementary teachers than it needed.[74]

Ohio. Other states, such as Ohio, have developed more targeted alternative route teacher preparation programs to increase the pipeline of math and science teachers and channel them into high-need schools. Expanding the Pool of Qualified Teachers (EPQT), for example, is a teacher recruitment initiative developed by the Ohio Department of Education for military personnel interested in becoming teachers. The program, which ended in September 2006, was funded by a grant awarded by the U.S. Department of Education. Current and recently retired members of the military, National Guard, or Reserve were eligible to apply. The program was limited to prospective teachers of hard-to-fill subjects and specializations, including mathematics, science, foreign languages, and special education.

Recipients were required to teach for three years in a high-need school district in Ohio in order to receive funding. The program covered the cost of teacher examination fees and up to $4,800 for required course work needed to complete an alternative teacher license in Ohio. (For prospective special education teachers, the program covered up to $13,000, since experience had shown that alternative route special education teachers typically needed more credit hours to fulfill the state's 30 semester-hour requirement than alternative route math and science teachers generally did).[75] A unique feature of the program was that the Department of Education also provided up to $2,600 to employing districts to cover mentoring costs for the EPQT graduates.[76]

In 2000, Ohio also awarded Diversity Grants of up to $200,000 to nine high-poverty school districts to design and implement strategies to fill vacancies in math, science, and special education. The districts formed partnerships with universities, special education resource centers, and regional professional development centers to prepare more than 300 teachers in these high-need subject areas through alternative route programs.[77]

Recruiting teachers from abroad is also becoming an increasingly popular way for states and school districts to find highly qualified teachers for the most

difficult-to-fill subjects. The U.S. Department of Education has given states flexibility to determine whether visiting international teachers have the necessary training, subject matter knowledge, and teaching skills to meet existing state certification and testing criteria, so that they can be considered highly qualified and districts can employ them on a temporary basis.[78] Some rural and urban districts that have great difficulty attracting and keeping qualified candidates rely heavily on this strategy. Baltimore, for example, hired 104 Filipino teachers in 2005 and another 120 in 2006.[79] Some were hired to fill vacancies at the city's most troubled schools, those that had been labeled "persistently dangerous."[80]

However, international teachers employed on J-1 visas are allowed to remain in the United States for only three years. Relying on a string of consecutive math and science teachers who leave within a few years is not a recommended strategy for staffing high-need schools that already suffer from high teacher turnover. States and districts that rely on international teachers to fill vacancies in some of their most difficult-to-staff schools must also develop long-term strategies to build the capacity of teachers within the school and improve the working conditions that contribute to staff instability. Short-term strategies are needed as well to provide the support, training, and mentoring needed by new international teachers, many of whom report they were not prepared for the kind of classroom management and discipline problems they encountered.[81]

Approach 2: Redistribute the existing pool of math and science teachers

A. Incentives

Guilford County, North Carolina. Guilford County, North Carolina, has instituted a pilot plan to attract experienced math teachers to its highest-need schools by offering incentives to reward teachers for the substantially harder work that these jobs entail. As part of the district's newly launched Mission Possible plan, up to 53 highly qualified math teachers will be paid one-time bonuses of $10,000 for teaching in eight low-performing high schools. The purpose of the bonus is to increase the relative attractiveness of the target schools, as well as to help close the salary gap between math teachers and math majors employed in the private sector.

A $2 million grant from a partner group of six local foundations has enabled the district to expand the number of target schools from six to eight this year. Contributions from the school district and the University of North Carolina system bring total funds for the project to $4 million. All of the schools participating in the pilot project are low performing. Two are on a list of schools threatened with closure if student test scores do not improve, and annual math teacher turnover in some of the schools has been as high as 50 percent. In addition to the $10,000 bonuses, teachers receive laptop computers to ensure they have needed equipment, and participating teachers are eligible for as much as $4,000 in performance pay, if students make at least 1.5 years of growth in mathematics during the year. With assistance from the North Carolina

Agricultural & Technical State University and the University of North Carolina, Greensboro, the pilot program also offers mentoring, college course work, and professional development to help improve teacher retention rates and lead to greater staff stability in the target schools.[82]

Bertie, Columbus, and Rockingham Counties, North Carolina. State funds are also being used to provide bonuses to math and science teachers in three additional North Carolina school districts this year. In September 2006, the North Carolina State Board of Education allocated more than $500,000 for teacher signing bonuses to three of the state's highest-poverty, lowest-performing school districts. The funds enable each of the districts to offer $15,000 signing bonuses to attract up to 10 new middle or high school teachers certified in mathematics or science.[83]

Tennessee. Similar signing bonuses are being used to help fill math and science teacher vacancies in two hard-to-staff rural districts in East Tennessee, where teacher salaries are among the lowest in the state. Last year, the University of Tennessee-Battelle Memorial Institute, which runs the Oak Ridge Lab for the U.S. Department of Energy, helped schools in the surrounding area to attract highly qualified math and science teachers by making a commitment to offer five $10,000 bonuses to teachers who agreed to remain in the school systems for at least three years. Mid-career changers and traditional classroom teachers alike were eligible for the bonuses, which were equal to about one third of a new teacher's salary. Among the first recipients of the bonuses were a 13-year veteran math teacher recruited from a neighboring county and a former Oak Ridge employee with a doctorate in chemistry, who now teaches AP physics and chemistry courses.[84]

Los Angeles. Although many districts offer signing bonuses to attract teachers of hard-to-fill subjects, the Los Angeles Unified School District (LAUSD) is one of only a few large urban districts which target their bonuses to math and science teachers willing to work in the schools with greatest need. In May 2006, LAUSD's Board of Education approved a new incentive program to attract and retain certified math, science, and special education teachers in the district's lowest-performing schools. The Teacher Recruitment and Student Support Grant Program is targeted to schools with achievement scores in the bottom three deciles of the state's Academic Performance Index and which are designated as Program Improvement schools.

Newly assigned, fully credentialed teachers are eligible to receive a $5,000 recruitment incentive, as well as a $5,000 retention incentive, if they remain in the target schools for three years. In addition, LAUSD will cover up to $5,000 in educational expenses to help participating teachers to earn a master's degree, and to help teachers of nonshortage subjects to become fully credentialed in math, science, or special education. Both newly hired teachers and current teachers who transfer from other schools are eligible to participate. In addition, schools that meet their AYP targets for two years in a row are eligible for one-time performance awards, and additional recruitment incentives and annual stipends are earmarked for certified special education teachers who work in any district school.

The cost of the three-year program is estimated to be approximately $14.2 million and will be funded with a combination of $11.2 million in state grant funds and $3 million in district general funds.[85]

Nashville. A similar proposal to use financial incentives to attract math and science teachers to high-need urban schools was under consideration in Nashville this past spring. An additional condition of the Nashville proposal, however, was that part of the teacher bonuses would have been tied to student and school performance. In April 2006, district officials proposed to the Board of Education that Nashville establish a pilot incentive pay plan that would offer several thousand dollars to math and science teachers who relocate to one of the district's lowest-performing high schools. Teachers currently working in the school also would be eligible for bonuses, if the school met performance goals in areas such as student discipline, attendance, and graduation rates. In both of the schools being considered for the pilot plan, the average high school graduation rate over the previous four years had been less than 44 percent. Administrators had initially hoped to launch the pilot program during the 2006-07 school year, but thus far no program has been enacted.[86]

New York City. Nearly $15,000 in housing incentives, rather than cash bonuses, are being used to recruit certified math and science teachers to hard-to-staff middle and high schools in New York City, as well as special education teachers for all grades. [87] To be eligible for the program, teachers must be fully certified in their subject, have at least two years of teaching experience, pass a stringent review and selection process, and commit to work for at least three years in one of the city's most difficult-to-staff schools. Former teachers are also eligible for the program, as long as they have not taught in New York City for the previous two years. Participating teachers receive an initial $5,000 payment, which can be used for housing-related expenses, such as relocation costs, down payments, or rental fees. Teachers then receive a $400 monthly housing stipend for two years. School system officials hoped that the housing subsidy would result in 100 new hires before the beginning of the 2006-07 school year, bringing program costs to $1.46 million. Initial reports indicate that by mid-July, the program already had received nearly 140 applications.[88]

Virginia. Experienced math teachers selected to participate in Virginia's Middle School Teacher Corps can earn up to $30,000 in additional pay over three years by transferring to one of the state's lowest-performing middle schools and fulfilling a three-year commitment to teach and possibly mentor other teachers. The program was created in May 2005 as part of former Governor Mark Warner's teacher retention and support initiatives. A primary goal of the program is to ensure there is at least one well-qualified math teacher in each of the state's middle schools identified as "at risk in mathematics." These schools are either not meeting annual measurable objectives that determine adequate yearly progress, or they have been accredited with warning in mathematics.

When the program was launched, 67 schools in 40 school districts met the eligibility criteria, and the Virginia

Department of Education planned to select up to 69 teachers.[89] Participating teachers must have a major or minor in mathematics, have at least three years of full-time math teaching experience, hold or apply for a Virginia teaching license with an endorsement in middle school mathematics, and meet the state's definition of a highly qualified teacher. As part of the application process, teachers must also submit two letters of recommendation attesting to their ability to teach mathematics successfully in challenging classrooms.

B. Tap new sources of math and science teachers by recruiting local college instructors to fill teacher vacancies

Durham, North Carolina. In September 2006, school district officials in Durham, North Carolina, turned to a local state university for emergency help at one of its high schools that still had not filled seven teacher vacancies for required math and science courses. The school is one of the district's lowest performers and faces possible restructuring if student performance does not improve. Within one week, 13 professors from North Carolina Central University (NCCU) had signed up to teach 21 courses at the high school. In addition to being able to complete required courses taught by highly qualified teachers, students have access to computer and science labs and tutors at the university, and some qualify for college credit. Using money saved from unused teacher salaries, the district will pay the university about $250 per student for tuition, which is equivalent to the cost of a distance education course at NCCU. Some of the instructors will earn up to $5,000 in additional pay. By mid-year, the district expects all of the teacher vacancies to be filled, so that professors can return to their regular teaching jobs at the university for the second semester.[90]

C. Rehire retired teachers for hard-to-fill subjects in hard-to-staff schools

Maryland. Although many states have instituted policies allowing districts to fill teacher vacancies by rehiring retired teachers without loss of pension benefits, Maryland is the only state to adopt a targeted policy that limits eligibility to teachers of high-need subjects who agree to work in high-need schools. Authorizing legislation allowing Maryland districts to rehire retired teachers was enacted in 1999, and a similar bill allowing the rehiring of retired principals was enacted the following year. Both laws were scheduled to end in 2004.[91]

In 2005, Maryland lawmakers reinstated a bill permitting districts to rehire retired teachers and principals, but it included additional restrictions on eligibility to ensure the program met its intended purpose. Rehired teachers must work in a high-poverty school receiving Title I funds, a school that is not making adequate yearly progress, a school that has been identified for improvement, or in certain alternative schools. In addition, teachers must teach a critical shortage subject or teach classes for English language learners or students with disabilities. Rehired principals are also restricted to working in the same four types of schools.[92]

D. Targeted teacher recruitment

Virginia. The Teach in Virginia program is an example of another way in which states can help to steer teachers of hard-to-fill subjects into the highest-

need schools. Although Teach in Virginia was discontinued at the end of September 2006, its purpose had been to recruit licensed and nonlicensed teachers only for high-need subject areas, and only to work in understaffed school districts. Teach in Virginia's application process was streamlined to allow teacher candidates to apply to several hard-to-staff school districts at once. The program had been created through a joint partnership between the Virginia Department of Education, Virginia State University, and The New Teacher Project.[93]

Approach 3: Provide intensive professional development, mentoring, and coaching to strengthen the skills of math and science teachers already working in low-performing schools

A. Test preparation

Philadelphia. In 2004, teacher test results indicated that half of Philadelphia's middle school teachers had failed state subject-certification examinations in English, math, social studies, and science. Test results were worst in math, which nearly two out of three middle school teachers failed. At the time, more than 90 percent of Philadelphia's middle school teachers held elementary-level teaching certificates that did not require in-depth knowledge in specific subjects. [94]

Once teacher pass rates were made available, Philadelphia School District officials took action to ensure teachers received the assistance they needed to pass the tests and become highly qualified. The district began investigating the possibility of hiring the Princeton Review to provide a 12-hour test preparation course at a cost of $450 per teacher, which would be paid by the district.[95] In addition, the district secured a $500,000 grant from Wachovia Bank to launch a teachers' academy, which would offer courses over the summer and strengthen teachers' subject matter knowledge.[96]

This example demonstrates that an important way in which state education agencies can provide technical assistance to districts is to provide data that reveal where inequities in teacher distribution occur, so that districts can take the necessary steps to correct them. As Philadelphia School District chief executive officer, Paul Vallas, pointed out, "You have to admit to a problem before you can address it. . . . It was important to get that number out there, so that it would be a wake-up call to everyone."[97] It should be noted, however, that data on teacher pass rates were made available to Philadelphia School District officials only because they had specifically requested this information from the Pennsylvania Department of Education. The agency did not routinely run such reports for all of the state's school districts. Yet Philadelphia's responsiveness suggests that providing this type of information proactively to districts, with necessary precautions taken to protect individual teachers' identity in information that is made public, is a strategy that state education agencies should carefully consider as they make changes to their teacher data systems and implement state plans to ensure an equitable distribution of teachers.

California. Another initiative to help underprepared math and science teachers to pass state subject matter tests and become highly qualified is underway in California. With $150,000 in funding from the Boeing Company and

$200,000 from the William and Flora Hewlett Foundation, the University of California at Irvine Extension has begun developing a series of online courses to help math and science teachers pass required California Subject Examinations for Teachers (CSET). When the initiative was launched in August 2005, an estimated 40 percent of teacher candidates could not pass CSET on their first attempt, and nearly 1,500 math classes and 800 science classes in California high schools were staffed by teachers who were not fully certified in the subjects they were assigned to teach. The initiative was developed to support the state's California Teach initiative, which aims to increase the number of math and science teachers produced in California from 250 to 1,000 each year by 2010.[98]

B. Master teachers as coaches and mentors

Texas. States can also help districts build the skills of underprepared teachers by funding mentoring, induction, and coaching programs targeted to low-performing schools. Texas has developed such a program, which identifies master teachers in math and science (as well as reading) at low-performing schools and rewards them for coaching less-experienced colleagues. Teachers who become master teachers must complete special preparation programs approved by the State Board for Educator Certification and pass a master teacher certification examination. Once they become certified as Master Mathematics or Master Science Teachers, they are eligible to receive state stipends of up to $5,000 at the end of the year for mentoring fellow teachers part time while they continue to teach. State funds are awarded to districts, rather than to individual teachers, and districts are responsible for determining which teachers will receive the stipends. State grants are renewable, and districts are encouraged to select teachers who are willing to serve as master teachers for several years.[99]

C. Professional development partnerships with institutions of higher education

Boston. An example of a federally-funded partnership to encourage institutions of higher education to provide intensive professional development in math or science to teachers in high-need districts is the Boston Science Partnership. The $12.5 million five-year grant from the National Science Foundation was awarded in response to the critical need to strengthen science teaching in Boston, where roughly 80 percent of middle and high school science teachers were not fully certified to teach science.

Core partners in the project are the Boston Public Schools, the University of Massachusetts (UMass)-Boston, and Northeastern University, with Harvard Medical School and the College Board as supporting partners. The purpose of the Boston Science Partnership is to raise student achievement in science by significantly improving the quality of the district's science teachers, to improve science teaching in the district and in the universities, and to increase the numbers of students who are prepared to enter university science and engineering programs. Major activities include revising the district's science curriculum, training new science teachers for the Boston public schools, and retraining current science teachers, so they meet state certification standards to be considered highly qualified. Small groups of science

teachers are taking course work at UMass-Boston and Northeastern, and Harvard faculty are working with parents and teachers to encourage more students to pursue science and technology careers.[100]

Other National Science Foundation-funded partnerships. The Boston Science Partnership is only one of many projects funded by the National Science Foundation's Mathematics and Science Partnership program, or MSPnet.[101] MSPnet is a research and development effort that supports partnerships among institutions of higher education, local K-12 school districts, and other supporting partners, which apply as teams for competitive grants. "Teacher quality, quantity, and diversity" is one of the five key features of MSPnet projects. While the National Science Foundation does not require a participating school district to be a high-need district, many of the awarded grants do serve high-poverty, low-performing, and hard-to-staff urban and rural districts, such as the Appalachian Mathematics and Science Partnership, the New Jersey Math Science Partnership, the Cleveland Math and Science Partnership, and the Milwaukee Mathematics Partnership.

U.S. Department of Education-funded partnerships. In addition to projects funded by the National Science Foundation, the U.S. Department of Education provides formula grants to states to support the development of partnerships between science, mathematics, and engineering faculty at institutions of higher education and high-need school districts. Additional partners may include faculty in colleges of education, businesses, and others. The program seeks to increase student mathematics and science achievement in low-performing schools by increasing the knowledge and skills of teachers through high-quality professional development. Partnerships supported by the U.S. Department of Education and funded through Title II, Part B of the No Child Left Behind Act, must include one or more high-need school districts.[102]

Approach 4: Improve working conditions that cause math and science teachers to leave or avoid high-poverty, low-performing schools

A. Targeted professional development opportunities in business and industry

Kansas. It is not uncommon for businesses in science and high-tech industries to offer temporary employment and professional development opportunities to math and science teachers during the summer. However, Kansas provides tax incentives to encourage businesses to do so and offers additional benefits to encourage businesses to form partnerships with high-need school districts. Legislation passed by Kansas lawmakers in 2005 created a corporate tax credit for businesses that hire math, science, physics, chemistry, or biology teachers during times when school is not in session.[103] The size of the tax credit increases if businesses hire teachers from rural schools, underserved areas, or schools in underperforming urban areas. To prevent corporate raiding, businesses must repay all tax credits to the state if they hire participating math and science teachers away from their districts.

B. Upgraded laboratory equipment, facilities, and textbooks

California. Surveys of principals and science teachers in several states have documented wide disparities in the adequacy of lab equipment, materials, and resources available to teachers and students in both high- and low-poverty schools. California is spending nearly $1 billion over a period of several years to address these kinds of deficiencies as a result of a settlement agreement reached in August 2004 in a major class-action lawsuit, *Williams v. California*. The American Civil Liberties Union and other civil rights groups filed the lawsuit in 2000 over inferior conditions in 2,400 of the state's lowest-performing schools, which serve more than one million poor and minority students. Plaintiffs in the lawsuit argued that the state had failed to provide its poorest students an adequate education and had violated its own laws guaranteeing minimum standards for education by allowing students to attend schools with insufficient textbooks, crowded classrooms, unsafe and unclean school facilities, decrepit physical conditions, and unqualified teachers. One elementary school district in North Sacramento reported that teachers had to alternate the days they taught science because each school in the district had only about 30 science textbooks, enough for a single class. Eight of the district's 10 schools are among the lowest-performing schools in the state.[104]

Conclusions and recommendations

This paper has described a number of challenges that make math and science teaching positions difficult to fill in any school, and particularly hard to fill in schools that serve students with the greatest needs. Promising news is that states and districts are designing and implementing a broad array of strategies to attract, develop, and retain greater numbers of math and science teachers in high-need schools, although many of these strategies are recently created and information about their effectiveness is limited. Nevertheless, there are already several important lessons that can be learned from these efforts.

In the recent policy statement executive summary released by CCSSO in 2006, the members of the Mathematics and Science Education Task Force recommended that states build or reinforce professional development policies and structures that equip mathematics and science teachers with the knowledge and skills to address students with diverse needs, including those from other cultures, English language learners, students in urban settings, and students with special needs.[105]

In fact, many of the task force recommendations are consistent with the policy recommendations in this report. It would be helpful if states implementing policy recommendations monitored and reported their progress to their peers in the future.

Lessons learned

1. General strategies that simply aim to produce more math and science teachers will not solve inequities in teacher distribution.
As noted at the beginning of this paper, a number of states have launched major initiatives during recent months to increase the numbers of math and science teachers produced by their institutions of higher education. Although these efforts appear to be highly promising, most say little about

what will be done to ensure an equitable distribution of these new teachers for poor and minority students. Simply producing more teachers will not ensure that they are targeted in areas of most need across the state, as has already been seen in California. More than 40,000 classroom teachers were teaching on emergency permits or waivers in 1999-2000, yet the California Commission on Teacher Credentialing estimated there were enough credentialed teachers in the state to fill every teaching vacancy four times over.[106]

2. Recruitment and retention strategies must be targeted to encourage math and science teachers to work in the schools where they are needed most.

Math and science teachers, like teachers of any other subject, are not generally drawn to struggling schools without some additional incentives to make these schools relatively more attractive places in which to work. There are three ways that states can target recruitment and retention strategies to achieve this aim and steer more teachers to the schools where they are most needed. First, states can make scholarships, bonuses, training, and other types of incentives available only to teachers of critical shortage subjects and only to those who work in high-need schools. Ohio's EPQT program, for example, was limited to prospective teachers of math, science, foreign languages, and special education, and participants were required to teach for three years in a high-need school district in Ohio in order to receive funding. Second, states can offer other types of programs and incentives to all teachers but increase the size of the reward or forgive loans faster, if they teach hard-to-fill subjects and work in high-need schools. All Florida Teaching Fellows, for example, receive a $5,000 signing bonus, but the signing bonus is doubled to $10,000 if fellows teach math or science in one of the state's lowest-performing D- or F-rated schools. Third, states can offer programs and incentives to all teachers or all schools but give priority to those with the highest needs. Rhode Island, for example, plans to upgrade science labs and equipment in all of its schools by 2010. Giving first priority for renovations and new equipment to high-poverty schools would be a targeted recruitment and retention strategy that would help make these schools more attractive to science teachers.

3. Efforts to recruit STEM majors into teaching will be more effective if states and districts reduce the sizable gaps between math and science teachers' salaries and those offered in the private sector.

A wide variety of recruitment strategies have been proposed to attract more STEM students to teaching: accelerated degree programs, scholarships, free tuition, loan forgiveness, paid teaching internships, and summer internships in private industry. These recruitment strategies provide essential financial support to reduce the cost of teacher preparation, as well as professional support as students start their teaching careers. However, Milanowski's research suggests that these types of recruitment strategies are not likely to attract very many STEM majors into teaching, unless salaries for math and science teachers also become more competitive with those in the private sector.[107] Salaries need not be raised as high as the levels that STEM majors would expect to earn in the private sector, but they must be

substantially larger than they are currently. A projected increase in entry-level salaries for math and science teachers of about 25 percent would be needed to motivate about 20 percent of students majoring in mathematics, science, and technology to consider a career in K-12 teaching. Because students' willingness to consider a career in teaching appears to be tied, in part, to the size of the salaries that they expect to earn in private industry, Milanowski advises policymakers that recruitment efforts targeted to engineering students and others in relatively high-paying STEM fields may not be particularly cost effective.

Paying math and science teachers more than teachers of other subjects is not easy for most districts to do, since compensation systems which differentiate pay by subject are seldom supported by teacher unions. However, the examples presented in this paper demonstrate a number of other ways in which states and districts can augment math and science teacher pay and reduce salary gaps, such as offering bonuses of as much as $10,000 to $15,000 in hard-to-staff schools, as was done in Los Angeles and in some North Carolina and Tennessee districts. Other strategies that provide valued benefits to teachers other than cash include offering up to $15,000 in housing incentives for math, science, and special education teachers in hard-to-staff schools, as was done in New York City, and up to $5,000 toward the cost of a master's degree for teachers of hard-to-fill subjects in low-performing schools, as was done in Los Angeles.

4. States and districts should establish partnerships with universities and with businesses in science- and technology-based fields to provide ongoing training opportunities to new and experienced math and science teachers.

Teacher mobility surveys indicate that math and science teachers are more likely than others to report job dissatisfaction as a reason for leaving. Low salaries are one source of their dissatisfaction, but salaries are not the only job characteristic that matters to teachers. Developing partnerships with universities and businesses in science- and technology-based fields to provide college course work, summer employment, and other professional development opportunities that rival those offered in private industry may be one way to increase math and science teachers' job satisfaction and retain them in the profession. Guilford County, North Carolina, has developed such a partnership with the North Carolina Agricultural and Technical State University and the University of North Carolina, Greensboro. States could also use these partnerships to provide high quality induction around current and cutting edge thinking in the field targeted to math/science teachers to further prepare them for the classroom. Such training will not only serve to prepare teachers better for the classroom, but could also prove helpful in retaining teachers in high-need classrooms. States should also consider offering additional incentives to businesses that target support to math and science teachers in high-need schools, as is being done in Kansas.

5. States and districts should develop more innovative strategies to grow math and science teachers

and build staff capacity in high-need schools.

Aggressively recruiting more students for higher education teacher preparation programs, as California is now doing and Texas has been doing for quite some time, is one way to address the scarcity of math and science teacher candidates in the pipeline. States and districts should also develop innovative short-term strategies to grow the number of math and science teachers, including expanded use of high-quality alternative route programs. Troops to Teachers graduates are more likely than other teachers to teach hard-to-fill subjects, and Teach for America has intensified its efforts to double the number of math, science, and engineering graduates admitted to its program. States should monitor their own alternative route programs to ensure program participants are not pursuing teaching certificates in subjects that do not meet the needs of the state, as was the case in Indiana. States should also consider revising their retire-rehire policies, as Maryland did, so that the program's sole focus is to redirect retired teachers to hard-to-fill subjects and retired principals to the state's lowest-performing schools. States should pay particular attention to the technical assistance needs of districts that rely heavily on international teachers to fill vacancies in chronically hard-to-staff schools. Ensuring that international teachers in these settings receive needed support and professional development should be coupled with strategies to improve working conditions in the schools and ensure greater staff stability.

Innovative efforts at the local level include a new grow-your-own strategy in the Los Angeles Unified School District (LAUSD), which pays up to $5,000 in educational expenses to help teachers of nonshortage subjects become fully credentialed in math, science, and special education. In Durham, North Carolina, district officials solved a teacher shortage by tapping local college instructors to fill teacher vacancies in required math and science courses. Although this was considered an emergency strategy at the time, district-university partnerships to share highly-qualified math and science instructors may be a strategy worth exploring.

6. States should encourage institutions of higher education to apply for existing funds that support scholarships and professional development programs for math and science teachers in high-need schools.

The National Science Foundation's Robert Noyce Scholarship program, federal teacher loan forgiveness programs for teachers of hard-to-fill subjects in Title I schools, the National Science Foundation's MSPnet program, and math-science partnerships funded by the U.S. Department of Education under Title II, Part B, are four federal programs that support the recruitment, preparation, and development of math and science teachers for high-poverty, low-performing schools. State education agencies should provide information about these programs via website and other means, and encourage their institutions of higher education to apply for scholarship and professional development funds from these sources. State education agencies should also explore ways they can support targeted teacher education programs that prepare math and science teachers specifically for high-need schools, such as the University of Cincinnati's African American Initiative for Math/Science and

the Math for America's Newton Fellows program in New York City.

It is clear that strengthening U.S. student achievement in mathematics and science will require much greater investments in teacher recruitment, preparation, development, and retention. Producing more math and science teachers is necessary, but not sufficient. States and districts must also take deliberate steps to ensure these teachers are equitably distributed, so that all students have the teachers they need to reach higher standards in mathematics and science.

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Chapter 3

Innovations to Provide Specialized Knowledge and Skills Needed to Teach Diverse Learners

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Introduction

A number of recent studies of teacher turnover in California, Texas, New York, Georgia, and Philadelphia indicate that teachers tend to move away from schools with low levels of achievement and high concentrations of poor and minority students.[1] Researchers and policy analysts have proposed that poor working conditions, insufficient resources, low pay, weak leadership, limited opportunities for professional development, student discipline problems, and lack of mentoring and support contribute to high teacher turnover in these schools.[2] An additional factor that has received far less attention, but which also may play a large role in teachers' decisions to leave, is that many teachers feel they have not been prepared to be effective with the populations of students typically served in high-need schools.

As schools become increasingly diverse and pressures increase to improve the academic performance of all groups of students, it is critically important that states take steps to ensure teachers are prepared to teach students from different ethnic, linguistic, cultural, and economic backgrounds and students with special learning needs. According to the National Center for Education Statistics, the percentage of minority students enrolled in U.S. public schools increased from 22 percent to 43 percent between 1972 and 2004, due in large part to the increase in the proportion of Hispanic students, which rose from 6 percent to 19 percent.[3] Nearly one in five school-aged children (9.9 million) spoke a language other than English at home. Between 1979 and 2004, the total number of school-aged children increased 18 percent. However, those who spoke a non-English language at home increased 162 percent, and those who spoke a non-English home language and spoke English with difficulty increased by 114 percent.[4] According to the U.S. Census Bureau, immigration was a major factor contributing to these dramatic shifts. In 2003, 22 percent of all students had at least one foreign-born parent, including 66 percent of Hispanic students and 91 percent of Asian students.[5]

The proportion of children in poverty and the proportion of students with special learning needs have also risen dramatically. In 2004, 18 percent of children—more than 13 million—lived in poverty, an increase of one million in only four years. One third of all children lived in a household with no parent who worked full time, year-round.[6] At the same time, 14 percent of youth aged 3 to 21 (6.6 million) received special education services, up from 8 percent (3.7 million) in 1976-77, after the passage of the Individuals with Disabilities Education Act (IDEA).[7]

Increasing the numbers of teachers with the specialized knowledge and training to work with diverse learners should be part of every state's strategies to improve teacher quality and retention, since evidence suggests that teachers leave schools in which they do not feel they are effective with their students. Yet teacher surveys are consistent in their findings that teachers do not feel prepared to work with English language learners (ELLs),

culturally diverse students, and students in poverty—the very students that tend to be concentrated in the most difficult-to-staff schools.

Moreover, teachers report they are not receiving the kinds of training and support that might enable them to improve their abilities in this area. Relatively few teachers report receiving recent professional development on how to work with special needs students or diverse learners. In addition, new teachers report communicating with and engaging the parents of their students is a struggle, especially in high-poverty schools.

States such as Oregon have made the development of culturally competent educators a priority. Susan Castillo, Oregon's superintendent of public instruction, argues that a culturally competent staff is critical to Oregon schools, and that "every teacher and principal needs to gain a thorough understanding of the culture, family and social values, community beliefs and expectations of the students they serve."[8] To help other states and districts recruit, prepare, and develop a teaching force that can successfully serve learners with diverse academic and language needs in high-poverty schools, this paper examines the following questions:

1. What specialized knowledge and skills do teachers need to be effective with the populations of students typically served in high-poverty, low-performing schools (including Native American students, ELLs, and other students at risk)?
2. What kinds of instructional practices have been found to be effective with diverse learners?
3. How well are teachers prepared and supported to work with diverse learners in high-poverty schools?
4. What can states do to develop a greater supply of teachers that have the specialized knowledge and skills needed to be effective with students from different backgrounds?

What specialized knowledge and skills do teachers need to serve diverse learners in challenging schools?

While there has been much recent discussion about strengthening teachers' subject matter knowledge, there has been considerably less discussion about the need to strengthen teachers' ability to teach all students effectively and to prepare teachers to be successful in challenging schools. Yet it is clear that some teacher education programs, researchers, and teachers have given a great deal of thought to this issue. Texas A & M University's "Learning to Teach in Inner-City Schools" program, for example, insists that teachers need to develop the following types of specialized skills and knowledge in order to be successful in high-poverty schools:

1. Knowledge of the community and students' cultures.
2. The skills to work with neighborhood children and their families.
3. An understanding of the research on effective teaching.

4. Classroom organization and management.
5. The skills to plan lessons that promote higher-level thinking.
6. Positive behavior-management techniques.
7. An understanding of students' prior knowledge, cultures, and experiences with school lessons.
8. The principles of interactive instruction.
9. The skills to improve reading comprehension with culturally diverse literature.
10. The ability to analyze personal change and set goals.[9]

In their review of the research literature on the kinds of preparation that teachers need to be successful with language minority students, University of California researchers Patricia Gándara, Julie Maxwell-Jolly, and Anne Driscoll conclude:

The most successful teachers of EL [English learner] students have identifiable pedagogical and cultural skills and knowledge including the ability to communicate effectively with students and to engage their families. They also have extensive skills in teaching the mechanics of language and how it is used in different contexts and for different purposes. Good EL teachers also have a sense of self-confidence regarding their ability to teach EL students, a finding that echoes a broader body of research on teacher efficacy in general and its effect on student achievement.[10]

University of Milwaukee Distinguished Professor Martin Haberman has spent his career developing and implementing customized programs to prepare carefully selected teachers to work with diverse learners in high-poverty schools. He argues that traditional teacher preparation programs have resoundingly failed to prepare sufficient numbers of teachers who will be able to relate to all children, and he notes that "in many states such as [his] own, as many as 71 percent of those prepared in traditional programs of teacher education in a given year do not take jobs serving diverse children in poverty."[11]

According to Haberman, teachers' subject matter knowledge and pedagogical knowledge are only two of the three essential realms of knowledge teachers need if they are to be effective with diverse children in poverty:

The content of what teachers need to know and do has been a source of continuing debate for 175 years between those who emphasize knowledge of subject matter and those who also support professional content. Subject matter advocates focus on the prospective teacher's knowledge of math, English, science, etc., and assume this to be the basic knowledge base of teachers. Professional educators focus on the future teachers' knowledge of child development, the nature of learning, and teaching methods as the essential knowledge base. For teachers of diverse children in poverty both realms are necessary but not sufficient conditions. There is a third realm dealing with the teachers' ability to relate to and connect with children, which determines whether subject matter and professional knowledge can be used. Without this

ability to connect with children how much the teacher knows about math or the seven parts of direct instruction becomes moot.[12]

Haberman believes teachers who succeed in high-poverty schools and those who "quit or fail" view their work quite differently. Successful teachers explain success in terms of effort rather than ability and believe that their most important task is to engage and motivate diverse learners, so they can continually generate effort from all students. But Haberman also argues that these relationship skills cannot be taught in traditional teacher preparation programs and that careful selection of teachers for high-poverty schools is more important than training. His Star Teacher pre-screening test is widely used by urban districts to assess the likelihood that a teacher will be successful in a high-poverty school. The pre-screener rates respondents on 10 aspects of teaching and compares their answers to teachers with a demonstrated record of effectiveness in poverty schools:

1. **Persistence** predicts the propensity to work with children who present learning and behavioral problems on a daily basis without giving up on them for the full 180 day work year.
2. **Organization and Planning** refers to how and why star teachers plan, as well as their ability to manage complex classroom organizations.
3. **Values Student Learning** predicts the degree to which the responses reflect a willingness to make student learning the teacher's highest priority.
4. **Theory to Practice** predicts the respondent's ability to see the practical implications of generalizations as well as the concepts reflected by specific practices.
5. **At-Risk Students** predicts the likelihood that the respondent will be able to connect with and teach students of all backgrounds and levels.
6. **Approach to Students** predicts the way the respondent will attempt to relate to students and the likelihood this approach will be effective.
7. **Survive in Bureaucracy** predicts the likelihood that the respondent will be able to function as a teacher in a large, depersonalized organization.
8. **Explains Teacher Success** deals with the criteria the respondent uses to determine teaching success and whether these are relevant to teachers in poverty schools.
9. **Explains Student Success** deals with the criteria the respondent uses to determine students' success and whether these are relevant to students in poverty schools.
10. **Fallibility** refers to how the teacher plans to deal with mistakes in the classroom.[13]

Haberman's ideas about who should teach in high-poverty schools and what teachers must be prepared to do were the focus of an online discussion among members of the Teacher Leaders Network, a professional community of several hundred highly accomplished teachers in 15 states. Network members, many of whom

teach in challenging schools, added their own thoughts about the specialized skill sets and knowledge teachers need to be effective:

> Here's my take: You need a different skill set to be a successful teacher in a challenging, hard-to-staff school and that skill set doesn't match exactly with the skill set you need to be a NBCT [National Board Certified Teacher]. As much as we hear about the difference a highly qualified teacher can make for kids, I think that there is a unique skill set needed to be a successful teacher in a challenging school.
>
> #1 — You need to be a risk taker and be willing to stand up for what you know is right for kids.
>
> #2 — You need to know what you are teaching inside, upside down, and backwards so you can deliver it to your audience.
>
> #3 — You need to know your audience, the kids you teach, and be willing to adapt your instruction to their needs.
>
> #4 — You need to understand Ruby Payne's ideas about poverty.
>
> #5 — You need to understand cultural relevancy and incorporate it into your teaching.
>
> #6 — You need to be able to collaborate and work comfortably in a multicultural, multilingual work environment.
>
> #7 — It really helps if you speak another language in addition to English.
>
> #8 — You need to be able to work collaboratively with families that come from different cultural traditions than your own.
>
> #9 — You need to be able to think "outside the box" and not be threatened by change.
>
> #10 — You need to believe that every child can learn and hold high standards for all children.
>
> #11 — You need to be an expert at a variety of assessment methods, looking at student work, and planning instructional next steps. Finally, you need to love what you do and not see it as a stepping stone but rather a safe landing spot.[14]

Participants did not necessarily agree with Haberman that the skills needed to teach in a high-poverty school cannot be taught, but several acknowledged that many teachers do not currently have either the skill set or the mind-set required to be effective in a challenging school:

> Many experienced teachers also openly state they would never consider working at schools like the school where I teach. In all fairness, their refusal may stem from knowing that teaching at a challenging school is simply more work. But, I think their refusal is also rooted in their self-awareness that they do not have the mind-set and/or skills to do the job.[15]

Many others who work in teacher education programs agree. Professor Michael Pavel of Western Washington University contends:

> Most mainstream universities provide little or no training pertaining to Native [American] learners. As a consequence, teachers being trained today do not necessarily know how to translate

cultural sensitivity into teaching techniques proven effective with Native students, especially if those students come from an array of different tribal cultures.[16]

What kinds of instructional practices have been found to be effective with diverse learners?

A growing body of research on successful instruction for children with diverse academic and language needs and children in poverty suggests that student academic achievement and motivation can be improved not only by increasing student access to highly qualified teachers, but by eliminating the use of ineffective instructional practices. Researchers at the Center for Research on Education, Diversity & Excellence at the University of California at Santa Cruz have spent nearly four decades analyzing ways teachers can structure learning activities that will be effective for diverse learners. Based on analyses of hundreds of education studies conducted in multicultural settings, Professor Roland Tharp and his colleagues identified five characteristics common to successful programs that cut across cultural groups. They developed the characteristics into five standards that they propose are ideals for best teaching practices for all learners, but vital for students from diverse ethnic, linguistic, cultural, and economic backgrounds.[17]

The five standards are

1. Teachers and students working together.
2. Developing language and literacy across the curriculum.
3. Making meaning by connecting school to students' lives.
4. Teaching complex thinking and engaging students with challenging lessons.
5. Teaching through conversation by emphasizing dialogue over lectures.[18]

The researchers then tested the standards in a series of studies conducted in California elementary schools and found that student learning increased when teachers incorporated the standards, but improvements were even greater when teachers also restructured classrooms to create opportunities for students to work together in groups or at learning centers.

Response to Intervention

Another area of practice that has promise for making a positive impact on diverse learners is Response to Intervention (RTI). RTI focuses on building a system of tiered intervention designed to prevent learning failure. RTI is a general education instruction model that demands that assessment tools be used in a formative manner, that data be analyzed to inform instruction, and that all students have the opportunity to participate in the general education curriculum maximally. Central to the implementation of RTI is the use of progress monitoring tools to identify struggling learners while there is still adequate time to address their difficulties. Students who are identified as having fallen behind the expected learning pace are grouped for

scientifically-based interventions that increase in intensity until either assessment results indicate an appropriate student learning gain or there is a referral for additional evaluation. RTI works best when students receive quality content and research-based instruction. [19]

The powerful potential of RTI rests in that it recognizes that the learning of an individual student at any point in the curriculum may not keep pace with that of the general population for a wide variety of reasons including a learning disability, a language acquisition challenge, a learning style conflict, or a general lack of engagement with the general education curriculum as it is presented. Regardless of a student's membership, or lack thereof, in a special population, a struggling learner is a struggling learner. And well-designed, scientifically-based interventions that are implemented with fidelity should have success in ameliorating the challenges of most struggling learners within the context of the general education classroom.

RTI requires all school staff to take responsibility for each student's achievement, necessitating an alignment of assessment, instruction, and support services to produce positive academic outcomes for all students. In particular, classroom teachers need to have the professional development and support necessary to implement interventions with fidelity and to interpret and respond to progress monitoring results. And building leaders need to create an environment in which the flexible grouping and regrouping that RTI requires is feasible within the general education setting.

Strategies for Special Populations

English Language Learners

It is critical to emphasize context and meaningful applications for the ELL student population. Zehler, in her report on working with ELL students,[20] has these recommendations for elementary and middle school teachers among others:

- Instructional activities should maximize opportunities for language use. Opportunities for substantive, sustained dialogue are critical to challenging students' abilities to communicate ideas, formulate questions, and use language for higher order thinking. Each student, at his or her own level of proficiency, should have opportunities to communicate meaningfully in this way.
- Instructional tasks should involve students as active participants. Students contribute and learn more effectively when they are able to play a role in structuring their own learning, when tasks are oriented toward discovery of concepts and answers to questions, and when the content is both meaningful and challenging.
- Instructional interactions should provide support for student understanding. Teachers should ensure that students understand the concepts and materials being presented. For ELL students this includes providing support for the students' understanding of instruction presented in English.

- Instructional content should utilize student diversity. Incorporating diversity into the classroom provides ELL students with social support, offers all students opportunities to recognize and validate different cultural perspectives, and provides all students information on other cultures and exposure to other languages. Also, examples and information relevant to ELL students' backgrounds assist them in understanding content.

Native Students

Other bodies of research are examining the specialized knowledge base teachers need to be effective with particular groups of students. Research on culturally based education, for example, seeks to understand whether Native American language and culture programs can improve student learning by employing instructional practices that are compatible with the way students are socialized to learn at home and in their communities. Professors William Demmert and John Towner of Western Washington University have identified six critical elements of culturally based education programs:

1. Recognition and use of Native languages;
2. Pedagogy that stresses traditional cultural characteristics and adult-child interactions as the starting place for one's education;
3. Pedagogy in which teaching strategies are congruent with the traditional culture as well as contemporary ways of knowing and learning;
4. Curriculum that is based on traditional culture, that recognizes the importance of Native spirituality, and places the education of young children in a contemporary context;
5. Strong Native community participation in educating children and in the planning and operation of school activities; and
6. Knowledge and use of the social and political mores of the community.[21]

Given the small number of experimental studies that have been conducted to date, only limited conclusions can be drawn about the effects of culturally based education on student achievement thus far, but new research is underway in Alaska, Hawaii, Arizona, and Montana to identify effective program characteristics that can guide the development of teacher improvement strategies.[22]

Reyhner et al. argue that this type of information is badly needed to help teachers of Native American students who need a specialized knowledge base because:

> Research indicates that many Native Americans tend to be global/holistic, reflective, and visual/tactile learners who achieve better in a cooperative rather than in an individual competitive setting. However, we find that traditional curriculum and textbooks teach to the sequential, linear, and auditory learners who do well in a competitive setting. Many problems that Native American students encounter may be caused by being

> taught to their weaknesses instead of their strengths.[23]

Pavel concurs, noting that "research has shown that Native students' culturally influenced learning behaviors, communication styles, and values are often misinterpreted in the classroom and clash with their teachers' dominant-culture perceptions of how a 'normal' student learns and behaves."[24] He notes three ways in which Native students' learning styles tend to clash with the instructional styles employed by most mainstream teachers. First, verbal instruction is the predominant way that information is transmitted in mainstream classrooms, yet Native students often learn best by processing visual information and by observing and modeling others. Second, Native students are more likely to participate in classroom situations which reward cooperation. Third, the steps involved in the acquisition of new knowledge at home and at school are actually reversed for Native students:

> Native children of many different tribes also avoid public performance of new skills and are unprepared or ill at ease when pushed into doing so without adequate opportunity for private practice… At home, observation, private self-testing, and demonstration of a task for approval are essential steps in the learning process. In school, Native children are expected to learn by responding publicly to direct questions from teachers even if they are uncertain of the answers, and opportunities to practice new skills privately before performing them publicly are rare.[25]

Students in Poverty

Ruby Payne, a former teacher who offers hundreds of training sessions across the country each year to help teachers working with students in generational poverty, contends that differences in home and school behavioral norms and communication styles can become a source of friction for children in poverty.[26] Payne proposes that schools operate by a hidden set of middle-class rules that are not explicitly taught. An understanding of these rules for communication and behavior is key to success in school and work. Students from generational poverty, she claims, come to school with a completely different set of hidden rules learned from family and neighborhood contexts, and teachers become frustrated when students behave differently than expected. Payne argues that teachers must develop a greater understanding of students' own hidden rules, so they can connect with students and explicitly teach them the hidden rules of school and work that they need to be successful in those environments.

How well are teachers prepared and supported to work with diverse learners in high-poverty schools?

Understanding how teachers are prepared and supported to work with diverse learners in challenging school settings is important because research indicates that teachers leave schools in

which they do not feel they can be effective with their students. Harvard professor Susan Moore Johnson and her colleagues from the Project on the Next Generation of Teachers explored teachers' sense of efficacy in a study that tracked 50 first- and second-year teachers over a three-year period to gain a better understanding of the reasons why new teachers leave the profession and the factors that cause teachers to leave certain schools.[27] Johnson and Birkeland note that building this knowledge base is critical for effective policy, because policymakers have been busily formulating policy remedies to stem teacher turnover without fully understanding the range of reasons which prompt teachers to leave.

Johnson and Birkeland contend that teaching by nature is unpredictable work and even well-prepared and highly committed teachers have no guarantee that they will succeed in the classroom:

> One of the greatest sources of uncertainty for teachers is whether they will be able to connect with students and build productive relationships (Lortie, 1975; Metz, 1978; Nias, 1989). Teachers report that their work is more difficult when they and their students do not share characteristics such as social expectations, race, ethnicity, and language.[28]

However, teacher education programs that prepare teachers to work with diverse learners and supportive schools that help teachers form connections with students and engage parents can reduce this uncertainty and help teachers to feel successful in their jobs.

The teachers studied by Johnson and Birkeland participated in a series of interviews during their first three years in the profession and were eventually sorted into three groups: Leavers, those who left public school teaching altogether; Movers, those who remained in the teaching profession but changed schools; and Stayers, those who remained in their original schools. The researchers found that when teachers made decisions about moving or staying, the deciding factor was whether they could be effective with their students. They concluded that "of central importance in all of the teachers' explanations of their decisions to stay in their schools, to move, or to leave teaching was whether they believed that they were achieving success with their students."[29]

Teachers who received support from administrators and colleagues during their first years in the classroom were more likely to feel satisfied and successful and tended to remain in their schools, even in high-poverty schools, which are usually among the most difficult to staff. But beginning teachers who did not receive the support they needed to serve their students effectively either left teaching or switched schools. In all cases, the teachers who changed schools moved to schools with lower levels of student poverty. On average, the percentage of students eligible for free or reduced-price meals in the receiving schools was 46 percentage points lower than in the schools the teachers left.

Substantial numbers of teachers believe they have not been prepared to be effective with the populations of students typically served in high-poverty schools

Findings from two nationally representative teacher surveys suggest that substantial numbers of teachers believe their teacher education programs have not prepared them to be effective with the populations of students typically served in high-poverty schools. In a 1998 teacher survey conducted by the National Center for Education Statistics (NCES) on the preparation and qualifications of public school teachers, the majority of K-12 public school teachers reported they were "moderately" or "somewhat" well prepared for most classroom activities, such as implementing state or district curriculum or performance standards. However, the researchers found that teachers were less prepared in other areas:

> Teachers were least likely to report being very well prepared for activities that have more recently become an essential part of expectations for classroom teaching: integrating educational technology into the grade or subject taught, addressing the needs of limited English proficient or culturally diverse students, and addressing the needs of students with disabilities.[30]

Only one in five teachers reported they were "very well prepared" to teach limited English proficient or culturally diverse students (20 percent) or students with disabilities (21 percent), yet 54 percent of the teachers had limited English proficient or culturally diverse students in their classes, and 71 percent taught students with disabilities.[31] It is encouraging that very few teachers (9 percent or fewer) stated they were "not at all prepared" to handle various classroom activities listed on the survey. However, the researchers noted that "the one exception was that 17 percent of teachers felt not at all prepared to address the needs of students who lack proficiency in English or come from diverse cultural backgrounds."[32]

The 2001 MetLife Survey of the American Teacher on key elements of quality schools reported similar findings. Although most of the K-12 public school teachers reported they were at least adequately prepared for most classroom demands, both the teachers and their principals agreed that teachers were not adequately prepared to meet the educational needs of linguistically and culturally diverse learners:

> The aspect of teaching quality that is rated the lowest by students, teachers, and principals is the ability to teach individual students according to their individual needs. This weakness also emerges in teachers' and principals' evaluations of where teachers have the least adequate preparation.
>
> - One third of teachers (33 percent) describe their preparation as less than adequate in addressing the needs of English as a second language (ESL) students or students with different ethnic or cultural backgrounds.

- Similarly, 3 in 10 principals (30 percent) describe the preparation of teachers in their school as less than adequate in this area.[33]

Both surveys noted that teachers in schools with more diverse student enrollments were more likely to report greater confidence in their ability to work with students of different ethnic and cultural backgrounds. The NCES survey found that 27 percent of teachers in schools with minority enrollments of 50 percent or more felt very well prepared, compared to 10 percent in schools with minority enrollments of 5 percent or less.[34] Similarly, the MetLife survey found that urban teachers were more likely than suburban/rural teachers (26 percent vs. 16 percent) to report being more than adequately prepared to address the needs of ESL students or students with different ethnic or cultural backgrounds. Urban principals were also more likely than suburban/rural principals (21 percent vs. 14 percent) to report that their teachers were prepared to teach diverse learners, even though they were less likely to report that the teachers in their schools were adequately prepared in other ways, such as teaching all subjects in the curriculum, implementing curriculum and performance standards, and maintaining discipline and order in the classroom.[35]

It is significant that both surveys found that teacher perceptions of their preparedness to teach diverse learners did not vary by years of teaching experience. That is, more experienced teachers did not report any greater confidence in their ability to meet the needs of these students than did beginning teachers. This finding suggests that more experienced teachers have not had sufficient opportunities to address deficiencies in their preparation and strengthen their skills in this area through ongoing professional development and training. The U.S. Department of Education's Schools and Staffing Survey and more recent studies conducted by the Southeast Center for Teaching Quality and the Center for the Future of Teaching and Learning confirm that this is the case.

Teachers are not receiving adequate professional development that could help them to become more effective teachers of diverse learners

English Language Learners

The 1999-2000 Schools and Staffing Survey revealed that large proportions of teachers who were assigned to teach ELL students and students with disabilities had received no recent training in how to meet the educational needs of these students. Although 41.2 percent of teachers nationwide reported having ELL students, only 12.5 percent of those teachers—one in eight—said they had received at least eight hours of training in the last three years on how to teach ELL students. At the state level, the percentages of teachers who taught ELL students and had received recent training ranged from a high of 49.2 percent in California to a low of less than 1 percent in West Virginia.

Students with Disabilities

For students with disabilities, the figures are only slightly better: 82 percent of teachers nationwide reported having students with disabilities in their classes, but only 31 percent of those teachers said they had received at least eight hours of training in the last three years on how to teach students with disabilities. The percentages of teachers in each state who taught students with disabilities and had received recent training in how to do so ranged from a high of 48.3 percent in Texas to a low of 17 percent in South Carolina.[36]

Professional Development Gaps

More recent surveys of teacher working conditions conducted by the Southeast Center for Teaching Quality in North and South Carolina indicate that professional development gaps not only persist but appear to have widened in these states. By 2004, 89 percent of North Carolina teachers reported having students with disabilities in their classrooms, but only 18 percent reported receiving at least 10 hours of professional development over the past two years. Six in 10 teachers reported teaching ELL students, but only 9 percent had received recent training.[37]

South Carolina teachers received very limited professional development opportunities in nearly every area of professional learning, but gaps were decidedly marked in training to work with diverse learners. Only 14 percent of teachers received at least 10 hours of special education training during the previous two years to help them to work with students with disabilities, even though 22 percent of South Carolina teachers identified this area of training as a priority and 22 percent reported they did not feel well prepared to teach special education students. Fewer than 4 percent of teachers received at least 10 hours of recent training to work with ELL students, although 15 percent had identified this type of training as a priority.[38]

One might expect that states with a much longer history of serving linguistically and culturally diverse students would have less difficulty ensuring that teachers have sufficient preparation and training to work with special needs students. But a 2004 survey of more than 5,000 teachers of ELL students conducted by the Center for the Future of Teaching and Learning indicates that California, as well, continues to struggle. Approximately 25 percent of the students in California public schools, nearly 1.6 million, are classified as ELL students. Yet more than 40 percent of California elementary teachers with ELL students in their classes reported they had little or no professional development during the previous five years to assist them. Even in classrooms in which at least one half of the students were ELLs, 43 percent of the teachers received no more than one professional development session in five years devoted to ELL instruction. In addition, only one half of new teachers had participated in professional development related to ELL instruction, despite state requirements that new teachers must do so as part of induction.[39]

Substantial numbers of teachers do not feel prepared to engage and communicate with students' families, particularly in high-poverty schools and when families speak a language other than English

In the same survey of California teachers, respondents indicated that lack of time to teach ELLs effectively and lack of resources made their jobs even more difficult. But the greatest challenge identified by K-6 teachers (27 percent) was their struggle to communicate effectively with students and their families.[40]

MetLife's 2004-05 Survey of the American Teacher found that teacher concern about engaging and communicating effectively with parents is fairly widespread.[41] Although 81 percent of new teachers and 90 percent of principals strongly agreed that effective teachers need to be able to work well with students' parents, one in four new teachers (24 percent) felt they were not prepared to engage families in supporting their children's education, and one in five new teachers (20 percent) described their relationship with their students' parents as somewhat or very unsatisfying.

Nearly one third of new teachers (31 percent) reported communicating with and involving parents was their greatest challenge and the area in which they felt least prepared. New teachers in high-poverty schools were nearly twice as likely as those in schools with fewer poor students to say this was true (40 percent vs. 24 percent).

Building satisfactory school relationships is important, because teachers who indicated that they were likely to leave teaching were less likely than others to be satisfied with their relationships with parents, principals, and students. New teachers indicated that their relationships with parents were the least satisfying, and 20 percent reported that parents were their greatest source of stress or anxiety.

What can states do to develop a greater supply of teachers who have the specialized knowledge and skills needed to be effective with students from different backgrounds?

Claycomb (2001) has proposed two key strategies to improve the supply of high-quality teachers in urban schools:

1. Recruit high-quality individuals into teaching who are likely to work in urban schools.
2. Shape the content of preparation programs to prepare candidates for teaching in urban schools.

Claycomb's strategies are modified and expanded in this section of the report to organize and describe policies and programs that states and districts are using to recruit and prepare teachers who will be successful in high-need urban and rural schools. Other successful state strategies have been included.

Strategy 1. Recruit high-quality individuals into teaching who are likely to work in high-need urban and rural schools.

1A: Develop targeted recruitment programs to increase the numbers of minority teachers

The National Commission on Teaching and America's Future has recommended that

> States should work with schools and colleges to expand the pools of teachers of color and from diverse linguistic backgrounds through targeted recruitment programs and financial supports for preparation. These efforts should include supports for programs that encourage middle and high school students to consider a teaching career.[42]

A 2004 report issued by the National Collaborative on Diversity in the Teaching Force, a consortium of the National Education Association and five other education groups, also called upon policy makers to make minority teacher recruitment a top priority.[43] The report maintains that cultural competence and diversity in the teaching force are essential to raising the performance of poor and minority students and closing achievement gaps.

One of the arguments presented in the report is that minority students' academic achievement tends to be higher when taught by teachers of their own racial/ethnic groups. Others who have reviewed the research literature on this issue have found mixed results, however.[44] Although some studies found that academic gains were greater when students were assigned to teachers of their own race,[45] other studies found that teacher race/ethnicity had no effect on student scores.[46]

Although the research on this particular issue is inconclusive, increasing the diversity of the teaching pool has numerous other benefits. For example, some evidence suggests that minority teachers are less likely than white teachers to move away from schools with high concentrations of poor and minority students.[47] In addition, the Collaborative maintains that

More teachers of color would

- increase the number of role models for students of color;
- provide opportunities for all students to learn about ethnic, racial, and cultural diversity;
- be able to enrich diverse students' learning because of shared racial, ethnic, and cultural identities; and
- serve as cultural brokers, able not only to help students navigate their school environment and culture, but also to increase the involvement of other teachers and their students' parents.[48]

Claycomb cautions, however, that "recruiting teacher candidates from specific populations often requires providing preparation programs that differ substantially from traditional four- or five-year university-based programs."[49] She notes that these programs "cannot be easily combined with full-time employment. As a result, promising nontraditional teacher

candidates who work full time, do not live near a university campus, or do not consider themselves capable of completing a university degree program may be discouraged from entering preparation programs."[50] The following examples demonstrate some of the ways by which states and institutions of higher education have developed targeted recruitment programs that incorporate the recommended flexibility and financial supports.

Cincinnati. With financial assistance from Toyota, the University of Cincinnati established a new program in 2004 to recruit and prepare more African American students for careers as math and science teachers in urban schools. The African American Initiative for Math/Science (AAIMS) provides full scholarships for five years, as well as housing support during a student's first year. In return, teacher candidates commit to teach in an urban school for at least five years after they graduate. The five-year undergraduate program includes a summer session to prepare students for freshman mathematics and science courses, support and mentoring from faculty and fellow students, and opportunities to interact with engineering students in the university's Emerging Ethnic Engineers program. Graduates receive a bachelor's degree as well as an Ohio teaching certificate upon completion of the program. During its first year of operation, the university received 95 applications for 25 spaces.[51]

Florida. More than half of Florida's public school students are minorities, but minority teachers make up only 25 percent of the state's teaching force. In September 2006, 15 state and national groups formed a statewide coalition to correct this imbalance.[52] The coalition, sponsored by the American Board for Certification of Teacher Excellence (ABCTE) and led by the Urban League of Greater Miami, aims to recruit 1,000 new minority teachers for Florida over a two-year period. In addition to holding teacher recruiting events around the state, the project is seeking corporate sponsorships to defray the costs of teacher certification fees for candidates.

Norfolk, Virginia. In 2002, Norfolk State University developed a master's degree program to recruit African American, Latino, and Filipino teachers as early childhood special educators for culturally and linguistically diverse children.[53] Project EMBRACE (Educating and Mentoring By Reaching All Cultures Educationally) aims to alleviate the shortage of teachers "who have the necessary knowledge, skills, attitudes, and understanding of culturally and linguistically diverse young children with disabilities." The program emphasizes preparation in assessment and intervention strategies for high-risk children and family involvement. Courses are offered in the evenings, on weekends, and during the summer, so that students can work full time while earning their degrees. The project pays students' tuition and fees and offers stipends for books, living expenses, and travel to attend national conferences.

Oregon. The Sapsik'walá program was established at the University of Oregon in 2002 to recruit, train, and mentor Native American teachers serving Native American communities. The program is supported by a grant from the U.S. Department of Education, which enables the University of Oregon to cover tuition, provide monthly stipends, and offer a child care allowance to help prospective teachers pay for college. In return, participants must agree to work one year in a Title III district for each year of grant assistance.[54]

Before the program was established, there were approximately 12,000 Native American students in Oregon's public elementary and secondary schools, yet there were only about 100 licensed Native American teachers. A goal of the program is to increase the number of Native American teachers in Oregon by 27 percent.[55]

The program was developed in partnership with the nine federally recognized tribes of Oregon.[56] An important feature of the program is its mentoring and support component.[57] The program seeks to reduce the isolation of Native American teachers by connecting them to other educators who can provide support and learning opportunities through a community of practice, as well as to a "cultural community" comprised of members of the nine Confederated Tribes, and by providing opportunities for the aspiring teachers to learn from each other.[58] All candidates continue to receive mentoring and support during their first year of teaching.

1B. Support and fund grow-your-own programs that recruit students and paraprofessionals from the community to become teachers

Claycomb notes that "one of the most effective ways to provide urban schools with high-quality teachers is to focus recruitment upon individuals who already live and work in urban areas or who have previous experience to prepare them for the particular challenges of urban teaching."[59] She observes that urban special education and bilingual paraprofessionals, in particular, are often ideal sources of teachers for hard-to-staff positions because they already have experience working in the school and ties to the community.

A program that recruits and prepares middle and high school students for careers in teaching is a type of grow-your-own program. Students who participate in these programs receive college tuition and support, often in return for agreeing to return to their communities to teach upon college completion. The following examples are representative of some of the programs that states and school districts have developed in partnership with institutions of higher education.

Alaska. At the University of Alaska Southeast (UAS), the Preparing Indigenous Teachers for Alaska Schools (PITAS) program recruits high school students for teaching careers. Although almost one quarter of Alaska's K-12 students are Alaska Natives, fewer than 5 percent of teachers and administrators in the state are Native. The goal of the PITAS

program is to double the number of Alaska Natives enrolled in teacher preparation programs at UAS and boost the numbers of Native educators in Alaska public schools.[60]

Philadelphia. Two Catholic universities and Aspira, Inc., a national Latino advocacy organization, have formed a new partnership to help the Philadelphia Public Schools to increase its proportions of Latino and bilingual teachers.[61] More than 15 percent of Philadelphia students, but fewer than 3 percent of district teachers, are Latino. Aspira will recruit up to 25 Philadelphia high school seniors each year to enroll in a new teacher preparation program, beginning in August 2007. For the first two years, program participants will live in Puerto Rico to develop their Spanish language skills and complete teacher education course work at Pontifical Catholic University. Students will then return to Philadelphia to complete their undergraduate degrees at Holy Family University. Students will receive tutoring from Aspira during high school, as well as mentoring from university and school district staff, as they progress through the program and become classroom teachers. Participants will be guaranteed teaching jobs in Philadelphia when they graduate from the program, but they are not required to teach in the district as a condition of program participation.

1C: Create partnerships to allow the hiring of international teachers to fill shortages of bilingual teachers

Dallas. In September 2006, the Dallas Independent School District became the first district in Texas to sign an agreement with Mexico to hire bilingual teachers.[62] State law requires schools to assign Spanish-speaking teachers to Spanish-speaking students at the elementary level, but the district failed to meet the requirement in more than 900 classrooms during the 2005-06 school year. The agreement with Mexico allows Dallas to hire up to 40 bilingual teachers for a three-year period to help the district to meet its teacher hiring goals and the state law.

1D: Establish hiring preferences

Dallas. An attempt at the local level to establish a hiring preference in Dallas for Spanish-speaking school principals was also contentious. In May 2005, a trustee of the Dallas Independent School District proposed that the district adopt a policy requiring all principals working in elementary schools in which at least half of the students were ELLs to learn the native language of the students.[63] The intent of the proposed policy was to improve home-school communication and increase parental involvement in schools with large numbers of non-English-speaking parents. At the time, more than 65 percent of Dallas students were Latino and 30 percent were ELLs. Principals would be required to begin learning Spanish within one year and to become proficient within three years.

The proposal ignited heated debates, with critics charging that it would cause Dallas to lose principals to other districts; that it was discriminatory to

non-Hispanic school administrators; and that it wrongly forced principals to learn Spanish instead of expecting parents in Texas to learn English. In August 2005, the school board narrowly approved the policy by a vote of 5 to 4.[64] Nearly 50 schools were affected by the new policy, although at least a dozen schools were already headed by bilingual principals. High-performing schools were exempt from the requirement.[65]

By the beginning of the following school year, attempts were being made by other trustees on the school board to eliminate the new policy.[66] By November 2006, a compromise was reached that would allow the language requirement to be fulfilled by someone other than the principal in a school with large numbers of ELLs, such as a counselor or assistant principal.[67]

Montana. In a few cases, states and districts have attempted to increase educator diversity by placing restrictions on hiring and assignments, but these attempts have proven to be highly controversial. In Montana, for example, a hiring preference bill was introduced in the State Legislature in 2005 to encourage the hiring of more Native American teachers as a possible way to reduce the high drop-out rate among the state's Native American students. The bill would have authorized public school districts to establish a hiring preference for Indian candidates for most education jobs in the district, with the exception of superintendents and clerks.[68] Schools would not have been prevented from hiring teachers, administrators, and staff who were not Indian, but they would have been required to give preference to Indian candidates. The bill was extremely contentious, and the legislator who sponsored it reported that it resulted in "the most vile, hateful mail that I've ever received anywhere in my entire life."[69] Similar bills had been introduced in 2001 and 2003, but in each case they failed to pass the State Legislature.

Strategy 2. Shape the content of preparation programs to prepare candidates for teaching in high-need urban and rural schools.

James A. Alexander, executive director of the Inner-City Teaching Corps in Chicago, notes that "most schools of education do not spend enough time preparing their teachers for inner-city environments because they do not often think their graduates will teach in inner-city environments." According to Alexander, there are three areas in which schools of education need to improve in order to become more effective at preparing teachers for the challenges of urban, high-poverty schools:

1. The connection between the management of classroom behavior and instructional success is not taught well in many education schools. Because some education schools do not bridge the gap between "book smarts" and "street smarts" well, classroom management is something for which inner-city teachers can plan but cannot fully understand until they're in front of students every day.
2. While some education schools are good at connecting assessment to

instruction and differentiating for instruction [teaching what is to be tested, and teaching in different ways for different children], others are not. Those schools that do them well put greater priority on these areas.

3. Inner-city teachers must deal with a child's home environment because it is reflected in her or his classroom behavior. Education schools often do not stress the role of parents as positive partners in a child's education.[70]

One of the questions that Allen (2005) examined in a review of the research literature on teacher preparation was, "Are there any teacher preparation strategies that are likely to increase the effectiveness of new teachers in hard-to-staff and low-performing schools?" He concluded that

> The very few studies that met the criteria for this report provide **limited support** for the conclusion that deliberate efforts to prepare teachers to teach in urban, low-performing schools can be beneficial. Field placement in an urban school, training in multicultural awareness, and effective recruitment and screening of teacher candidates are the only three strategies with any real support in the research—and of these three, field placement is the most commonly mentioned.[71]

Some teacher programs do emphasize the preparation of teachers for poor, urban schools, however. One example is the University of Maryland at Baltimore County, which places students in high-poverty schools early in their training, so students can observe teachers in schools that have successfully raised the achievement of poor students and students with disabilities. The teachers-in-training must spend at least 100 days in schools to earn their teaching certificates.[72] Another example is the University of Tennessee at Chattanooga, which has joined forces with Johns Hopkins University to create a master's degree in urban education and literacy. The degree program was developed as a result of a grant awarded by the Osborne Foundation to nine low-performing Chattanooga schools designated as "Benwood" schools. The Benwood schools originally received funds from the Benwood Foundation to recruit talented teachers from the district and provide training and financial incentives if they agreed to move to the target schools.

Kaufmann and Coulter (2006) report that a number of states mandate that teacher preparation programs include specific course work addressing the education of diverse student populations:

- Alaska, Connecticut, Iowa, Louisiana, and Michigan require teacher candidates to take specific classes in multicultural or cross-cultural education and intergroup relations.
- North Dakota requires the study of multicultural education and strategies for teaching and assessing diverse learners.
- Nebraska requires course work leading to the "ability to relate effectively to other individuals and to groups in a pluralistic society other than the teacher's own.[73]

A growing number of states also are adopting curricular requirements that would require teachers to become more knowledgeable about Native American history, culture, and languages. Montana, New Mexico, and Wisconsin require the teaching of Native American history in all public schools.[74] A tribal education bill enacted in Washington in 2005 does not require, but "encourages," school districts to teach Native American history, government, and culture.[75] In December 2005, the Idaho State Department of Education proposed new curriculum requirements that would mandate the teaching of Native history and culture in all public schools.[76]

Establish certification requirements for cultural competence for teachers

Minnesota requires teacher preparation programs to include content about Minnesota Indian Tribes and teaching Native American students. State standards require teachers to "understand the cultural content, world view, and concepts that comprise Minnesota-based Native American tribal government, history, language, and culture."

Oregon is developing a cultural competence requirement to ensure that all teachers are prepared to work with diverse students.

Strategy 3. Shape the content of professional development programs to specifically support candidates for teaching in high-need urban and rural schools.

As discussed in this as well as the other chapters, there is no replacement for high-quality content and current topical information delivered to teachers through professional development.

3A: Develop professional development and training materials for teachers who work with specific populations

California[77] and **Washington**[78] have developed statewide training materials for teachers to understand and use RTI. Online training, resources such as videos, parent guides, and subject specific approaches are available on SEA websites.

Montana is developing a five-year professional development plan to ensure all teachers have the knowledge and understanding of Native culture and history required to implement the state's Indian Education for All Act and to work effectively with Indian students and parents.

New Jersey has developed an online tutorial for teachers who have ELL students in their classes but have little previous experience or training on how to teach ELLs effectively.[79] The tutorial is intended for both mainstream teachers and bilingual/ESL teachers and includes videos of experienced New Jersey teachers demonstrating effective instructional strategies for ELL students in content-area classes.

In 2001, the Washington State Office of the Superintendent of Public Instruction and Evergreen

State College developed a culturally relevant reading curriculum to "transform how teachers approach teaching reading to Native students."[80] Tribal content experts, curriculum specialists, teachers, and Native American authors and illustrators collaborated in the project. The curriculum was piloted in seven schools with the lowest levels of Native American achievement in the state, and it is now used in schools across Washington.

In 2004, the Wisconsin Department of Public Instruction developed a school district information packet to help teachers and administrators to work effectively with rapidly growing numbers of Hmong refugee students and their families in Wisconsin.[81] In addition, the state education agency sponsored a series of regional workshops for teachers, administrators, and school staff to help them to gain a better understanding of the educational, health, and language needs of newly arriving Hmong students and to identify additional sources of assistance.

3B: Require teachers to participate in professional development designed to improve their ability to teach diverse learners effectively

The Pennsylvania State Board of Education has approved new rules that would require teachers to participate in professional development on teaching diverse students in order to keep their teaching certificates active.

3C: Require state or district mentoring and induction programs for new teachers to include instruction in the teaching of diverse learners

New rules approved by the Pennsylvania State Board of Education would require all school districts to include instruction in the teaching of diverse learners as part of their induction programs for new teachers.

Alaska has developed a statewide mentoring program that helps to prepare new teachers for the state's unique teaching conditions, including mentoring in ways to support local culture and initiatives in the classroom.

Recommendations

1. Develop high-quality teacher preparation programs that focus on at-risk areas and prepare teachers for working with diverse students.

   States must emphasize their efforts to support high-need areas by taking a proactive approach to not only filling teaching slots, but also preparing teachers during training to work effectively with diverse populations. An emphasis on content knowledge as well as pedagogy and further work on cultural awareness is recommended. Teachers must be given opportunities to understand culture to work with the students and the families represented in the school community.

2. Design professional development experiences that support building, collecting, and interpreting classroom data to enhance instruction.

   As collecting and using data becomes more commonplace in the classroom, teachers must be instructed on how to collect, interpret, and use data appropriately when it comes to instruction.

3. Provide opportunities for teacher candidates to gain field experience early on in at-risk schools and ensure that a strong network of support is in place to nurture the teacher's growth over time.

   Opportunities must occur first during teacher preparation programs and then again at in-service. Building partnerships with nongovernmental organizations at the state and local level is necessary to further support the building of experience and resources.

4. Regularly evaluate teacher preparation programs and track new-teacher experiences specifically in high-need schools over time.

   Multiple methods of evaluation for the preparation programs should be utilized. Beyond assessment scores, considerations should include teacher placements, teacher retention, number of teachers pursuing extra credentials, and other methods. For more information on this topic, please refer to chapter 1.

5. Create collaborative partnerships between school districts and teacher preparation programs.[82]

   Partnering with additional outside organizations, regional agencies, and professional organizations will increase state and local capacity to provide effective preparation, professional development, and technical assistance for teachers in high-need areas. More partners can share the research and resource burden to support high-need schools.

Conclusion

High-need schools become increasingly diverse every year. Pressure to improve the academic performance of all groups of students increases with every state assessment cycle. It is critically important that states take steps to ensure teachers are prepared to teach students from different ethnic, linguistic, cultural, and economic backgrounds and students with special learning needs.

States and districts must take a multifaceted approach to preparing teachers for diverse learner environments. Equally important is offering strong professional development that is relevant for diverse classrooms and improves content knowledge and pedagogy. Teachers must be able to contextualize their instruction and be able to use real-time data formally and informally

to tailor instruction in order to serve diverse learners.

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Chapter 4

The Role of Leadership on Teacher Attrition in High-Need Schools

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Introduction

Improving the quality of leadership is one of the most promising ways to reduce teacher attrition in high-need schools. Research indicates that the quality of support teachers receive from principals is associated with teacher job satisfaction as well as teacher retention. Three fourths of teachers who say that they are satisfied with their jobs report they are satisfied with their relationship with their principal, while only half of teachers who are dissatisfied say that this is true.[1] Schools that provide more administrative support and that have fewer student discipline problems also have lower rates of teacher attrition.

On the other hand, teachers who leave their schools because of job dissatisfaction cite lack of administrative support as one of the top two reasons for their departure.[2] Teachers who work in high-minority schools are less likely to report they are very satisfied with their relationships with their principals, and teachers who work in high-poverty schools are less likely to give their principals high marks for maintaining a supportive environment.[3]

In a 2004 report commissioned by The Wallace Foundation, researchers from the Universities of Minnesota and Toronto found not only that "leadership is second only to classroom instruction among all school-related factors that contribute to what students learned at school" but that "leadership effects are usually largest where and when they are needed most."[4] These findings have huge implications for state and district reform efforts and support the work and resources geared toward improving leadership in schools especially for the betterment of high-need schools and students.

Superintendents and principals alike strongly believe school success is highly dependent on the quality of school leadership. A 2001 Public Agenda poll found that nearly 7 in 10 principals (69 percent) and nearly 8 in 10 superintendents (79 percent) agreed that "finding a talented principal is the first and most important step to take if you want to fix a troubled school."[5] But many superintendents, especially those in large, urban districts, are not convinced they have sufficient numbers of principals with the skills and training needed to attract and develop talented teachers, raise student test scores, and transform low-performing schools. Last year, Clifford Janey, former superintendent of Washington, DC, estimated that 25 to 40 percent of his principals "were not of the caliber they need to be."[6] Only 41 percent of large urban district superintendents, compared to 52 percent of all superintendents, reported they were happy with the performance of their principals.[7]

Some recent surveys indicate that even though the majority of teachers do not voluntarily choose to work in the most challenging schools, more teachers would consider doing so if given the opportunity to work for an outstanding principal.[8] The problem is that principals tend to avoid the highest-need schools, too, although for slightly different reasons than teachers do. As a general rule, high-poverty, low-performing schools attract fewer principal applicants per vacancy, have higher rates of administrator turnover, and are more likely to be led by principals with relatively little

experience. As a result, schools most in need of experienced, successful principals are least likely to get them. A Wallace Foundation policy brief focused on how a system recruits the principals they need, and place them where they are most needed, offered that states/districts need to move beyond just identifying "strategies focused on adding more certified people to the pipeline."[9] The studies supporting this policy brief suggest that policies need to be focused on establishing and supporting conditions that allow leaders to do their work and that incentives and hiring practices need to align with the new and increased expectations of school leadership.

Promising news is that increasing numbers of states and districts are examining how they might help their highest-need schools compete for good principals and how they might strengthen the skills of principals already working in them. Yet little information has been available to help policy makers to develop strategies that address the underlying reasons for why principals may avoid high-need schools or the specific training, supports, and policy changes that would be needed for principals to succeed in the most challenging schools. This paper attempts to address that need by answering the following questions:

1. What challenges make it particularly difficult to attract qualified principals to high-need schools?
2. What strategies and working conditions are likely to attract and retain quality principals in the highest-need schools, including identifying and providing the knowledge and skills principals need to be successful in these contexts?
3. What policy approaches are states and districts using to ensure that schools in greatest need of experienced, effective principals get a greater share of them?
4. What lessons have been learned from previous efforts?

Background

Before addressing the above questions, it is important to understand what is known about the current context.

A school's ability to attract and retain teachers depends in large part on the quality of its principal

The quality of school leadership matters greatly to teachers and can be one of the most important factors that teachers weigh when deciding whether to stay or leave a particular school. Ingersoll's (2002) analyses of national Schools and Staffing Survey data indicate that, contrary to conventional wisdom, only a small percentage of teacher turnover is due to retirement. Instead, two reasons directly related to the organizational characteristics of teaching and the working conditions of schools—job dissatisfaction and the desire to pursue another job—account for nearly half of all teacher turnover. Teachers who reported leaving their jobs due to dissatisfaction cited poor salary (46 percent) and poor administrative support (34 percent) as the top two reasons for their departure.[10]

The relationship between strong administrative support and teacher retention is further underscored by findings from North Carolina's 2004 Teacher Working Conditions Survey. Nearly 3 in 10 North Carolina teachers (27 percent) cited "leadership" as the most important working condition in deciding whether to stay in a particular

school, second only to "collegial atmosphere" (34 percent).[11]

Teachers in schools which serve high concentrations of poor and minority students are less likely than others to be satisfied by the quality of their school leaders. A 2001 MetLife survey found that teachers in high-poverty schools were less likely than those in more affluent schools to give their principals an A on measures of parent involvement (48 percent vs. 60 percent), school safety and discipline (40 percent vs. 50 percent), and administrative support (40 percent vs. 51 percent). Teachers in high-minority schools were also less likely to be very satisfied with their relationship with their principal (36 percent vs. 45 percent).[12]

To gain a better understanding of the relationship between principal actions, school working conditions, and teacher retention, the Charlotte Advocates for Education conducted a small study of principals in Charlotte-Mecklenburg, North Carolina, in 2004. The purpose of the study was to examine the characteristics of principals who had been most successful in retaining teachers, particularly in high-need schools.[13] At that time, the teacher turnover rate in Charlotte-Mecklenburg schools was between 15 and 20 percent each year, and the estimated cost to the school system was $11,500 per teacher. The group administered written surveys to 20 principals, followed by more in-depth focus group discussions with 8 of the 16 who returned the survey.

Though limited in scope, the study revealed several important traits common to principals who managed to retain large proportions of teachers in high-need schools. First, these principals demonstrated some of the same characteristics attributed to successful entrepreneurs. They were self-motivated, visionary thinkers, took calculated risks, analyzed and synthesized research and data to guide their decisions, solved problems quickly, and remained focused and committed to improving their schools. Second, they created highly supportive work environments for their teachers and believed certain support structures were critically important in retaining teachers, such as giving teachers continual feedback, arranging professional development opportunities, providing additional support staff to help them perform their duties, involving them in decision making, and ensuring that they had time to plan and collaborate with their colleagues. Third, the principals believed certain aspects of leadership training were essential in developing effective principals and would have liked their own training to have prepared them better in areas such as building teams within the school, working effectively with communities, and focusing on a limited number of goals that would have the most impact.

High-need schools and districts attract fewer applicants for principal vacancies

Because leadership matters so much to teachers, policy makers are hopeful that the opportunity to work for an outstanding principal might just be powerful enough to outweigh teacher reluctance to work in particularly challenging schools. A 2000 survey conducted by the North Carolina Association of Educators found that only 30 percent of teachers and 40 percent of teaching assistants would

voluntarily work in a low-performing school. However, when asked if they would consider doing so if they knew they would receive strong support from an administrator, 82 percent of the teachers and 86 percent of the teaching assistants responded affirmatively.[14]

But most principals are not enthusiastic about working in high-need schools, either. The same 2000 survey conducted by the North Carolina Association of Educators found that less than half of the administrators polled (45 percent) would volunteer to work in a low-performing school.[15] An earlier study conducted in New York City revealed similar patterns among job-seekers. In 1997-98, the average number of applicants for principal positions in New York City elementary schools was 39.7, but the average masked wide variation among schools. The school that received the fewest applications (11) was a high-poverty elementary school in Brooklyn, whereas the school that received the most (116) was a more affluent school in Queens; yet a school in another neighborhood of the same Queens district that had a substantially higher poverty rate received only 21.[16]

Applicant pools were even smaller for high-poverty middle and high schools in New York City. On average, middle schools received 23 applicants per vacancy and high schools received 21. However, 47 percent of the city's middle schools and 57 percent of the high schools received 20 or fewer applications. As was the case at the elementary school level, applicants gravitated to secondary schools with higher levels of achievement and lower levels of poverty. A desirable middle school on the Upper West Side of Manhattan received 58 applications, for example, whereas a middle school in Harlem that had recently been taken over by the chancellor of schools received only 5.

Evidence from a recent national study confirms this pattern is not isolated to only a few areas of the country. In a survey of 89 school districts in 10 regions of the country, Roza et al. (2002) found only a slight decline over a seven-year period in the average number of applicants per principal vacancy, from 19 to 17.[17] Although the researchers found no evidence to support predicted nationwide shortages of principals, they did find that disparities in applicant pools had widened. Job seekers increasingly "clustered" in certain districts and avoided others: about one third of the districts received 6 or fewer applicants per principal vacancy, about one third received between 7 and 20, and about one third received 21 or more. Wide disparities in applicant pools were found within all regions, and even between neighboring districts. A suburban district in the affluent Silicon Valley area of California, for example, received more than 40 applicants per vacancy, whereas an urban school district just 12 miles away in San José received fewer than 4. Similarly, several suburban Philadelphia school districts received 40 or more applicants per principal vacancy, whereas Philadelphia itself received only 7 to 10. As was the case in New York City, disparities in applicant pools were found not only between districts, but between schools within the same district. A human resources administrator in Philadelphia reported that "we get about 25 to 30 applicants for an opening in a preferred school,

and only about 4 to 6 for one in the least preferred schools."

High-need schools have higher rates of administrator turnover

In addition to attracting fewer applicants, high-need schools have a harder time retaining their principals. In some urban secondary schools, administrator turnover is chronic:

- Ballou High School in Washington, D.C., which gained notoriety for a school shooting and a mercury spill that closed the school for a month in 2003-04, was led by three principals in three years.[18]
- In 2004, Kensington High School in Philadelphia was estimated to have had six principals in five years, while West Philadelphia had eight.[19]

Although these are extreme cases, evidence suggests administrator turnover is a significant problem in a substantial number of high-need schools:

- Approximately one third of public schools in Hartford began the 2004-05 school year with new principals, as did roughly one third in Washington, D.C., the following year.[20]
- In 2002, teacher turnover in Chicago reportedly increased 60 percent in four years' time, while administrator turnover reportedly increased by 80 percent.[21] For the past two years in a row, more than 100 Chicago public schools have opened with new principals, affecting roughly one third of the city's 600 schools.[22]
- In New York City, more than half of all public school principals left their jobs during the past five years.[23]

High-need schools tend to be led by less experienced principals

Low-performing schools that serve high concentrations of students in poverty are most in need of experienced principals who have learned how to balance competing demands on their time, recruit and develop an effective team of teachers, and remain focused on the task of improving teaching and learning. Yet evidence suggests that schools most in need of experienced leadership are often led by relatively inexperienced beginners:

- In 2004, roughly half of Buffalo's principals and assistant principals had less than three years of leadership experience.[24]
- A 2002 study that analyzed 30 years of personnel data in New York State found that low-performing schools in New York City were more likely to be led be inexperienced principals and by principals who had attended less competitive colleges.[25]
- In 1999, 16 percent of New York City public schools had no permanent principal at all when they opened.[26] In 2001, this figure was only slightly better at 12 percent. Large proportions of the remaining schools were being run by relatively inexperienced school leaders. Two thirds of the city's principals had five years of experience or less, and more than one third (36 percent) had less than two years. Nearly half of the city's assistant principals were also rookies: 48 percent had three years of experience or less.[27] Although the situation has improved markedly since then, more than half of New York City's 1,451 principals still had less than three years of experience in 2005-06.[28]

As a point of comparison, 59 percent of K-8 principals nationwide had 10 or more years of experience as a principal in 1997.[29]

What challenges make it particularly difficult to attract and retain principals in high-need schools?

Roza et al. found that "uncompetitive" school districts—those that received six or fewer applicants per principal vacancy—shared several important characteristics.[30] Three fourths of these districts were urban or near urban areas, three fourths served high concentrations of students in poverty, and 88 percent served high concentrations of minority students. In addition, median community income was 20 percent lower in the noncompetitive districts than in other districts, per-pupil expenditures were nearly $500 lower, average principal salaries were $4,000 lower at the elementary level and $11,000 lower at the secondary level, and all of the districts were in low-priced housing areas.

The researchers found that the schools that had the greatest difficulty attracting candidates for principal positions within these districts also had higher levels of poverty, lower levels of achievement, and "high concentrations of complex and more challenging student populations." The researchers noted that "although none of these factors—community income, housing costs, incidence of poverty, racial isolation, per-pupil expenditures, or salaries—can by itself explain the entire difference in numbers of applicants between districts, in combination they explain a lot." When districts had several of the characteristics considered less desirable, applicants tended to apply to other districts within the same region.

One study that attempted to separate the effects of some of these school characteristics on principals' ratings of job attractiveness was conducted by Winter and Morgenthal (2002).[31] The researchers randomly selected 189 assistant principals from 13 school districts across Kentucky to investigate the degree to which prospective principals' ratings of the attractiveness of high school principal jobs were related to school achievement, school location (inner city, suburban, rural), and their current school assignment (elementary, middle school, high school). On average, participants had 8.9 years of administrative experience. Each was principal-certified in Kentucky and therefore qualified to apply for a high school principal position. According to the researchers, these experienced, qualified administrators would be an obvious internal pool of applicants for principal vacancies within the state.

Participants were asked to review job descriptions for high school principal positions in hypothetical school districts. The descriptions varied according to school location and achievement. Participants were then asked to indicate on a scale of 1 to 5 the likelihood that they would accept an interview for a principal vacancy at each school and the likelihood that they would actually accept the position if offered.

Results revealed that the opportunity to move up from a position as an assistant principal to the top position of school principal was not sufficiently powerful to attract potential applicants if the vacancy was in a low-performing

school. School achievement accounted for 64 percent of the variance in participant ratings, which is an especially large effect size. School location, however, was not significant. Unlike some previous teacher recruitment studies, which found that teachers rated jobs lowest when they were located in inner-city schools, Winter and Morgenthal found that school location did not play as important a role in applicants' decisions to interview for or accept jobs as principals.[32] Rather, it was low student achievement that appeared to be a decisive factor for potential principal applicants, even among administrators who were qualified and highly experienced.

Although the relationship between school achievement and principal recruitment and retention is not a simple one, schools with chronic low achievement do present some potentially greater professional risks for school leaders. As Paul Vallas, Philadelphia school district CEO, explained, "If the Phillies don't win, you're not going to fire the team. You're going to fire the manager or you're going to transfer the manager.... Where there's persistent failure, you've got to look to the leadership."[33]

The No Child Left Behind Act has substantially increased pressure on principals to ensure that all groups of students make steady test score gains and to ensure that schools meet annual performance targets. Nearly two thirds of superintendents (63 percent) surveyed in 2003 said the main criterion they used to evaluate principals was their ability to raise student achievement.[34]

The No Child Left Behind Act has also given superintendents much greater latitude to remove principals whose schools are considered unsafe or whose schools continually fail to meet academic performance goals. Schools which continually fail to make adequate yearly progress are subject to increasingly severe sanctions, including the removal of the principal and the teachers. In 2003, 43 percent of superintendents admitted they were "much more likely" to remove or transfer principals if achievement was low in their schools.[35]

In the past, superintendents often faced stiff opposition from teachers' and principals' unions, parent groups, and school board members—sometimes resulting in the loss of their jobs—if they attempted to redistribute teachers and principals or remove unqualified ones.[36] Even now, moving teachers involuntarily to low-performing schools is usually considered an option of last resort, because forcing teachers to work in schools where they do not want to go is risky—teachers may simply choose to leave. Charlotte-Mecklenburg Superintendent Peter Gorman, for example, announced in early August that he fully intended to reassign some principals during the 2006-07 school year to improve achievement in the district's lowest-performing high schools, but he pledged he would try "every feasible, possible option" before transferring teachers.[37] Reassigning principals, on the other hand, is usually easier than moving teachers, because superintendents have more direct authority over principals. Principals are also far less likely than teachers to be unionized. Even in districts which do have principals unions, such as New York and Philadelphia, the trend has been for

principals to give up tenure protection in exchange for higher salaries.

With support from The Wallace Foundation, Public Agenda produced *Rolling Up Their Sleeves: Superintendents and Principals Talk About What's Needed to Fix Public School,* which provides helpful insights into beliefs held by superintendents and principals about what it takes to turn around a low-performing school. Nearly two thirds of all superintendents (62 percent) believed moving an exemplary principal to a low-performing school was an excellent way to turn a school around, and the vast majority who have done so reported the performance of schools did improve when this strategy was used (87 percent).[38] Redistributing the existing pool of principals is particularly popular among urban superintendents. Nearly half of all superintendents (47 percent), and almost three fourths of those in urban districts (73 percent), reported they have purposely moved a successful principal to a struggling school. Almost 9 in 10 of those superintendents reported that their efforts to shake up a low-performing school by placing an effective leader in those schools were "successful."[39]

Principals themselves, however, are less optimistic that bringing in a new principal is enough to transform a struggling school. Only 4 in 10 principals (41 percent) perceived this was an excellent strategy for turning around a low-performing school, and 3 in 10 reported it was actually a bad strategy (30 percent) or were not sure about the strategy (29 percent).[40] This suggests that far greater incentives and supports will likely be needed to convince most principals to move willingly to challenging schools.

In addition to presenting potentially greater professional risks, leading a high-need school is significantly more demanding, and principals must be prepared to accept a long list of additional responsibilities. First, high-poverty, low-performing schools have higher rates of teacher turnover, which means principals must devote more time to recruiting, interviewing, and hiring new teachers to replace those who leave. Studies of principals who were highly successful at recruiting and retaining teachers for high-need schools in Chicago and California indicated that effective principals assumed responsibility for many of these duties themselves, instead of relying on the central office to do it for them. One Chicago principal explained that his strategies were to "print brochures, heavily recruit student teachers, work the room at job fairs, and, most importantly, make his school a place where teachers say they want to work."[41] In California, some of the strategies used by effective principals of hard-to-staff schools included "attending graduation at local schools of education to scout for candidates, calling local college graduates when they are home from college, and getting recommendations from their emergency-credentialed teachers who are taking classes." One of the California principals interviewed for the study had even flown to Texas to recruit new Teach for America graduates. Another explained that he could not depend on his district's central office to recruit sufficient numbers of hard-to-find bilingual teachers, so he took this on himself: The district does a great job of recruiting, and they always send me plenty of good candidates—

except for my bilingual classes. For those, I have to do the recruitment. I use my contacts in the community and with local university folks to find possible candidates. Then I do what it takes, including helping them get work visas, so that I can get fluent Spanish speakers in those classrooms.[42]

Principals in high-poverty, low-performing schools must also devote substantially more time mentoring and supporting new teachers, since these schools are disproportionately staffed by inexperienced beginning teachers and have few experienced veteran teachers. One 2002 California study found that California's highest-achieving schools had nearly seven veteran teachers for every beginning teacher, compared to only three veteran teachers per beginner in the state's lowest-performing schools. Approximately 17 percent of California schools had no first- or second-year teachers, and 43 percent had 10 percent or fewer. At the other extreme, the researchers found 1,500 California schools (17 percent) at which one fourth or more of the faculty were first- or second-year teachers and 700 schools at which one third or more were in their first or second year of teaching. "These schools," the researchers argued, "must devote significant administrative time and resources to hiring, supporting, and trying to retain new teachers, leaving less time for curricular and pedagogical leadership."[43]

Principals in high-poverty schools must also spend substantially more time helping beginning teachers learn how to work effectively with the parents of their students. Nearly one third of the new teachers who participated in MetLife's annual teacher survey in 2004-05 said that communicating with and involving parents is their greatest challenge.[44] New teachers in high-poverty schools were nearly twice as likely as those in schools with fewer poor students to say this was true (40 percent vs. 24 percent). Building satisfactory relationships is important because teachers who indicated they were likely to leave teaching were less likely than others to be satisfied with their relationships with parents, principals, and students. New teachers indicated their relationships with parents were the least satisfying, and 20 percent reported parents were their greatest source of stress or anxiety.

High-poverty, low-performing schools are also disproportionately staffed by under-prepared teachers, which creates further demands on principals to ensure teachers receive the professional development they need to meet highly-qualified teacher requirements. Principals of high-need schools may have to find creative sources of funds to do so. A 2003 survey conducted by the U.S. General Accounting Office found that high-poverty districts planned to direct a significantly larger portion of their federal Title II funds to teacher recruitment and retention activities than did wealthier districts (77 percent vs. 59 percent) and planned to spend a significantly smaller portion on teacher professional development (23 percent vs. 41 percent).[45] Principals of high-need schools must also devote significantly more time to team building, since research reveals lower levels of collaboration in schools with high concentrations of under-prepared teachers.[46]

Finally, principals of high-need schools must devote significantly more time to facilities and maintenance demands, because their buildings tend to be older and in greater need of repair. A recent study of the condition of New Jersey public schools revealed wide disparities in the adequacy of school facilities in wealthy and poor areas of the state.[47] Overall, 80 percent of New Jersey principals rated the condition of their schools as "adequate" in 2004, but only 65 percent did so in the state's highest-poverty districts. High school facilities were judged to be adequate by 95 percent of principals in the state's wealthiest districts, but by only 45 percent of principals in the highest-poverty districts.[48] These differences matter, the study's author contends, because schools in poor physical condition face far greater challenges in attracting and retaining teachers. In fact, a 2002 survey of teachers in Washington, D.C., found that the quality of school facilities was an important predictor of teachers' decisions to leave or remain in their current schools.[49] Nearly one fourth of New Jersey principals in the state's highest-poverty districts believed the condition of their school was less than adequate for recruiting and retaining teachers, a percentage that was two to three times higher than in other districts.[50]

What strategies and working conditions are likely to attract and retain quality principals in the highest-need schools, including identifying and providing the knowledge and skills principals need to be successful in these contexts?

Increasing principal rewards and decreasing risks

One way to offset the greater challenges outlined above and compensate for the additional responsibilities involved in leading high-need schools is to align principal salaries with the demands of the job.[51] But this is not how principals are usually paid. Traditional compensation systems base principal pay primarily on the number of years of administrative experience, not school characteristics. Except for paying secondary school principals more than elementary school principals, because their schools tend to be bigger, principal pay typically does not vary according to job difficulty or complexity. As Winter and Morgenthal found, simply offering assistant principals the opportunity to move up to the top position of school principal was not sufficiently powerful to attract qualified candidates to low-performing schools.[52] They concluded that additional monetary and non-monetary incentives would likely be needed to make these jobs relatively more attractive. Roza et al. argue that states also must take action to reduce administrator salary differentials among districts, so that noncompetitive districts can become more attractive to applicants. They note that "without some external force adjusting the incentives among districts, the least desirable districts will be left with very limited ways in which they can try to become more competitive."[53]

In addition to increasing rewards, states and districts can also reduce the amount of risk these jobs entail by giving principals additional training and support needed to make the job doable. To be successful leaders in

high-need schools, principals need specialized training that most traditional leadership training programs do not provide. Charlotte-Mecklenburg principals who were highly successful at retaining teachers in high-need schools reported their own graduate training and early experience would have been more helpful if it had better prepared them for challenges such as hiring quality staff who were a good fit for their schools, team building, and working effectively with students, staff, and parents in diverse schools.[54] Marc Tucker, president of the National Center on Education and the Economy and developer of a new leadership training initiative for principals, discovered that,

> When we looked at administrator training in the U.S., it was "how to keep school." It was how to keep the organization running.... From our point of view, that wasn't the challenge at all. The challenge was how to produce enormous increases in student achievement at no increase in cost.[55]

In addition to providing additional support and specialized training, states and districts can increase principals' chances of success in high-need schools by changing inefficient hiring practices, policies, and working conditions which impede the ability of principals to choose their own staff. Principals may be more willing to apply for and accept leadership positions in low-performing schools if they know they will be given the authority to select the teachers they need to raise low levels of student achievement. More than 8 in 10 superintendents (82 percent) and principals (86 percent) believed the ability to recruit and develop talented teams of teachers was an "absolutely essential" quality of good leadership.[56]

However, evidence suggests that principals, particularly urban principals, are hampered by the inability to select teachers, to reward the best teachers, to remove ineffective teachers, and to refuse teachers they do not want. A 1997 survey of K-8 principals found that fewer than 4 in 10 urban principals (37 percent) had primary responsibility for selecting teachers.[57] Moreover, more than half of urban principals (54 percent) polled by Public Agenda said they needed a lot more autonomy to remove ineffective teachers, compared to 42 percent of suburban principals and 36 percent of rural principals.[58]

According to a 2005 study conducted by the New Teacher Project in five large urban districts, the staffing rules in urban teacher union contracts contribute to the problem by forcing principals to accept teachers they do not want.[59] On average, principals had little or no say in filling 40 percent of teacher vacancies across the five participating districts, because the slots were allocated to veteran teachers with bumping rights or teachers whose jobs had been cut at another school. In one of the districts, nearly two thirds of the principals reported they did not want the teachers who had been assigned to them, and nearly half admitted hiding vacancies from the central office to prevent unwanted teachers from being forced upon them.

Districts themselves may further aggravate the problem by hiring principals so late that they miss critical windows of opportunity to hire the most promising teachers for their schools. A 2005 *Baltimore Sun* article

provides a detailed description of the effects of the late hiring practices and limited support one new principal in Baltimore received.[60] The principal was a Teach for America graduate, had four years of teaching experience, and had a bachelor's degree from Northwestern University in human services and social policy as well as a doctorate in education from Ohio State. She was appointed to one of Baltimore's most challenging schools late in the summer, after other schools in the district had already signed on most of the experienced teachers in the applicant pool, and with little time to prepare for the start of school. When school opened, she had a teaching staff of primarily novice teachers, no assistant principal, no hall monitors, and no working phone line. Some of the challenges she faced during her first year included student fights, a school stabbing, fires that were deliberately set in the building, and the resignation of several teachers mid-year.

In contrast, a new principal with similar skills and training hired in Baltimore the same year had a much smoother job transition, in part because he had been hired well in advance of the start of the school year and had received the support he needed. This principal had been hired to work in a struggling Baltimore school that had recently formed a partnership with a nonprofit organization specializing in helping schools to implement successful school models. He was hired six months before school opened, spent more than six weeks observing a successful high school in New York City which followed the same school reform model, and received help during the year with curriculum and teacher training.

What are potential state and district solutions?

As shown in the following policy and program descriptions, the strategies that states, districts, and the federal government are using to attract, develop, and retain greater numbers of effective principals in high-need schools can be grouped under five approaches. Approach 1 is to create new pipelines of school leaders specifically trained to lead high-need schools. Some of the new pipelines are high-quality alternative programs operated by providers other than colleges and universities, as well as grow-your-own programs that recruit and train prospective principals for hard-to-staff schools.

Approach 2 is to redistribute the existing pool of highly effective principals, so that greater numbers are placed in schools with high concentrations of poor and minority students. Financial incentives, performance pay, new forms of compensation that base principal pay on the complexity of the job, principal-on-loan programs, and policies that permit districts to rehire retired principals if they agree to work in high-need schools are some of the ways this can be done.

Approach 3 is to provide intensive professional development, mentoring, and coaching to strengthen the skills of principals who are already working in high-need schools. Strategies include establishing partnerships with nonprofit organizations to target intensive professional development to principals on specific topics and collaborating with higher education

institutions to create executive education programs designed to help practicing principals turn around consistently low-performing schools.

Approach 4 is to change policies and practices that deter good principals from working in the schools where they are needed most. These include promoting efficient practices in the hiring and placing of principals as well as policies that give principals some control over the selection of teachers.

Approach 5 is to focus on strengthening the instructional leadership role of the principal and distributing the roles and responsibilities of instruction and management to make the job of the principal more "doable." Distributed leadership models are "often motivated by the increasing demands of NCLB and pressure to attend to the instructional needs of the school in addition to operational and management needs."[61] Recent strategies include freeing the principal of management tasks so that he/she may focus on instructional leadership; redesigning principal preparation programs geared more towards instructional practices rather than managerial tasks; creating new positions with instructional or management responsibilities; utilizing the expertise within the school (formalizing teacher leadership positions); and forming a dynamic learning community in which sharing among the teachers is encouraged and made available (i.e., restructuring professional development or changing the schedule within the school day).[62]

The following sections of this paper describe some of the most promising strategies states and districts are using to attract or develop greater numbers of effective principals in high-need schools and lessons that have been learned from these efforts.

Approach 1: Create new pipelines of school leaders specifically prepared to lead high-need schools.

A. Nontraditional principal preparation programs

Chicago. Like New York City, Chicago draws a sizable proportion of its principals from nontraditional preparation programs. The three main sources are New Leaders for New Schools (NLNS, described below), the Leadership Academy and Urban Network for Chicago (LAUNCH), and the University of Illinois-Chicago (UIC) Urban Education Leadership program.

LAUNCH was established in 1998 to train aspiring principals to work in Chicago. Program partners include the Chicago public schools, the Chicago Principals and Administrators Association, and Northwestern University.[63] The program provides course work and leadership preparation training from Northwestern's School of Education and Social Policy as well as the university's Kellogg School of Business Management. The structure of the program is similar to New York City's Leadership Academy. LAUNCH fellows participate in an intensive four-week Summer Leadership Academy at Northwestern that covers topics such as creating and supporting high performance teams, staff development strategies, sustaining a professional learning community, developing an understanding of how to use data to achieve results, and developing

effective community relations. Fellows then participate in a year-long internship with exemplary mentor principals. During the year they participate in action research and school case studies, develop leadership portfolios, and gain both elementary and high school leadership experience. After completing the program, they continue to receive professional development and support from mentors and peers through the Urban Network for Chicago. LAUNCH graduates currently work in more than one quarter of Chicago public schools, and thus far, 120 fellows have served as Chicago public school principals.[64]

The UIC Urban Education Leadership program is the newest of the three programs.[65] Unlike the NLNS and LAUNCH programs, the UIC program enrolls some candidates who are already principals, because it is the only one of the programs that leads to a doctoral degree.[66] The university's Ed.D. program in Urban Education Leadership is specifically designed for K-12 school- and district-level leaders. Applicants must have a master's degree, substantial teaching experience, leadership experience as a teacher or administrator, and "a demonstrated commitment to leading the improvement of low-performing urban schools." The program requires about three years to complete course work, followed by a year spent developing a dissertation. Candidates who are not already working as a school or district leader are placed in a leadership position in the Chicago public schools as part of their training. Courses are scheduled during evenings and on weekends and are designed and co-taught by university faculty, principals, and school system leaders. Participants receive three years of site-based coaching and mentoring from leadership trainers and high-performing principals.[67]

According to a recent analysis, the three leadership preparation programs in Chicago together produce about 45 new principals each year, although the programs vary substantially in the numbers of principals they individually produce. Nearly two thirds of NLNS graduates who are trained in Chicago become principals, compared to less than half of those trained in the LAUNCH program (49 percent) or the UIC Urban Education Leadership program (42 percent). In addition, the analysis found that LAUNCH principal placement rates have declined from a high of 68 percent in 1998 to 21 percent of the most recent class of graduates. Fewer resources are believed to have contributed to a decline in program enrollment as well, from 37 participants in 1998 to 19 in 2006.[68] The analysis noted that part of the reason NLNS has a higher placement rate is that the program has deliberately steered its graduates to principal vacancies in charter schools and new small schools. In addition, part of the reason for the decline in LAUNCH placements is that, in earlier years, most candidates who enrolled in the program were already assistant principals and may have had an easier time securing job offers, because they were expected to move up to principal positions. The UIC program may also place fewer graduates as principals because a large proportion of them may be looking for jobs as superintendents or other leadership positions. Although all three programs are creating new pipelines of principals specifically prepared to work in Chicago, this approach alone is not

likely to produce enough principals to meet demand, given the district's high rates of administrator turnover—in fact this year, one in five administrators have notified the Chicago of their intent to step down after the completion of the 2006-2007 school year.[69]

Maryland. In addition to the partnerships formed directly with local school districts, NLNS has formed a unique partnership with one state to recruit and prepare urban school principals. In February 2005, the Maryland State Department of Education entered into an agreement with NLNS to prepare 40 new principals for Baltimore City public schools in three years, enough to fill more than one fifth of the principal positions in the city.[70] About half of the district's 184 principals were nearing retirement age, and leadership succession planning was a growing concern. The state partnership with NLNS would help to build a pipeline of new principals in Baltimore by recruiting and training 10 candidates during the first year and 15 in each of the following two years. The cost of the three-year program was estimated at $2.8 million, about half of which would be paid by local foundations. The school district would cover the principals' salaries, and NLNS grants from national foundations would be used to cover the remaining costs.

The Maryland partnership is unique because the State Department of Education approved NLNS as a leadership preparation provider, rather than requiring candidates to undergo training in a college- or university-based program. Upon completion of NLNS training, one year spent shadowing an experienced principal, and one year working as an urban school administrator, Maryland's NLNS graduates receive full principal certification, rather than an alternative certificate that must be renewed every two years.[71] Principals in the other cities in which NLNS operates receive only alternative principal certificates. At present, 8 candidates from the original class of 10 are working as principals in Baltimore and the other two are working as assistant principals. Sixteen new candidates have completed summer training and are shadowing experienced principals, and a new class of trainees is being recruited for the third program year. NLNS has expressed interest in training an additional 40 principals in Baltimore beyond the initial three-year commitment, and it has just received an additional $540,000 grant from a local foundation to support its work in Baltimore. The funds will be used to recruit and hire exemplary retired principals to provide mentoring and support to program graduates during their first years as urban school administrators.[72]

New Leaders for New Schools (NLNS).
Fourteen states allow principals to forego traditional college- and university-based principal preparation programs and enter the profession through alternative routes.[73] The best-known alternative principal preparation program is New Leaders for New Schools (NLNS). NLNS was founded in 2000 by five Harvard graduate students in education and business. The program recruits bright, motivated graduates from premiere colleges and universities and trains them to lead urban public schools. The program is similar in many ways to Teach for America, which seeks to recruit and train outstanding college graduates as

teachers for some of the nation's most challenging schools. However, Teach for America places teachers in high-need rural areas, on Indian reservations, and in urban settings, whereas the focus of NLNS is urban schools only. NLNS is funded by grants from a wide variety of corporations, national and local foundations, and venture philanthropy funds.[74]

During its first year of operation, NLNS trained only 13 school leaders in two cities, New York and Chicago. By 2006, it had trained 330 school leaders who were working in more than 150 schools, and it had branched out to Baltimore, Washington, D.C., Oakland, San Francisco, Memphis, and Milwaukee.[75] The program's goal is to recruit and train 2,000 urban school leaders within 10 years. By concentrating on a select number of cities, NLNS hopes to build a critical mass of highly trained leaders in each location who can accelerate reform at the district, as well as the school, level. At the current level of effort, NLNS expects New York City, Chicago, and Washington, D.C., will each have more than 100 "New Leaders" by 2008. By that time, NLNS also anticipates that its graduates will staff approximately 55 percent of Washington, D.C., schools, 45 percent of Memphis schools, and 40 percent of Oakland schools.[76]

NLNS is an extremely selective program, admitting less than 7 percent of applicants.[77] In 2005, more than 1,100 applications were submitted for only 90 openings.[78] Roughly half of the program participants come from the school districts in which NLNS operates, and roughly half are nontraditional candidates drawn from the public and private sectors.[79] NLNS screens applicants against 10 essential criteria, including knowledge of teaching and learning, team building, and an unyielding focus on goals and results. Unlike some alternative teacher preparation programs that require no previous classroom experience, NLNS requires all principal candidates to have at least two years of experience in a K-12 setting—half of the current program graduates have had at least six. Eighty-five percent of NLNS graduates have completed a master's degree, and 12 percent have completed two. Nearly two thirds are female, and nearly two thirds are minorities.[80]

The two-year leadership training program is tuition-free and consists of one year of intensive training in administrative and instructional leadership, including a five-week summer institute and four one-week seminars. During year 2, participants complete a full-time paid residency under the supervision of a highly skilled urban principal who serves as a mentor and coach. After completing the program, graduates receive two more years of professional development and support. Participants must make a commitment to work for at least four years as an urban school administrator after completing the program. Initial, though limited, data on program graduates indicate that schools led by NLNS graduates with at least two years of experience produced larger gains in reading and mathematics than did other schools.[81]

One of the biggest challenges the program encountered during its first few years of operation, was securing principal positions for its graduates. Russo (2004) found that only 5 of the program's first 15 graduates, and only

slightly more than half of its 32 graduates in 2003, were able to secure leadership positions at traditional public schools, although nearly all program graduates were able to find other types of education-related jobs.[82] More recent analyses suggest the hiring situation has indeed improved. The principal placement rate for NLNS graduates in Chicago is now reportedly 61 percent, well above the placement rates of two other principal preparation programs in Chicago at 49 and 42 percent.[83]

New York City. The New York City Leadership Academy is another example of an accelerated principal preparation program that was created to meet demand for skilled principals in high-need urban schools. New York City Schools Chancellor Joel Klein spearheaded the efforts to establish the Leadership Academy; however, it is privately financed and operates as a nonprofit. The program has been described by the *New York Times* as "perhaps the most intensive and costly principal training program in the country."[84] The cost of the three-year program is estimated at $75 million, with about 70 percent of the budget allocated to an Aspiring Principals program designed to recruit and prepare hundreds of teachers, counselors, assistant principals, and nontraditional candidates to become principals at some of the city's most challenging schools. In addition to running the Aspiring Principals program, the Leadership Academy recruits principals from other districts, trains, and assigns mentors to beginning principals, and provides professional development.[85]

The Aspiring Principals program is a full-time, 14-month preparation program. Like NLNS, the program is highly selective. Of the more than 1,400 individuals who applied in 2005-06, only 7 percent were admitted.[86] While undergoing training, participants draw a salary as high as $92,000 for some members in the first group of aspiring principals, depending on their experience.[87] Candidates are required to have at least three years of teaching experience, and, after completing the program, they must work for at least five years for the New York City Department of Education or repay the cost of the training.[88] Participants complete six weeks of intensive preparation during the summer, followed by a one-year residency. During the residency year, candidates complete additional training and work alongside an experienced mentor principal. The final phase of preparation is a summer planning program that prepares them to lead their own schools in the fall. During their first year as principals, graduates continue to receive individual coaching and ongoing support.

The first class of 90 candidates entered the Aspiring Principals program in 2003, and the first group of graduates began working in their own schools in 2004-05.[89] Not all of the program graduates were immediately assigned to the most troubled schools, but those who were faced some daunting leadership challenges. One graduate assigned to a middle school in the South Bronx, for example, suspended 34 seventh and eighth graders during his first hour on the job.[90]

The Aspiring Principals program has received its share of criticism from leaders of the principals' union and others, particularly because of its high cost, which averages about $180,000

per year per participant, including salary.[91] The program has created some tensions between Aspiring Principals graduates and assistant principals who have worked their way up the ranks the traditional way, and it has encountered some delays in placing its graduates.[92] Questions have also been raised about the program's effectiveness, since not all candidates graduate, and only a portion of those who do actually become principals. Thirteen candidates in the original class of 90 did not complete the program. Eight of the 77 who did graduate took administrative jobs within the system instead of working in schools, and 6 more of the 69 who did take jobs in schools left education completely.[93] Of the 147 program graduates, 114 were working as New York City principals in January 2006.[94] Nevertheless, program officials note that 95 percent of Aspiring Principals program graduates are working in New York City Department of Education leadership positions, and more than 75 percent are currently leading New York City schools. In addition, one in five New York City principal vacancies in the last two years have been filled by graduates of the program.[95]

B. Grow-your-own leadership programs

Federally-funded Indian administrator training programs. Another popular strategy, particularly in hard-to-staff rural areas, is to recruit educators who are already working in hard-to-staff schools, then provide the leadership development and training they need to become principals. In geographic areas where principals are scarce, grow-your-own programs can help to address administrator shortages by recruiting potential school leaders who already have strong ties to the community and are less likely to move away. This strategy can also improve school-community relations by recruiting individuals from the community who understand the language, culture, and backgrounds of students and families.

One source of federal funding for grow-your-own leadership training programs is the U.S. Department of Education's Indian Education Professional Development Grant program.[96] Its purpose is to provide funds to support the training of qualified Indian teachers and administrators and to increase their numbers in schools that serve Native American children. An example of such a grant-funded administrator training program is the Indian Leadership Education and Development (I LEAD) program, which is a joint project of Montana State University, Fort Peck Community College, and the Poplar, Montana, public schools.[97] Data compiled by the Montana Department of Public Instruction indicate that in 2004, 49 of the 58 schools in Montana which have majority enrollments of Native students failed to make adequate yearly progress. The high school drop-out rate for Native students in Montana is three times the rate of white students, and Native students comprise three fourths of all junior high school dropouts in the state.[98] The I LEAD project has received a $1.2 million grant to recruit and train 40 aspiring principals from Native communities to lift student performance in these schools. Teachers and principals with experience working in Native communities and university faculty will provide mentoring, support, and training. Additional Indian administrator training programs funded

in 2006 include the American Indian Leadership in School Administration program at the University of Oklahoma, the Model of American Indian School Administration project (Project MAISA) at New Mexico State University, the American Indian Leadership Program at Penn State, and the Lakota Leadership/Management: Educational Administration program at Oglala Lakota College in South Dakota.

Federally-funded NCLB School Leadership Program. Another source of federal funding to develop grow-your-own leadership programs is the NCLB School Leadership Program, funded by the U.S. Department of Education. The purpose of the program is to provide funds to states, so they can award competitive grants to high-need school districts or partnerships of high-need school districts and institutions of higher education to develop, enhance, or expand "innovative programs to recruit, train, and mentor principals (including assistant principals) for high-need schools."[99] An example of a recently funded program to develop school leaders in a hard-to-staff rural area is the Pee Dee Leadership Academy in South Carolina.[100] In May 2006, Winthrop University was awarded a four-year $776,000 grant to prepare teachers to become principals in four rural counties in the Pee Dee region of the state. The partners are among a group of districts that recently sued the state of South Carolina for failing to provide adequate educational opportunities for children in high-poverty areas. Three of the four participating districts failed to make adequate yearly progress for the previous three years, and the poverty rate in each of the four districts exceeds the state average by 8 to 28 percent.[101] Sixty teachers were recommended by their school districts for the new two-year program, which will award a master's degree in educational leadership. During summer 2006, the first class of 25 teachers began taking courses, which are taught by university professors who travel to the rural districts several days a week. When the first group of teachers completes the training, a second class of 25 will be admitted to the program. The grant and an additional source of funding from the university will cover most of the teachers' tuition, so that only $150 per class must be paid by the participants or their school districts. Professors from the university also provide professional development to current principals in the four counties as part of the grant-funded program.

The Pee Dee Leadership Academy is one of many programs that have received funding from the U.S. Department of Education (ED) to prepare principals and assistant principals to lead high-need schools. Twenty programs received ED leadership grants in 15 states in 2002; 4 programs received grants in 4 states in 2003; and 23 programs received grants in 14 states in 2005.[102] Six of these programs were highlighted in a 2004 study of innovative practices in leadership development for high-need areas.[103]

Approach 2: Redistribute the existing pool of principals, so that strong principals are placed in weak schools.

When implementing strategies as described in the examples below, it is critical the state or district or state spend adequate preparation time and

resources to lay the foundation for change on this scale.

A. Bonuses

Chicago. Chicago is using cash incentives for the first time to reward top principals recruited to turn around four of Chicago's lowest-performing schools. Principals in three target elementary schools can earn bonuses of as much as $69,000 over four years in addition to their annual pay, which averages $119,000 in Chicago.[104] All three principals received specialized training from the University of Virginia on strategies to turn around low-performing schools. In addition, each received a signing bonus of $7,500 at the beginning of the 2005-06 school year and signed a four-year contract, which includes three annual school performance targets. The principals will earn $6,000 to $19,000 in performance pay each year, depending on the number of targets met. The fourth principal, who was hired to mentor a beginning principal at one of the city's lowest-performing secondary schools, received a $10,000 signing bonus and moved up two grades in salary, to $137,000. The principal will also receive a $2,000 bonus for each of four performance targets that school reaches, which are tied to ACT and state test scores, course passing rates, and student attendance.

Maryland—Distinguished Principal Fellowship Program. In 2002, the Maryland State Department of Education and the Baltimore City Public School System established the Distinguished Principals' Fellowship Program, which allowed Baltimore to "borrow" successful principals from other districts to turn around some of its lowest-performing schools.[105] Applicants for the Distinguished Principal Fellowship Program were required to have at least three years of experience as a Maryland principal, be fully certified, and agree to lead one of Baltimore's most challenging schools for three years. At the end of the three-year rotation, the principals were expected to return to their original schools. In addition to serving as principals, the fellows trained principal interns and participated in intensive peer-to-peer training and development activities. State funds were used to pay the fellows' $125,000 salaries, which were substantially higher than the top salary of $109,000 that principals in Baltimore could earn at that time.[106]

Three principals from two suburban districts were selected from a pool of approximately 35 applicants for the first class of fellows in 2002, although one eventually withdrew from the program.[107] In 2003, two more fellows were chosen.[108] Only one of the five principals selected was from Baltimore, which created some resentment among other principals in the district who had worked for years under equally challenging conditions, but without the recognition and rewards that were suddenly being given to the incoming suburban principals.

The five participating principals were assigned to three elementary schools and two middle schools. According to reports from the Maryland State Department of Education, the four schools led by principal fellows for the entire three-year rotation saw improvements in student achievement, attendance, teacher retention, and parent involvement, and two of the schools made adequate yearly progress.[109]

When the partnership between Baltimore and the State Department of Education was nearing the end of the three-year trial period, a bill was introduced in the state legislature to bring the Distinguished Principals' Fellowship Program to scale statewide.[110] The bill would allow the state superintendent to select up to 10 exemplary principals each year who were willing to serve a three-year rotation in low-performing schools identified for restructuring in other Maryland school districts. The state would pay each principal a $20,000 annual stipend in addition to their regular salaries. If the principal fellows were assigned to school systems that paid less than what they were earning in their home districts, the state would pay the difference. The program was expected to cost $750,000 for 30 fellows, if the maximum number of fellows was selected each year, although the State Department of Education recommended that only three fellows be selected initially, then gradually increase to nine. The proposed Principals' Fellowship and Leadership Development Program received unanimous support from the House and the Senate during the 2005 legislative session.[111] However, state officials reported that the Maryland General Assembly did not approve funding for the program in 2006, even though the governor had earmarked $95,000 for it in his budget.[112]

Maryland—Proposed Bonuses for Turn Around Principals. In August 2006, then-Baltimore mayor and Maryland gubernatorial candidate, Martin O'Malley, proposed a new incentive program that would more than double the $20,000 annual stipends that had been previously proposed for principals who agreed to lead Maryland's most-challenging schools.[113] Under Mayor O'Malley's proposed Turn Around Principals program, top principals would earn $200,000 bonuses in addition to their regular salaries, which would be disbursed over a four-year period, if they agreed to work in one of the state's lowest-performing schools. As a point of comparison, principal salaries averaged about $84,000 in Baltimore and $94,000 statewide.[114] This program has not yet been funded.

More than 200 Maryland schools would be eligible to participate in the proposed program, although only about half were expected to participate initially.[115] The majority of the 236 target schools designated as "in need of improvement" were in Baltimore (95 schools) or in Prince George's County (75 schools), which borders Washington, D.C. Principals would be required to work in one of the target schools for four years to collect the entire bonus. Annual program costs were estimated at $5 million to $10 million.[116] Specifics of the plan were promised after the November 2006 election, which O'Malley won. Details that remain to be worked out by the new governor-elect and his staff include whether principals already working in the schools will be eligible for the bonuses, the amount of school progress that will have to be made, and how it will be measured.

B.Restructure principal pay systems according to the difficulty of the job

Palm Beach County, Florida. Although many districts offer bonuses on top of teachers' or principals' regular salaries, Palm Beach County, Florida, is the only district that has actually restructured its salary system

to compensate principals according to the difficulty of the job. The strategy to change principal pay grew out of an earlier unsuccessful attempt to reduce disparities in teacher experience at some of the district's lowest-performing schools. In 2002, the district offered $10,000 bonuses to encourage experienced teachers to relocate to schools in the district that had received academic ratings of D or F. Although the incentive may have helped persuade 20 teachers already in the target schools to remain there, only 10 teachers in the district agreed to move from a higher-performing school to a lower-performing one.[117]

A number of teachers told district officials they would consider working in a low-performing school if they could work for an outstanding principal. Superintendent Art Johnson tried to convince some of his top principals to move to F-rated schools in hopes that teachers would follow, but most declined, and some of the schools still ended up with inexperienced first-year principals.[118]

Because the current plan was not having the desired effect, the district increased the size of the teacher bonuses and developed a new pay plan that was partially implemented in February 2003 and fully in place the following summer.[119] The new plan bases principal pay on three factors which reflect the difficulty or complexity of running a particular school: the number of students, the number of extracurricular activities offered, and the percentage of students eligible for free and reduced-price meals.[120] Assistant principals' pay is determined according to a similar formula.[121] Experience and performance are still factored into school leaders' pay, but principals at schools that are larger, poorer, and offer a large number of extracurricular activities can now earn up to 20 percent above the district's base pay of $81,600.[122] Principals can increase their salaries by an additional 15 percent if test scores increase and other performance targets are met. In combination, these incentives bring the maximum principal salary in Palm Beach County to nearly $134,000. The incentives were expected to cost approximately $1.9 million during the first three years.

C. Performance pay

Wayne County, Charlotte-Mecklenburg, and Guilford County, North Carolina. Several school districts in North Carolina have experimented with different forms of performance pay for principals who raise student academic achievement in high-need schools. The performance incentives range from a relatively modest $1,200 annual salary differential in Wayne County, to more substantial $5,000 rewards in Charlotte-Mecklenburg, which are given to principals and assistant principals at high-need FOCUS schools that meet growth targets on the state's ABCs accountability system and make adequate yearly progress for all subgroups.[123] Some of the highest principal incentives are being offered in Guilford County, where principals in designated high-need schools can earn up to $15,000 per year in performance incentives if all student subgroups in their schools make adequate yearly progress in all subjects.[124]

Denver. Like Guilford County, Denver is 1 of 16 recipients of new federal Teacher Incentive Fund grants, which were awarded in November 2006 to states, districts, and nonprofit

organizations. The purpose of the grant program is to support the development of new forms of educator compensation that reward teachers and principals for working in high-poverty schools and for raising student achievement.[125] One of the primary uses of Denver's grant will be to expand ProComp, the district's well-known teacher pay-for-performance system, to include principals and assistant principals.

A spring 2006 survey of Denver's principals and assistant principals revealed that 68 percent were in favor or strongly in favor of a pay plan similar to ProComp, which bases pay, in part, on student performance. The principal pay plan developed by Denver officials shares some of the same features of the district's performance pay plan for teachers, including bonuses for working in 1 of more than 30 "hard-to-serve" schools. Teachers who work in these schools, which serve high concentrations of students in poverty or English language learners, earn annual bonuses of approximately $1,000. According to Denver's draft plan, administrators in these schools also will earn annual bonuses, ranging from $3,750 for assistant principals to $5,000 for principals.[126] Bonuses could reach as high as $30,000 for principals who substantially improve student achievement in hard-to-serve schools.[127]

D. Housing incentives

California. The overwhelming majority of housing incentives to attract educators to high-need schools are targeted to teachers, but California offers a program that is also open to administrators and school staff, including nurses, counselors, and librarians. California's Extra Credit Teacher Home Purchase Program is operated by the California Housing Finance Agency under the auspices of the California State Treasurer's Office.[128] The program offers a special reduced interest rate and down payment assistance for the purchase of a home anywhere in California to eligible teachers, administrators, and school staff who work in high-priority schools. High-priority schools are those that rank in the bottom half of the state's Academic Performance Index or are high-poverty schools in which 70 percent or more of the students enrolled are eligible for free or reduced-price meals. To be eligible for the program, participants must be first-time home buyers or they must not have owned a home in any state within the past three years. All participants must agree to serve continuously in a high-priority school for a minimum of three years from the date of the loan.

E. Rehire retired principals to lead hard-to-staff schools

Maryland. A temporary solution to administrator shortages that has been tried in many states and districts is to rehire retired principals. Maryland is the only state which restricts participation to principals willing to work in its highest-need schools. In 1999, the Maryland General Assembly approved a bill to allow Maryland districts to rehire retired teachers without loss of pension benefits, if they teach high-need subjects and work in high-need schools. A similar bill allowing districts to rehire retired principals was approved the following year. Both of the laws were scheduled to sunset in 2004.[129]

In 2005, the state legislature enacted a new bill to reinstate Maryland's retire-rehire policy, with tightened

restrictions to ensure program participants were assigned only to the neediest schools. The new law requires principals who are rehired under this provision to work in a high-poverty school receiving Title I funds, a school that is not making adequate yearly progress, a school that has been identified for improvement, or in certain alternative schools. Teachers are restricted to the same four types of schools and must teach a critical shortage subject or teach classes for English language learners or students with disabilities.

Approach 3: Strengthen the skills of principals already working in high-poverty, low-performing schools.

Alabama. The Southern Regional Education Board's Leadership Academy model is an intensive approach to professional development that provides both instructional strategies and school-based applications centered on school improvement.[130] While many states are using some or all of the 14 available modules, Alabama in 2005 was also applying the methodology to selected Torchbearer schools—schools in which 70 percent or more of the student body receive free or reduced lunch. Of the 13 Torchbearer schools that participated in the Leadership Academy in 2005,[131] 8 were honored in September 2006 for meeting several criteria, including making adequate yearly progress for two years in a row.[132]

Chicago. In addition to the previously described LAUNCH program for aspiring school principals, the Chicago Leadership Academies for Supporting Success offers several types of mentoring, support, and professional development to principals who are already working in Chicago public schools. The Leadership Initiative for Transformation program, for example, has provided mentoring, support, and monthly professional development sessions to more than 500 first-year principals in Chicago over the past 10 years.[133] Another program, the Chicago Academy for School Leadership, provides ongoing professional development for experienced school leaders.

In addition to these well-established programs, Chicago is working with two nonprofit organizations to deliver intensive professional development designed to help principals to raise student achievement and improve teacher recruitment and retention in some of the city's most challenging schools. NLNS is training Chicago public school principals to use assessment data to improve classroom instruction and school performance. With funding provided by the Joyce Foundation, NLNS will teach principals how to measure student performance at frequent intervals throughout the year, analyze the results, and use the information to strengthen instruction and raise achievement.[134]

In addition, Chicago has hired the New Teacher Project to help 100 principals in struggling Chicago schools to develop better ways to screen, select, and retain quality teachers.[135] Although Chicago has made some progress in retaining its first-year teachers, the teacher turnover rate among new hires during their first five years in the classroom is still about 42 percent. To reduce teacher attrition, the New Teacher Project aims to improve principals' ability to identify teachers who would be a good fit for their

schools and screen out those not likely to succeed. The principals will receive a set of interview questions, advice on what to look for in applicants' resumes, and help tailoring interview questions to their particular schools. In addition, the project will advise principals on ways to promote their schools at job fairs and will offer strategies for keeping good teachers, such as staying in touch with incoming teachers over the summer, so they are not lured away by others before the school year begins. Training for the 100 principals will cost $150,000. Some of the principals who have undergone the training in Baltimore report that student achievement and discipline in their schools have improved, in part, because they have learned to make better hiring decisions.

Massachusetts. The Massachusetts Department of Education is also working in partnership with higher education institutions and a nonprofit organization to provide leadership training for principals in the state's highest-need school districts.[136] Training is being delivered by the National Institute for School Leadership (NISL), which is operated by the National Center on Education and the Economy based in Washington, D.C.[137] Minnesota, Mississippi, and Pennsylvania are also working with NISL.[138] The program uses instructional models developed by educators, business executives, and military leaders to help principals improve school performance. The intensive two-year program uses case studies, computer-assisted simulations, Web-based instruction, and interactive tutorials and covers units on instructional leadership, team building, and managing for results. An additional benefit of the Massachusetts program is that participants can earn up to 24 of 60 credits required to earn a Ph.D. in educational leadership from Lesley University in Cambridge. Eventually, all principals in Massachusetts will receive the training, but the state began by first targeting principals in high-need urban districts. In summer 2005, 84 school leaders from more than 15 urban districts took part in the program.[139] Close to two thirds of the participants also received training to become certified NISL trainers, so they could train others in their districts. The training is being paid for by the state, using a combination of state and federal funds. Program costs were estimated at $541,000 for the first year and are projected to total $4.5 million by 2010. By then, 370 of the state's 528 urban school principals are expected to have completed the program.[140]

New York City. In 2003, the NYC Leadership Academy opened its doors through private funding and a strong commitment to its work from the city and school system leaders. This Academy was created to recruit, prepare, and support school principals, especially for the city's hardest-to-staff schools. While it does provide pre-service preparation, it also offers a principal support program and provides in-service mentoring to NYC's new principals. By fall of 2006, it had "provided a full year of mentoring to more than 800 first-year principals throughout the city."[141] The Academy regularly evaluates it program effectiveness and has so far learned that selection of coaches (for mentoring) is critically important. They now utilize recently retired principals who are hired by the Academy and provide the coaches with training to feed in new knowledge. They also

structure the coaching relationship with more flexibility—rather than requiring a set number of hours for mentoring, the Academy supports flexibility based on the needs of the sitting principal.

North Carolina. Since 1984, more than 6,000 school administrators have participated in leadership training programs offered by the University of North Carolina (UNC) Principals' Executive Program (PEP).[142] Over the past two decades, PEP has provided a wide array of training and professional development opportunities for principals, assistant principals, aspiring principals, new principals, experienced principals, and aspiring superintendents.

The most recent addition to the list is the Leadership for Priority High Schools program. At the behest of UNC President Erskine Bowles, PEP and the UNC Kenan-Flagler Business School formed a cross-campus partnership in 2006 to design and administer an executive education program exclusively for leaders of the state's 17 lowest-performing high schools. As the dean of the Kenan-Flagler Business School notes, a key factor contributing to the dismal levels of student achievement in these schools is that they are disproportionately staffed by inexperienced and underprepared teachers and leaders.[143] Less than half of the students in the schools performed at grade level on end-of-course exams in 2004-05, compared to three quarters of all students in North Carolina. Only 59 percent of the students took the SAT, compared to a statewide average of 74 percent, and the average score among those who did take the test was 181 points lower than the statewide average. Principals in these schools were less experienced than those in high-performing schools and teacher turnover was high (27 percent vs. 19 percent statewide). Moreover, teachers in these schools were less likely to be fully licensed (69 percent vs. 85 percent statewide) and more likely to be lateral-entry teachers or to hold an emergency or provisional license (27 percent vs. 15 percent statewide).

Participation in the Leadership for Priority High Schools program is by invitation only for teams of principals, assistant principals, and teacher leaders in the target schools. The curriculum covers topics such as teacher retention, team building, communication skills, effective practices with diverse learners, effectively monitoring instruction, and performance reviews, coaching, and feedback strategies. As part of the program, leadership teams observe schools that have made significant progress, and they work with business coaches to develop strategic plans that will turn around the academic performance of their schools.

Virginia. An alternative way to increase the number of effective principals in high-need schools is to develop the leadership skills of those who are already working there, through intensive professional development, mentoring, and induction programs. Several state education agencies are currently working in partnership with nonprofit and for-profit organizations and higher education institutions for this purpose. Virginia was the first state to develop a statewide executive education program specifically designed to provide school leaders with the training and support needed to improve consistently low-

performing schools. The Virginia School Turnaround Specialist Program was created in spring 2004 as part of then-Governor Mark Warner's teacher retention and support initiatives.[144] The program was developed through a joint partnership between the Virginia Department of Education, the Governor's Office, and the University of Virginia Darden School of Business and Curry School of Education. Microsoft Partners in Learning joined the partnership later in the same year to help to bring the program to scale and create a model that could be replicated nationwide.

Candidates selected for the two-year training program must have at least five years of successful school leadership experience and a master's degree, and they must be willing to make a three-year commitment to lead a designated low-performing school.[145] The Virginia Department of Education is responsible for identifying the eligible turnaround schools and for recruiting candidates to apply for the program, but school districts interview and hire their own principals from the pool of program participants.

The program relies heavily on case studies to teach participants how to use business and education management strategies to develop solutions to low school performance. In addition to the training and course work provided by university faculty and other experts, the program supplies peer coaches and district mentors and works with district- and school-support teams to ensure candidates receive the support and collaboration they need to accelerate and sustain school improvement. Candidates receive $5,000 bonuses after the first year of training and earn additional salary supplements when their schools meet designated performance targets. A Turnaround Leadership Credential is awarded at the end of the program, if the candidate's school makes adequate yearly progress and shows other signs of success, such as earning full accreditation and improving mathematics and reading achievement.

Initial results show strong signs of program success. Seven of the 10 turnaround schools made adequate yearly progress during the first year, a feat none had accomplished during the previous two years, and the remaining three schools made significant gains on some state assessments.[146] Two more schools reduced reading and math failure rates by 10 percent.[147] In one school, the percentage of students who scored at the proficient level on state assessments jumped from 58 percent to 93 percent in reading, and from 69 percent to 96 percent in math.[148] By 2006-07, the annual class of participants had expanded from 5 to 25, and Philadelphia, Chicago, and Broward County, Florida, were sending principals from some of their lowest-performing schools to Virginia to receive turnaround specialist training.[149] In addition to the two-year program, the University of Virginia now offers a four-day Turnaround Leadership Program for other principals and central office administrators who wish to receive some of the same leadership training.[150]

Approach 4: Change policies and improve working conditions that deter principals from working in hard-to-staff schools in the first place.

California. Like Philadelphia and New York City, California has recently

changed policies to give principals more control over staffing decisions. In fact, California is the first state to pass legislation giving principals in low-performing schools the authority to refuse to accept teacher transfers. This legislation represents a significant and unprecedented change in education policy, because these decisions are normally made by local school districts, not by states.

Prompted by the New Teacher Project 2005 report, which concluded that teacher transfer rules in urban teacher contracts forced weak teachers on schools that could not refuse them, State Senator Jack Scott (D-Altadena) introduced SB1655.[151] The purpose of the bill was to put an end to the practice of allowing poorly performing teachers to transfer from one school to another within the same school system, a practice administrators referred to as "the dance of the lemons." This practice occurs, some contend, because it is so difficult for principals to fire ineffective teachers that some simply encourage the teachers to seek voluntary transfers. Because low-performing schools have higher rates of teacher turnover and consequently more vacancies, they tend to get the majority of unwanted teacher transfers. The New Teacher Project findings lend support to this theory—more than one fourth of principals in San Diego admitted they had encouraged an underperforming teacher to switch schools.[152] Teachers' union contracts in a number of California districts, including Los Angeles, San Diego, and San Francisco, contained provisions which required principals to accept teacher transfers, whether they were wanted or not.

In addition to allowing principals to refuse teacher transfers, the bill also permits principals to hire new teachers as early as mid-April. This change was prompted by an earlier New Teacher Project report, which found that some urban districts lose large proportions of promising applicants because union contracts require districts to delay hiring of new teachers until those with seniority have been given first pick of open positions.[153] This practice can delay hiring well into summer, after many promising new teachers have already been hired by surrounding districts.

Despite strong union opposition to SB1655, it was widely supported by both Republicans and Democrats in the state legislature. The bill passed 33 to 1 in the Senate and 59 to 12 in the Assembly and was signed into law by Governor Arnold Schwarzenegger in September 2006.[154] The law is expected to affect approximately 3,000 schools across the state, and Senator Scott has stated he would consider introducing new legislation next year that would give the right to refuse unwanted teacher transfers to principals of all California schools, not just principals of low-performing schools.[155]

New York City. Shortly after the Philadelphia teachers' contract dispute was settled, New York City teachers agreed to a new contract which likewise eliminated some long-standing teacher seniority protections and gave principals much greater authority to select teachers and staff.[156] The new contract also gave principals greater authority to refuse teachers they did not want. In keeping with efforts to give principals more autonomy and more power to select their staff,

Chancellor Joel Klein lifted a hiring freeze in September 2006 that would have forced principals to fill any remaining vacancies from a pool of 1,000 unassigned, "excessed" teachers who were already in the school system.[157] Instead of requiring principals to hire teachers who may not have been well-matched to the needs of their schools, the excessed teachers were placed in a substitute teacher pool.

At the time, the city and the local administrators' union were involved in heated disputes over a new principals' contract, and Chancellor Klein announced he would rather spend millions of dollars to create unneeded jobs for excessed assistant principals than force schools to accept assistant principals they did not want.[158] A subsequent memo from the chancellor did encourage principals to consider the excessed assistant principals, but he remained steadfastly opposed to a contract provision that allowed administrators without assignments to displace less experienced administrators whom the schools wanted to keep.

In addition to giving principals more power to choose their own staff, New York City is giving more authority to its highest performers.[159] A group of principals, who have volunteered to lead now 332 "empowerment" schools[160] (equaling roughly one in four of the New York City's schools[161]), have been given additional funding and control over all major decisions in their schools, including decisions about curriculum, the length of the school day and year, and professional development for teachers. In exchange for greater freedom, the principals are held to stricter performance standards. Their schools must meet academic performance benchmarks every year and earn A's or B's on school report cards. Principals who do not meet expectations can be removed, and schools that do not meet expectations can be closed. Other school districts, such as Chicago and Washington, D.C., are also considering strategies which would reward successful principals with greater flexibility, freedom from certain regulations, and more autonomy.[162]

Philadelphia. The fourth approach that states and districts are using to strengthen principal quality in high-need schools is to improve adverse working conditions that may discourage good principals from working in the schools in which they are needed most. For principals whose jobs depend heavily on their ability to make dramatic gains in school performance, the single most important working condition may be the amount of authority they are given to choose their own teachers.

In Philadelphia, principals had virtually no input in teacher-assignment decisions until a new teachers' contract was negotiated two years ago. Prior to 2004, seniority and transfer rules in the teachers' union contract gave teachers with the most experience the first choice of jobs. As a general rule, teachers tended to shift to schools serving fewer poor, minority, and low-achieving students as they gained experience and moved up in seniority. As a result, the lowest-performing schools, which were considered least desirable, struggled with high rates of teacher turnover and disproportionate concentrations of inexperienced, and often underprepared, teachers. These novice teachers were assigned by the district's central office to fill the

vacancies veteran teachers did not want.

About 40 of Philadelphia's 264 schools had experimented with site-based selection when the last teachers' contract was up for renewal. In this group of schools, principals and committees of teachers and parents—rather than teachers with seniority or the central office—controlled the hiring decisions. However, two thirds of the teachers at the school had to agree to this change, and it had to be approved again each year.[163] When the teachers' contract was up for renewal in 2004, school district officials proposed eliminating the faculty votes and making site-based selection permanent and mandatory at all schools.[164] When polled, 7 out of 10 Philadelphia parents supported the notion of giving principals greater power to hire and fire their own teachers, but the teachers' union was firmly opposed to the idea of limiting teacher seniority rights.[165]

After months of tense negotiations, the district and the teachers' union finally reached a compromise which allowed principals to fill half of their vacancies, with input from school-based selection committees.[166] The other half would still be filled according to teacher seniority or central office directives. In the 40 schools that had opted for site-based selection, and in 10 additional low-performing schools, principals and their school committees were authorized to make all hiring decisions.[167]

During the next round of hiring in summer 2005, principals exercised their new right to make hiring decisions about two thirds of the time, and the number of teachers who were hand-picked by principals increased five-fold.[168] Although principals still allowed about one third of their vacancies to be filled according to teacher seniority, Paul Vallas, Philadelphia school district CEO, predicted that the proportion of hiring decisions made by principals would increase to more than 80 percent in only a few years as principals became accustomed to the new system.

Approach 5: Focus on strengthening the instructional leadership role of the principal and distributing the roles and responsibilities of instruction and management across teams of people in and outside of the school building.

Through support from The Wallace Foundation, many states and districts are piloting various distributed leadership models and support mechanisms for instructional leadership. Many states are looking into the use of teacher leaders and the creation and formation of leadership teams (including teachers, instructional support staff, etc.) to make the job of the principal doable. Some states have also looked into putting supports into the schools to focus on management concerns (one example may be found below) so that the principal may focus more on the instruction taking place within the school.

To prepare principals to be instructional leaders, many states have turned to efforts in redesigning their preparation programs or professional development requirements. A 2007 Wallace-commissioned report produced by the Stanford Educational Leadership Institute in conjunction with The Finance Project examines eight exemplary pre-and in-service program models that address key issues in developing strong instructional leaders.[169]

Delaware. As a concrete example of exploring the benefits of distributive leadership, Delaware has tackled leadership supply under a grant from The Wallace Foundation. Delaware has developed exemplary models of distributed leadership as well as leadership succession planning. Their distributive leadership work reinforces their guiding policy framework that "recognizes the collaborative nature of school leadership" and honors "access, opportunity, and improvement for all members of the school community."[170] Delaware selected four districts to develop and implement models of distributive leadership at the middle or high school levels using professional development. The participating districts were determined through a competitive bidding process and are expected to share the findings with the remaining districts in the state.

Kentucky and Jefferson County Public Schools. Jefferson County Public Schools (JCPS) began studying principal use of time and the conditions that seem to keep school leaders from making instructional leadership their priority in 2002.[171] After creating a system to track principal use of time, JCPS hired School Administration Managers (SAMs) at three pilot schools to answer the following questions:

1. Can management duties be separated from the principal's job?
2. Can a School Administration Manager (SAM) take on those duties successfully?
3. Will the principal spend more time on instructional improvement?
4. Will this focus on instruction improve relations with teachers?
5. Will student achievement increase at a greater rate?

Three years later Jefferson County reported that they can answer each question in the affirmative. As reported in the LEAD Kentucky newsletter, principals' time spent on instruction, one year after the SAMs were placed at pilot schools to help with managerial work, increased from 29.7 percent to 65.8 percent.[172]

With its initial success, JCPS is expanding this pilot and has placed SAMs into five more schools in the district. The Kentucky Department of Education (KDE) replicated the JCPS SAM model in three additional districts, seven schools, to further test the concept. JCPS will increase SAM sites to thirty-one and KDE will expand to twenty-two in July 2007.

Utilizing the networking power of other sites funded by The Wallace Foundation, JCPS is now working with and helping other states and districts in implementing SAMs in their sites. JCPS provides planning, readiness, data collection, analysis, selection, training, and professional development services as needed at each site.

By January 2007 SAM replication and innovation projects were underway in California, Delaware, Georgia, Iowa, and Illinois at all three school levels: elementary, middle, and high. Each state will expand their projects in July 2007. New projects using time/task tools developed in the original study will focus on using principal time data to assist coaches in their work with early career principals.

Conclusions and recommendations

This paper has described a number of challenges that make attracting teachers and leaders to positions in high-need schools difficult. Promising news is that states and districts are designing and implementing a broad array of strategies to attract, develop, and retain greater numbers of leaders and teachers in schools in which they are most needed.

Within CCSSO, several projects collaborate with other national organizations and state education policymakers to implement sound policy and practice in the area of education leadership.

The Wallace Foundation-funded state technical assistance received by CCSSO has been a key lever for the Council's work in education leadership. Currently 22 states are active in this project (Arizona, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Missouri, New Jersey, New Mexico, New York, Ohio, Oregon, Rhode Island, Texas, Virginia, and Wisconsin) and CCSSO will be sharing lessons learned with the nation in the near future.

States increasingly use the Interstate School Leaders Licensure Consortium (ISLLC) Standards for School Leaders[173] as a national model for state standards. Forty-three states reported in 2006 that they have either adopted the ISLLC standards or have modified, adapted, or aligned their leadership standards to ISLLC standards.[174] The ISLLC Standards for School Leaders were written by representatives from states and professional associations in a partnership with the National Policy Board for Educational Administration in 1994-95 and were published in 1996. State Education Agency representatives asked the Council to work with them in updating the ISLLC Standards for School Leaders to reflect a decade of policy experience and significant political and social changes since they were published. The Council is currently working with the NPBEA on a national process to update the standards, providing guidance and input from a consortium of states (called The Interstate Consortium on School Leadership) that CCSSO convenes.

CCSSO hopes that its efforts coupled with the strategies and practices underway in individual states and districts will help to inform the field and ultimately help to strengthen both teaching, learning, and leadership in high-needs schools. The additional strategies discussed in this paper, which are but a sampling of the many efforts by state and districts to improve the quality of leadership and reduce teacher attrition in high-need schools, offer several important lessons.

Lessons Learned

1. States should use multiple nontraditional pathways to cultivate new leaders who will serve in high-need areas. States that have seen the most success in filling administrator positions not only have pipelines from schools of education and leadership, but also effective partnerships with non-traditional programs. Some states have seen success using vendor-specific models that allow states to

use modules specifically for training and professional development. Other states have been able to attract and train professionals from other fields in intensive preparation programs.

2. The role of the principal is evolving as the role of the school has evolved. Principals not only must be prepared to use superb management skills and maintain the infrastructure of the school itself, but also must be instructional leaders in their schools.

3. States should consider providing incentives for experienced principals to relocate to challenging settings. Principals should be hired earlier for the most difficult schools to allow them more time to hire teachers and address facility issues before the start of the academic year. States can consider using incentives such as performance pay, housing assistance, signing bonuses, and additional supports such as mentors and specialized training to attract highly-qualified leaders.

4. States should offer intensive ongoing professional development opportunities in substantive areas and should partner with outside parties to diversify and complement district and state professional development offerings. This strategy is critical for both attracting education professionals into leadership roles and retaining them once they are in their new positions.

5. States should examine policies at the state and local levels to determine where regulations are facilitating or inhibiting effective distribution of leadership. Utilize state and local laws and policies to support making the job of attracting and retaining qualified leaders in high-need areas. Special attention should be placed on hiring, training, and compensation policies.

It is clear that strengthening the role of leadership in high-need, underperforming schools is as critical as it has ever been. States and districts must also take deliberate steps to ensure these strong leaders are equitably distributed, so that schools will have the ability to attract and retain stronger teachers where they are needed most.

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