



# TEACHER QUALITY AND STUDENT ACHIEVEMENT: MAKING THE MOST OF RECENT RESEARCH

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# CONTENTS

	<b>Page</b>
Introduction.....	1
What Makes a “Good” Teacher? .....	2
Teacher Qualifications .....	3
Teacher Characteristics .....	6
Teacher Practices .....	7
Teacher Effectiveness.....	9
Policy Implications .....	10
A Word of Caution.....	10
Translating Research Into Practice .....	12
Teacher Salaries and Pay Differentiation.....	15
Directions for Future Research.....	15
References.....	21



## INTRODUCTION

While many studies attest that some teachers contribute more to their students' academic growth than other teachers, research has not been very successful at identifying the specific teacher qualifications, characteristics, and classroom practices that are most likely to improve student learning. Unfortunately, this is just the information that educational policymakers need most.

Most of us believe that good teaching matters. What's more, most of us think we know good teaching when we see it. However, while many studies attest that some teachers contribute more to their students' academic growth than other teachers, research has not been very successful at identifying the specific teacher qualifications, characteristics, and classroom practices that are most likely to improve student learning. Unfortunately, this is just the information that educational policymakers need most.

This lack of definitiveness does not necessarily mean that research studies on teacher quality have been poorly conducted. Findings in an area as broadly defined as teacher quality are often difficult to interpret, given the many ways of identifying and measuring the qualifications, characteristics, and practices that contribute to the concept of what makes a good teacher. Differences in definitions, combined with differences in ways of measuring teacher effectiveness, can even produce contradictory findings about educational efficacy. While careful research is the appropriate tool for determining more precisely what it means to be

an "effective teacher," these inherent complexities make it difficult for stakeholders to draw useful conclusions from the diverse findings.

In an effort to pinpoint teacher quality variables across studies for which there is strong agreement, Goe (2007) recently undertook a research synthesis for the National Comprehensive Center for Teacher Quality. This particular synthesis—which is available online ([www.ncctq.org/link.php](http://www.ncctq.org/link.php))—examines dozens of research studies that link a number of teacher quality variables to student achievement, as measured by standardized tests. While many studies have been conducted on the variables described in the following section, Goe focused only on studies in which authors tied their findings explicitly to teacher quality. Goe's analysis unearths many contradictory and weak conclusions, but the synthesis also identifies a few strong and consistent predictors of student achievement. This Research and Policy Brief culls the associations between teacher quality and student achievement that Goe identifies, with the goal of elucidating trends relevant to current educational policymaking.

## WHAT MAKES A “GOOD” TEACHER?

Goe’s (2007) examination of teacher quality focuses on four categories of teacher quality indicators—teacher qualifications, teacher characteristics, teacher practices, and teacher effectiveness—which, Goe determined, empirically capture the primary variables examined in research studies on teacher quality published between 2000 and 2007. (Some earlier landmark studies are occasionally also included in later discussions of specific teacher quality indicators.) Largely due to the “highly qualified teacher” provisions of the No Child Left Behind (NCLB) Act, these four categories also align with the current national emphasis on certification and licensure, experience, and subject-matter knowledge. In addition, the four categories summarize the ways that teacher quality is commonly defined for policy purposes, and they are frequently linked to hiring and career-ladder

decision making. Table 1 lists and defines the categories and provides examples of the indicators encapsulated by each.

To identify consistent findings for variables culled using the categories, Goe first employed a protocol to summarize the variables on which each study focused, then evaluated these for statistically significant positive or negative findings as well as for the absence of significant findings. Any concern about how a study was conducted was also noted because this could provide useful information about the generalizability of the study’s findings. The collection of summaries was then sorted by finding to determine whether a preponderance of evidence points to any statistically meaningful measures of teacher quality as well as to determine whether the research as a whole reveals any telling differences between variables. Findings for each category are discussed in the sections that follow.

**Table 1. Four Lenses for Examining Teacher Quality**

Category	Definition and example indicators
<b>Teacher qualifications</b>	<i>Credentials, knowledge, and experiences that teachers bring with them when they enter the classroom, such as:</i> Coursework, grades, subject-matter education, degrees, test scores, experience, certification(s), and evidence of participation in continued learning (e.g., internships, induction, supplemental training, and professional development)
<b>Teacher characteristics</b>	<i>Attitudes and attributes that teachers bring with them when they enter the classroom, such as:</i> Expectations for students, collegiality or a collaborative nature, race, and gender
<b>Teacher practices</b>	<i>Classroom practices teachers employ—that is, the ways in which teachers interact with students and the teaching strategies they use to accomplish specific teaching tasks, such as:</i> Aligning instruction with assessment, communicating clear learning objectives and expectations for student performance, providing intellectual challenge, allowing students to explain what they are learning, using formative assessment to understand what and the degree to which students are actually learning, offering active learning experiences, subscribing to cohesive sets of best teaching practices
<b>Teacher effectiveness</b>	<i>A “value-added” assessment of the degree to which teachers who are already in the classroom contribute to their students’ learning, as indicated by higher-than-predicted increases in student achievement scores</i>



## TEACHER QUALIFICATIONS

Teacher qualifications are particularly necessary for regulating entry into the classroom when performance and outcome data are not yet available, as is the case with new teachers. Teacher qualifications are also commonly used as indicators of teacher quality because of the relative ease and cost-effectiveness of collecting this data, which can often be found in public records maintained by states and districts. But are teacher qualifications also effective at identifying teachers who improve their students' achievement?

The simple answer is yes, to a *limited* extent. Certain types of teacher qualifications are consistently associated with increased student achievement in particular subject areas—most notably in mathematics, where research efforts seem to be concentrated. In particular, Goe (2007) discerned the following two key teacher qualification variables that, across studies, are consistently shown to produce strong, positive effects on student learning:

- Teachers' knowledge of mathematics matters for student learning in mathematics at all school levels, but particularly at the secondary level. Whether measured by mathematics course taking, certification, or degree, it appears that teachers with stronger mathematics knowledge produce better student achievement in mathematics compared with less knowledgeable teachers.
- Teachers' level of experience matters—but only for the first five years of teaching. During these first few years, teachers appear to gain incrementally in their contribution to student learning. After five years, however, the contribution of experience to student learning appears to level off.

Other noteworthy findings about teacher qualifications that Goe (2007) observed follow, by teacher qualification variable.

**Subject-Matter Knowledge.** The association of this specific teacher qualification with higher student achievement varies by grade level. Stronger correlations exist between the achievement of secondary school students and their teacher's subject-area expertise (as reflected by various credentials) than exist between the success of younger students and their teacher's subject knowledge. In particular, several studies indicate that teacher completion of an undergraduate or graduate major in mathematics is associated with higher student achievement in high school and middle school (Aaronson, Barrow, & Sanders, 2003; Frome, Lasater, & Cooney, 2005; Goldhaber & Brewer, 2000; Monk, 1994; Wenglinsky, 2000, 2002). Monk (1994) and Wenglinsky (2000) identify a similar trend in science.

**Advanced Degrees.** The effects associated with a teacher's possession of an advanced degree are strikingly counterintuitive, especially given the salary incentives offered to encourage teachers to pursue graduate degrees. Not only do recent empirical studies *not* find a substantial benefit for students of teachers with advanced degrees, but the majority of such studies also indicate that teachers with



master's degrees and beyond may negatively influence their students' achievement (Clotfelter, Ladd, & Vigdor, 2006; Monk, 1994; Rowan, Correnti, & Miller, 2002). Betts, Zau, and Rice (2003) find marginal benefits for middle school mathematics achievement when teachers hold master's degrees, but this effect is not practically significant. Hanushek, Kain, O'Brien, and Rivkin (2005) find no association between teachers holding master's degrees and fourth- through eighth-grade students' mathematics test score gains in Texas.

**Test Scores.** While teacher test scores are often used as an indicator of teacher quality, the results of three recent empirical investigations are somewhat mixed on the subject. Hanushek et al. (2005) find no relationship between elementary and middle school teachers' recertification exam scores and their students' mathematics achievement, while Cavalluzzo (2004) finds that National Board Certified teachers with higher licensure test scores have a marginal positive impact on middle school mathematics achievement. However, because National Board Certified teachers, as a group, have higher licensure test scores than teachers without the distinction, it is not clear whether (or to what extent) National Board Certification or teachers' test scores (or both) contribute to increased student achievement. A study by Clotfelter et al. (2006a) also finds that teacher licensure test scores have a marginally positive relationship with middle school students' mathematics test scores.

Recertification and licensure tests, on the other hand, tend to have very high pass rates, which may not allow enough sensitivity to detect meaningful differences in teacher quality. Because states select their own "cut" scores—the passing score a teacher must have—states must weigh teacher supply and demand considerations with the need to ensure that teachers have a minimum understanding of the subject matter and how to deliver it. However, teacher certification tests cover a subject broadly, rather than focusing only on items that measure teachers' specific knowledge of, say, algebra.

In an in-depth study of rural Brazilian students, however, Harbison and Hanushek (1992) found that teacher subject-area test scores in mathematics positively influenced their students' achievement. The stronger impact of test scores in this study may reflect the variation in scores as well as the specific content tested. Although the teachers took the *same tests administered to their second- and fourth-grade students*, the average teacher score was only 87 percent. Because teachers were tested on the exact same tests that students took, it should not be surprising that teachers with higher scores had students with higher scores. However, this tells us nothing about teachers' general knowledge of mathematics and ability to teach mathematics concepts—only about their ability to teach the material that is tested—an important distinction.

**Undergraduate Institution.** Many have proposed that the selectivity of the undergraduate institution a teacher attends may be a useful indicator of teacher quality. However, recent empirical investigations of teacher qualifications do not support this theory (Cavalluzzo, 2004; Clotfelter et al., 2006a). Nevertheless, Wayne and Youngs' (2003) literature review identifies several older studies that find a marginal relationship between the selectivity of a teacher's undergraduate institution and his or her students' achievement.



**Certification.** Teacher certification as a signal of teacher quality has been investigated at various levels, including full standard certification, emergency certification, advanced or National Board Certification, and subject-area certification. While recent studies find that *full* certification is either unrelated or positively related to student achievement (Carr, 2006; Darling-Hammond, 2000; Darling-Hammond, Holtzman, Gatlin, & Vasquez Heilig, 2005), other research shows that *emergency* certification is generally either unrelated or negatively related to student achievement. In particular, one study (Betts et al., 2003) suggests that teachers with emergency certification negatively influence middle and high school student achievement but not elementary student achievement. Another study (Goldhaber & Brewer, 2000) finds no significant differences between the mathematics and science achievement of high school students of teachers with either emergency or full certification. Thus, while there are a number of studies that suggest certification makes a difference, the studies that find certification has no significant or practical value suggest that we still have much to learn about what certification is “signaling” in terms of teachers’ ability to teach specific content effectively.

Teachers’ subject-area certification or authorization is one of the teacher qualifications most consistently and strongly associated with improved student achievement, especially in middle and high school mathematics (Betts et al., 2003; Cavalluzzo, 2004; Goldhaber & Brewer, 2000). Carr (2006) also indicates that highly qualified teachers, or those with both full certification and demonstrated subject-matter competency, are associated with increased elementary and middle school achievement in reading, science, and social studies as well as in mathematics. This is another area where more work must be done because the evidence of a relationship between certification and student achievement is strong primarily in mathematics but there is scant evidence in other subjects.

Studies suggest that teachers’ attainment of National Board Certification is associated with marginal to moderate improvements in high school mathematics achievement (Cavalluzzo, 2004) and elementary and middle school mathematics and reading achievement (Clotfelter et al., 2006a; Goldhaber & Anthony, 2004; Vandevort, Amrein-Beardsley, & Berliner, 2004). However, National Board Certified teachers have not been found to be reliably more effective than teachers who have *never attempted* National Board Certification, because of substantial variation in effectiveness among both National Board Certified teachers and nonattempting teachers (Clotfelter et al., 2006a; McColsky et al., 2005; Sanders, Ashton, & Wright, 2005). Goldhaber and Anthony’s (2004) longitudinal methods indicate that while the National Board Certification process does effectively differentiate between teachers who contribute to increased student achievement and those who do not, the process itself does not improve teacher quality.

Except in the case of the Teach for America (TFA) program, there is too little recent research on alternative preparation programs to generalize findings about the quality of the teachers they produce (e.g., see Boyd, Lankford, Loeb, & Wyckoff [2006] for more information about New York City Teaching Fellows). A small but consistent body of research indicates that TFA teachers are about as effective as college-prepared teachers in mathematics, but not in English (Boyd et al., 2006; Decker, Mayer, & Glazerman, 2004). In addition, Darling-Hammond (2000) finds that once they attain full state certification, TFA teachers are as effective as traditionally prepared, fully certified teachers.

**Induction and Mentoring.** Goe (2007) found only one recent study that specifically examines the impact of teacher induction and mentoring experiences on student achievement. Frome et al. (2005) suggest that the percentage of teachers participating in mentoring or induction programs is



positively related to school-level achievement in mathematics. Because this research is at the school level rather than the teacher level, it is impossible to say that participation in induction is responsible for better student achievement. And, unfortunately, there is too little research in this area on which to base defensible conclusions about the impact of induction and mentoring on student achievement.

**Professional Development.** Several studies indicate that certain types of professional development contribute to teacher quality and student achievement. Specifically, professional development that is sustained, aligned with the curriculum, and focused on instruction is shown to positively influence school-level achievement in mathematics and science at both the elementary and high school levels (Cohen & Hill, 1998; Kannapel & Clements, 2005; Wenglinsky, 2000, 2002). Although Harbison and Hanushek (1992) find no beneficial relationship between professional development and student achievement in rural Brazilian schools, they speculate that this finding may be the result of targeting particularly underqualified teachers for participation in the professional development programs studied.

**Experience.** The relationship between teacher experience and student achievement receives considerable attention in the empirical literature, with somewhat mixed results. Several researchers find that experience, especially during the first couple of years in the classroom, is positively associated with student achievement in mathematics and reading at the elementary and middle school levels (Cavalluzzo, 2004; Hanushek et al., 2005; Rockoff, 2004; Rowan, Chiang, & Miller, 1997). Several other studies, however, do not detect meaningful differences between more and less experienced teachers (Carr, 2006; Gallagher, 2004; Harbison & Hanushek, 1992). It is interesting to note that three of the four studies that find no significant relationships between teacher experience and student achievement do not focus on traditional public schools: Both Gallagher and Carr examine charter schools, and Harbison and

Hanushek's research looks at impoverished schools in rural Brazil.

**Content-Based Pedagogical Knowledge.** Finally, teachers' content-specific pedagogical knowledge—assessed in the research base by way of the completion of formal coursework, questionnaire, or observation—is substantially positively associated with students' mathematics achievement at all levels. A key older study goes further, associating the number of mathematics pedagogy courses teachers had taken with student achievement at the elementary, middle, and high school levels (Monk, 1994). Based on teacher questionnaire responses, other studies point to both elementary and high school teachers' mathematics pedagogical knowledge as the strongest teacher-level predictor of student achievement (Hill, Rowan, & Ball, 2005; Rowan et al., 1997). More generally, another study distinguishes teacher content knowledge as one of 12 teacher practices that are positively associated with elementary student achievement in reading, mathematics, and language (Schacter & Thum, 2004).

## TEACHER CHARACTERISTICS

Teacher characteristics are often included in descriptions of teacher quality but are less often measured in conjunction with student learning outcomes. Some teacher characteristics are immutable, such as race and gender, and others may be more resistant to influence by policy initiatives than are teacher-qualification variables. All are viewed as related to teacher quality in Goe's (2007) framework because these characteristics are brought into the classroom by teachers and because they exist independently of the actual act of teaching. While a number of teacher attitudes have been proposed as essential to teacher quality, Goe's synthesis reviews only those teacher characteristics that are empirically associated with student test scores.

**Social Capital.** Teacher collegiality and the willingness to collaborate have received considerable attention in recent years as potential vehicles for



improved student achievement. Empirical research confirms that this team approach is positively associated with school-level achievement in mathematics and reading (Kannapel & Clements, 2005; Leana & Pil, 2006; Rowan et al., 2002). Collaborative decision making is one of several characteristics that researchers say can differentiate high- from low-performing elementary schools (Kannapel & Clements, 2005). Rowan et al. (2002) observe similar benefits of common planning periods and collaborative decision making on high school mathematics achievement. In addition, teachers' social capital is seen as positively related to researchers' ratings of the observed quality of instruction in schools (Leana & Pil, 2006). Typically, however, these attributes are measured at the school level rather than the teacher level—meaning that it is not possible to use these data to accurately measure the impact of *individual* teachers' collaborative skills on student achievement.

In a related vein, after investigating the association between school-level test scores and collective teacher efficacy—a construct closely connected with both teacher collaboration and instructional efficacy—Goddard, Hoy, & Hoy (2000) find substantial correlations between teacher self-ratings of their *collective* confidence that they will improve student achievement and the students' actual achievement. However, these results are difficult to interpret. It is equally likely that teachers' confidence in the combined efficacy of their schools' teachers *reflects* high-level achievement rather than *contributes* to it.

**Expectations.** Several researchers indicate associations between teachers' high expectations for students and middle and high school achievement in mathematics (Frome et al., 2005; Rowan et al., 1997). Others find that high teacher expectations for students can differentiate high- from low-performing elementary schools (Kannapel & Clements, 2005). Much like the finding concerning collective teacher efficacy, however, these school-level

findings must be interpreted cautiously. They cannot be used to gauge the ways in which individual teachers contribute to student achievement.

**Race.** The most recent and rigorous research indicates that having a same-race teacher improves the mathematics and reading achievement of both students who are black and students who are white (Dee, 2004a; Hanushek et al., 2005). The relationship between student achievement and students whose teachers are from other underrepresented racial groups (such as Asian or Hispanic) could not be analyzed in these studies because of insufficient numbers of students in the researchers' samples. These studies seem to point in the same direction, but more research in this area needs to be done in order to understand *how* having a same-race teacher contributes to higher student achievement.

## TEACHER PRACTICES

The teacher-practices variable represents a process view of teacher quality, which might more aptly be described as *instructional* quality. Research on teacher practices investigates the relationship between student achievement and the classroom practices that teachers employ (i.e., the ways in which teachers interact with students and the



teaching strategies they use to accomplish specific teaching tasks). As defined and measured in the literature, teacher practices are usually delineated into “best practices” and teachers’ *actual* practices to determine their impact on achievement.

**Alignment of Instruction and Assessments.** Not surprisingly, one component of best practice—the alignment of instructional content with student assessments—is shown to be positively associated with student achievement in mathematics, reading, and science (Marcoulides, Heck, & Papanastasiou, 2005; Rowan et al., 2002). In addition, Kannapel and Clements (2005) observe that aligning instruction with student assessments differentiates high- from low-performing high-poverty schools. Two other studies provide further support for this trend, although they did not specifically set out to investigate alignment. First, Cohen and Hill (1998) find teachers’ use of California Learning Assessment System (CLAS) mathematics “replacement units” (lessons designed around the CLAS test of mathematics) to be associated with higher CLAS scores, suggesting that the aligned lessons contributed to student achievement. Second, McCaffrey, Hamilton, Stecher, Klein, Bugliari, and Robyn (2001) note that teachers’ use of practices aligned with National Council of Teachers of Mathematics (NCTM) standards is positively associated with students’ mathematics achievement, but only in “integrated” courses that are based on NCTM standards.

**Clear Learning Objectives and Performance Expectations.** A small research base suggests that providing students with clear learning objectives and performance expectations is associated with student achievement in mathematics and reading—at least at the elementary and middle school levels (Matsumura et al., 2006; Schacter & Thum, 2004). In both of these studies, clear learning objectives and performance expectations are shown to be associated with student achievement. However, because the researchers analyzed several components of “instructional quality” as a set

rather than separately, it is not possible to determine whether or to what extent providing clear learning objectives and performance expectations influenced student learning.

**Intellectual Challenge.** Cognitively engaging or challenging instruction is also positively associated with elementary- and middle-school achievement in mathematics and reading (Frome et al., 2005; Kimball, White, Milanowski, & Borman, 2004; Matsumura et al., 2006; Schacter & Thum, 2004). Again, however, cognitive engagement or challenge was measured as *one component* of a set of instructional practices related to improved student learning. Only Wenglinsky (2000, 2002) independently investigated the relationship between teachers’ emphasis of higher-order thinking skills and students’ mathematics scores on the National Assessment of Educational Progress, finding such cognitively challenging instructional practices to be only marginally associated with student achievement.

**Explaining What They Are Learning.** Several researchers observe that providing students with opportunities to explain and discuss projects and assignments is positively associated with middle school achievement in mathematics, reading, and science (Frome et al., 2005; Marcoulides et al., 2005; Matsumura et al., 2006). Due to considerable variation in how this type of instructional practice is operationalized and measured among the studies, however, the results cannot be generalized.

**Formative Assessment.** A teacher practice with much current policy interest is teachers’ use of formative assessment—the practice of frequently assessing the degree to which students are learning and providing feedback that ensures they learn. Formative assessment is positively associated with elementary school achievement in mathematics and reading (Schacter & Thum, 2004) and mathematics and science achievement at all levels (Wenglinsky, 2000, 2002). In addition, frequent assessment and feedback is one of the school-level practices that distinguishes high- from low-performing schools

(Kannapel & Clements, 2005). In the study cited, however, it is important to note that frequent assessment and feedback were much more broadly defined than true formative assessment; thus, the findings may underestimate the benefits of this particular teaching practice.

**Active Learning.** Teachers' use of interactive or hands-on teaching practices is positively associated with student achievement in elementary school mathematics and reading (Smith, Lee, & Newmann, 2001) and in middle and high school mathematics (Frome et al., 2005; Wenglinsky, 2000, 2002). What's more, the quality of teachers' assignments is positively associated with elementary students' mathematics achievement (Newmann, Bryk, & Nagaoka, 2001) and middle and high school students' reading achievement (Matsumura, Garnier, Pascal, & Valdés, 2002).

**Teacher Practices as Measured by Expert Observers.** Several studies associate practices aligned with Charlotte Danielson's 1996 *Framework for Teaching* with elementary students' reading, mathematics, science, and social studies achievement (Borman & Kimball, 2005; Gallagher, 2004; Heneman, Milanowski, Kimball, & Odden, 2006; Holtzapple, 2003; Kimball et al., 2004). The relationship is strongest for schools that *rigorously* conduct the evaluations, suggesting that standards-based evaluations may be useful indicators of teacher quality—if done well (Heneman et al., 2006). Also, McCaffrey et al. (2001) find teacher practices aligned with NCTM standards to be related to high school students' mathematics achievement in courses designed around these reforms, while Cohen and Hill (1998) associate teacher practices that are consistent with the 1985 *Mathematics Framework* (California Department of Education, 1985) with increased school-level mathematics achievement.

**Principals' Subjective Assessments of Teacher Quality.** Jacob and Lefgren (2005) found that principals' subjective assessments of teacher quality

are substantially related to elementary school students' mathematics and reading test scores. The principals who participated in this research did not conduct formal observations for the purposes of the study. Rather, they were asked to consider teacher practices and other teacher quality characteristics in providing more holistic assessments of teachers on their staffs. In addition, Jacob and Lefgren observe that these assessments of teacher quality are also better predictors of student achievement than more traditional teacher qualifications and that they are strongly linked with parent satisfaction. However, the findings of this single study may reflect a particularly astute sample of principals rather than a consistent trend in the efficacy of subjective principal assessments.

## TEACHER EFFECTIVENESS

One measure of teacher quality that is playing a key role in current discussions throughout the country about educational policy, merit pay, and differential pay is teacher effectiveness. Derived through the use of "value-added" methodologies that estimate teachers' contributions to their students' learning (as measured by standardized achievement tests), teacher effectiveness can be determined only after a teacher has had an opportunity to impact his or her students' learning. Thus, this measure is not useful as a measure of teacher quality for new hires.

There are many issues and challenges in defining and measuring teacher quality this way—from statistical concerns with particular value-added models to more conceptual issues about the fairness of comparing classrooms serving different groups of students. Researchers have yet to reach consensus on these issues and challenges. We do not have a method for confirming whether a value-added model has attributed the "right" amount of variance in student achievement to *teachers*; other factors that impact student learning may have influenced students' achievement in a particular classroom. Although teacher effectiveness scores may seem like "magic bullets" that allow us to rank and reward teachers for

improving student achievement, policymakers should be wary that various models may attribute changes in student achievement to teachers when these changes are actually the result of factors outside the teacher's control—such as community and school resources, parent involvement, family socioeconomic status, student effort, and the impact of other students in the classroom, to name just a few.

Overall, studies that examine the use of teacher effectiveness ratings consistently indicate that the majority of variation in teachers' effectiveness at raising student achievement scores is due to “unobserved” variables. That is, the changes cannot be specifically attributed to the influence of teacher qualifications, teacher characteristics, or teacher practices (Aaronson et al., 2003; Nye, Konstantopoulos, & Hedges, 2004; Rivkin, Hanushek, & Kain, 2004). These studies also suggest that teacher effectiveness may not be a stable value, as indicated by large, overlapping confidence intervals between teachers of varying levels of effectiveness (Noell, 2006; Thum, 2003).



## POLICY IMPLICATIONS

### A WORD OF CAUTION

The take-away message in the current body of evidence is this: With the exception of teachers' experience during the first five years of teaching and teachers' mathematics knowledge, researchers have not yet developed the tools, measures, and data sources that allow them to state, with a strong degree of certainty and consistency, which aspects of teacher quality matter most for student learning. This does not mean that *no* relationships exist among other measures of teacher quality and student achievement; in fact, studies that show positive relationships between particular indicators of teacher quality and student achievement are numerous in the literature. But some of these studies are conducted at the school level, making it impossible to link student achievement to particular teachers, while others are looking at many variables at once, making it difficult to separate out the likely effects of one variable. Still others use small samples or lack sufficient data to make convincing arguments. Thus, the findings may not be substantial enough to base future educational policy development and implementation upon them.

Another important caveat about the findings collected and evaluated by Goe (2007) is that all of the research uses standardized state achievement test scores to measure student learning. There are many problems with using scores on these types of tests—which are designed and validated for the specific purpose of getting a snapshot of student achievement at a particular point in time—for the purpose of identifying the differential contributions of teacher qualifications, teacher characteristics, and teacher practices to student achievement. Other outcome measures, such as beginning- and end-of-year subject tests aligned with state and district standards and curriculum, may be more sensitive to differences among teachers' subject-matter teaching abilities and might yield stronger and more consistent results.



It is also important to realize that student achievement is not the only important outcome of teaching. There may be important reasons to value teacher experience, above and beyond its impact on student achievement. Similarly, teachers' character, classroom management skills, stability, and leadership qualities may contribute to smooth school and classroom functioning, yet this situation may not be reflected in significantly higher student achievement. Thus, policies should not be shaped solely by test scores but should take into consideration the many important ways in which teachers make a positive impact on the lives of students, the success of colleagues, and the culture of schools.

When reviewing what the research says about teacher quality, educational leaders and policymakers should remember the following:

- **Context matters.** Evidence that Goe (2007) culled from the research makes clear that what is important at the secondary level may be less important at the elementary level. Further, a high level of teacher subject-matter knowledge contributes more to student learning in some subjects than it does in others. For example, while the research is strong and consistent on the importance of highly qualified mathematics teachers, particularly for middle and high school teaching positions, considerably less evidence exists about the importance of advanced subject-matter knowledge for teachers of other subjects.
- **One size does not fit all.** When using evidence from research to develop policy decisions, consider the value of nuanced policies that fit the requirements of particular teaching jobs. As the research suggests, most indicators are likely to be more or less effective for predicting or evaluating teacher quality in different contexts; thus, educational leaders and policymakers should focus on using teacher quality indicators where they make the most practical sense. This approach may be a challenge, given the

historic reluctance among teachers and unions to embrace differential qualifications or salaries, but the research is clear: Due to important context differences, it does not make sense to demand a uniform set of qualifications for all teachers. For instance, the finding about mathematics subject knowledge may be relevant when setting hiring priorities and possibly differential pay scales. And because there is little strong and consistent evidence that associates any teacher quality indicators with student achievement at the elementary level, perhaps different considerations should apply when hiring teachers for different grade levels.

- **Teachers contribute to other important outcomes besides student achievement on standardized tests.** The current policy climate encourages a singular focus on test scores. Because few teacher qualifications, teacher characteristics, or teacher practices are strongly and consistently related with improved student achievement, it is wise when making decisions about teacher hiring and placement to also consider the ways in which teachers may contribute to outcomes such as student self-esteem, student attendance, teacher collaboration and collegiality, and school culture.
- **A new tool can help.** The National Comprehensive Center for Teacher Quality has developed a tool—the *Communication Framework for Measuring Teacher Quality and Effectiveness* (Cogshall, 2007)—to help states organize their discussions about, and sort out complex issues surrounding, the measurement of teacher quality and effectiveness. It is available online ([www.nctq.org/communicationFramework.php](http://www.nctq.org/communicationFramework.php)).

The caveats having been sounded, the following sections discuss ways in which policies may need to be reconsidered in light of the results of Goe's (2007) analysis.

## TRANSLATING RESEARCH INTO PRACTICE

Although many teacher qualifications are promising indicators of teaching skill, educational leaders and policymakers should not embrace these qualifications as unconditional or absolute gauges of teacher quality. It is important to note two points:

- The associations documented in the research are often small enough to be of little practical significance at the level of individual students' achievement.
- A substantial literature base indicates that strong teacher qualifications tend to be positively matched with *student* characteristics that are known to contribute to high achievement. For example, a teacher with an undergraduate major in mathematics, full state certification in mathematics, and several years of experience teaching mathematics is more likely to teach more privileged students whose previous achievement is at or above grade level (e.g., Cavalluzzo, 2004; Clotfelter, Ladd, Vigdor, & Wheeler, 2006). Such a confounding of teacher qualifications and student characteristics can lead to overestimates of teacher impact. In other words, if achievement that is really the result of previously untested student learning—or of some students' extracurricular opportunities to learn—is incorrectly attributed to teacher effects, then teachers will seem more or less effective based on the characteristics of their students.

It may be tempting—but would be wrong—to think that this lack of definitive evidence means that typical state requirements (such as credentials, licensure, and certification, whether from a conventional or an alternative program) are irrelevant. Consider the following information gleaned from Goe's (2007) analysis:

- **Teacher Preparation Programs.** The links between student achievement and what teachers learn in teacher preparation programs are few

and weak. Moreover, teachers who do not complete traditional preparation programs are not consistently worse or better than those who do. Perhaps the true value of teacher preparation programs is simply not being measured in terms of student achievement scores. Or, maybe what is learned in teacher preparation programs does not significantly affect the ways in which teachers impact student achievement. In either case, it is likely that much of what is learned in teacher preparation programs enables teachers to be effective in other important ways—ways that are not reflected in student achievement scores but may be reflected in the how teachers provide and manage learning opportunities as well as the relationships they build with their colleagues, students, and the community.

- **Teacher Certification.** While there may be differences in knowledge or skills between the certified and uncertified, these differences are not pronounced enough to be picked up in student achievement gains. This is not to suggest that we need to do away with teacher certification. Rather, it means policymakers need to pay more attention to what is being signaled about teachers through certification. In other words, what important qualities or knowledge do certification tests measure, and how do they relate to student outcomes (not just test scores) that states, parents, and students care about?
- **Alternative Certification.** The quality of teachers prepared by alternative certification programs is currently a pressing policy concern. Advocates believe that alternatively prepared teachers are just as effective as their traditionally prepared counterparts and help meet critical staff shortages in high-needs schools (e.g., Decker et al., 2004). However, others raise concerns that alternatively certified teachers are not adequately prepared to be effective in the classroom and that their

placement in at-risk, high-needs schools may be just another case of the system shortchanging poor, minority, and special-needs students (e.g., Laczko-Kerr & Berliner, 2002).

How does the research base weigh in on this debate? There is too little recent research on alternative-certification preparation programs to say definitively, but even if teachers with alternative certification and teachers with traditional certification contribute about equally to student learning, they *both* have some type of certification, which signals that they have met some minimum requirements. It is possible that differences among types of certification are simply not meaningful when it comes to measuring gains in student achievement.

- **Subject-Area Certification and Knowledge.**

Taken together with empirical evidence of (1) the importance of academic majors or minors in the subject-area taught, (2) some types of teacher test scores, and (3) teachers' pedagogical content knowledge, the research on teachers' subject-area certification solidly supports the importance of this qualification for predicting which teachers will contribute to student achievement, at least in upper-level mathematics courses. Along the same lines, the research is strong and consistent about the importance of subject-matter knowledge for mathematics teachers—especially at the secondary level—whether that expertise is reflected in their certification, course taking, or degrees. One policy this finding seems to support is a requirement that mathematics teachers demonstrate high levels of knowledge about their subject, as appropriate to the grade levels they teach. However, given the general shortage of qualified mathematics teachers, demanding more of an educational investment from mathematics teachers may require

appropriate incentives in the form of bonuses, differential pay, tuition reimbursement, and so on.

- **Advanced Degrees.** How should educational leaders and policymakers interpret the largely discouraging findings concerning the value of teachers holding advanced degrees? Rowan et al. (1997) speculate that advanced academic training may substitute for pedagogical training—meaning that those with advanced subject-matter degrees may have completed little or no pedagogical coursework.

Alternatively, graduate-level study may produce teachers who cannot simplify their advanced understanding of the subject matter, at least for students at the elementary and middle school levels. Finding the same trend in the effects of advanced degrees on high school student achievement, however, Monk (1994) notes that degree level and number of content-area courses taken are not highly correlated and suggests that “the simple accumulation of credits with no regard for the subject being taught [does not improve student achievement]” (p. 142). Monk suggests that caution should be exercised in equating advanced degrees with teacher quality; they seem to be poor proxies of the subject-area expertise that they are supposed to reflect.

- **Professional Development.** While professional development that is sustained, aligned with the curriculum, and focused on instruction appears



to positively influence school-level achievement in mathematics and science at both the elementary and high school levels, professional development that focuses on minor changes in teachers' knowledge or practice may not impact student learning, at least as measured by standardized tests. Little evidence indicates that specific teacher practices positively impact student achievement gains—a finding that may be attributable to the insensitivity of standardized tests to subtle differences in teaching practices. Or perhaps, given the current focus on standards and the availability of textbooks and curricular materials appropriate to specific grade levels and subjects, differences in instructional delivery are simply washed out by the uniformity of what is taught. This is not to say that professional development is pointless. Good professional development may help teachers manage student behavior so that there is more time for instruction, show teachers novel ways to teach a subject, or help teachers understand what their students already grasp and what they need to learn next.

- **Experience.** Many of the studies that Goe (2007) analyzed find no significant relationship between teacher experience and student achievement, but they do not focus on traditional public schools. Both Gallagher (2004) and Carr (2006) examine charter schools, and Harbison and Hanushek's (1992) research looks at impoverished schools in rural Brazil. This situation suggests that the evidence *supporting* the relationship between teacher experience and student achievement may be more relevant to current U.S. policy concerns than the evidence that finds little or no relationship.

Hiring teachers with more than five years of experience may not result in improved student achievement, but there are other ways that teachers' experience benefits schools. Thus, experience is one of many factors that should be taken into consideration when hiring teachers and determining appropriate assignments. In particular, schools with many novice teachers may benefit from hiring more experienced teachers who can serve as mentors, particularly in matters of classroom management and discipline, which many new teachers find particularly challenging.

- **Teacher Characteristics.** Except in the subject of mathematics, specific teacher characteristics are poor predictors of student learning gains. For this reason, prior to making hiring decisions, schools should consider prioritizing those teacher characteristics that are the best match for the specific context. For example, some teachers may contribute to overall student achievement gains by virtue of their collegiality, leadership ability, or impact on school culture. Such practices do appear to benefit schools and may play an important, if unseen, role in students' success.





- **Teacher Practices.** The research base suggests that better results are likely to be achieved in the classroom (1) if, at the outset of their lessons, teachers clearly define for students what they are supposed to be learning and what acceptable performance looks like; and (2) when what teachers teach—and, subsequently, teachers, schools, and states test—is aligned with those learning goals and performance criteria.
- **Standards-Based Practices.** The finding by McCaffrey et al. (2001) that teacher practices aligned with NCTM standards benefit high school students' mathematics achievement in courses designed around these reforms, along with the finding by Cohen and Hill (1998) that teacher practices that are consistent with the 1985 *Mathematics Framework* positively influence school-level mathematics achievement, suggest that the alignment between professional standards and teacher practices may matter in terms of student achievement. Thus, policymakers may wish to consider the alignment between standards and best practices when prioritizing teacher professional development for particular positions.
- **Teacher Effectiveness.** Currently, the empirical research base does not support inferences about possible relationships between teacher effectiveness (determined by value-added scores) and observable teacher qualifications, teacher characteristics, or teacher practices. While the sophisticated statistical models that yield value-added scores *can* estimate teachers' supposed contributions to their students' learning, they do not illuminate *what in particular* makes teachers effective. Without this information, educational leaders and policymakers lack concrete evidence with which to inform program and policy initiatives to improve teacher quality.

## TEACHER SALARIES AND PAY DIFFERENTIATION

Teachers usually earn pay increases two ways: (1) they earn another degree, and (2) they continue teaching. Because, with the exception of mathematics, there is little evidence that having another degree matters, and because teacher growth, as measured by contributions to student test scores, levels off after about five years, should salary increases for experience or education be withheld? No! The fact is that experienced, educated teachers are valuable for many reasons beyond their ability to contribute to student achievement gains. To retain them in the profession, districts must pay them salaries that are commensurate with experience and education, just as any employer would reward valued employees in order to ensure their loyalty.

Pay differentiation is a difficult issue, and the findings from this study do not make the discussion any easier. Again, except for mathematics, there is little evidence that teachers with specific qualifications should be paid more. It is outside the scope of this study to present research on supply and demand issues, but suffice it to say that if a district needs teachers for a specific subject and the market for such teachers presents many more opportunities to choose from than there are teachers to fill positions, that district may have to find appealing ways to compensate these teachers. While many bargaining agreements prohibit differential pay, districts may need to employ other incentives—such as providing signing bonuses or housing assistance to desirable teachers. However, little research has been done in this area, and little is known about how much or what types of incentives would have to be provided to alleviate shortages.



## DIRECTIONS FOR FUTURE RESEARCH

Goe's (2007) research review provides a snapshot of the current state of research on teacher quality, with the optimistic goal of helping policymakers and others develop and implement policies and practices that hold the greatest promise for improving student learning. (See Table 2 on page 17 for a synthesis of Goe's findings.) While few strong, clear, and consistent findings emerge from the analysis, many more findings suggest promising directions for future research, such as the following examples:

- **Linked Student-Teacher Data.** Only recently has linked student-teacher data been available to researchers to help them study the relationship between teacher quality and gains in student achievement. When individual students are linked to specific teachers, it is possible to use sophisticated statistical methods, such as hierarchical linear modeling, to examine teacher effects. Currently, only a limited number of linked data sets exist; but as states move toward collecting and maintaining student and teacher information with unique but anonymous identifiers, more revealing research may be possible than has been seen previously.
- **Subject-Matter Knowledge.** More research is needed on the role a teacher's subject-matter knowledge plays in student achievement in science, as well as on the impact that a teacher's subject-area major or minor has on student achievement at the elementary level, in reading, and in English.
- **Content-Based Pedagogical Knowledge.** Because of the demonstrated impact of teachers' content-based pedagogical knowledge on student achievement, future research and policy efforts should focus on identifying the best ways to measure teachers' pedagogical content knowledge.
- **Experience.** Inconsistencies in findings about the relationship between teacher experience and student achievement suggest a need for clarification through continued research.
- **Explaining What They Are Learning.** While providing students with opportunities to explain and discuss projects and assignments is positively associated with middle school achievement in mathematics, differences in how this instructional practice is operationalized and measured in the research prevent us from generalizing the results. More research is needed to determine how students' explanations and discussions contribute to student achievement.
- **The Role of Race.** Having a same-race teacher is associated with improved mathematics and reading achievement for both black and white students, though why this is the case is not well understood. This relationship should be explored more thoroughly, as well as examining how (or if) race matters for other students such as Hispanic, Asian, Native American, and Alaskan Native students.



**Table 2. Selected General Findings From Synthesizing the Teacher Quality Research**

Teacher Quality Framework	Variables Impacting Student Achievement	General Findings
Teacher Qualifications	Academic major/minor	Teachers' undergraduate or graduate major in mathematics marginally improved secondary student achievement (Goldhaber & Brewer, 1996). Teachers' subject-matter expertise, as reflected by academic course taking, positively impacted secondary student achievement in mathematics and science (Monk, 1994). Percentage of teachers with mathematics education majors positively impacted middle school math achievement (Frome et al., 2005; Wenglinsky, 2000).
	Advanced degrees	Master's degrees marginally improved middle school students' mathematics achievement (Betts et al., 2003). Hanushek et al. (2005) found no impact. Master's degrees negatively impacted middle school student achievement (Clotfelter et al., 2006a) and elementary and middle school students' mathematics achievement growth (Rowan et al., 2002). Master's degrees and beyond negatively impacted student achievement in mathematics and science (Monk, 1994).
	Teacher test scores	Teacher scores marginally improved middle school students' mathematics achievement (Cavalluzzo, 2004). Teacher subject-area test scores positively impacted rural Brazilian students' mathematics and Portuguese achievement (Harbison & Hanushek, 1992). Hanushek et al. (2005) found no impact.
	Undergraduate institution	Cavalluzzo (2004) and Clotfelter et al. (2006b) found no impact.
	Preparation programs	Teach for America teachers were similarly as effective as college-prepared teachers in mathematics but not in English (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2005; Decker et al., 2004). TFA teachers who attained full certification were similarly as effective as traditionally prepared, fully certified teachers (Darling-Hammond et al., 2005).
	Mentoring and induction	Percentage of teachers participating in mentoring or induction programs positively impacted middle school mathematics achievement (Frome et al., 2005).
	Professional development	Teacher curriculum workshops and learning about the 1985 <i>Mathematics Framework</i> positively impacted elementary school achievement (Cohen & Hill, 1998). Kannapel and Clements (2005) found that ongoing, job-embedded professional development differentiated high- from low-performing elementary schools. Wenglinsky (2000; 2002) found significant relationships between student mathematics and science achievement and specific types of professional development. Harbison and Hanushek (1992) found no impact.

Teacher Quality Framework	Variables Impacting Student Achievement	General Findings
Teacher Qualifications (continued)	Teaching experience	Experience marginally improved middle school student achievement in mathematics and reading (Cavalluzzo, 2004). First few years of teaching experience improved elementary and middle school students' mathematics achievement (Hanushek et al., 2005). Teaching experience up to two years positively impacted elementary student achievement in mathematics and reading (Rockoff, 2004). Experience contributed to elementary and middle school students' mathematics and reading growth (Rowan et al., 2002). Carr (2006), Harbison and Hanushek (1992), and Gallagher (2004) found no impact.
	Certification (general)	Emergency-credentialed teachers negatively impacted secondary students (Betts et al., 2003). Teacher "highly qualified" status contributed to student achievement in all subject areas (Carr, 2006). Teacher certification impacted student achievement (Darling-Hammond, 2000; Darling-Hammond et al., 2005).
	National Board Certification	National Board Certified Teachers (NBCTs) marginally improved high school students' mathematics achievement (Cavalluzzo, 2004). NBCTs were not reliably more effective than non-NBCTs (Clotfelter et al., 2006a; McColsky et al., 2005) due to substantial within-group variation (Sanders et al., 2005). NBCTs sometimes contributed and sometimes detracted from elementary students' achievement (Vandevoort et al., 2004).
	Subject-area certification	Teachers with a mathematics authorization positively impacted secondary student achievement in mathematics (Betts et al., 2003). In-subject full state certification contributed to high school students' mathematics achievement (Cavalluzzo, 2004). Any type of subject-specific certification in mathematics contributed to students' mathematics scores (Goldhaber & Brewer, 1996).
	Pedagogical content knowledge	Elementary teachers' "mathematical knowledge for teaching" positively impacted their students' achievement (Hill et al., 2005). Teachers' mathematics pedagogy courses contributed to student achievement (Monk, 1994). Observed teacher content knowledge was part of a composite of teacher practices that positively impacted elementary student achievement in reading, mathematics, and language (Schacter & Thum, 2004). Teachers' subject-matter knowledge positively impacted high school students' mathematics achievement (Rowan et al., 1997).



# TEACHER QUALITY AND STUDENT ACHIEVEMENT

Teacher Quality Framework	Variables Impacting Student Achievement	General Findings
Teacher Characteristics	Teacher collaboration	Teacher social capital, or sharing of information, vision, and trust, positively impacted observed instructional quality and school achievement in reading and mathematics (Leana & Pil, 2006). Kannapel & Clements (2005) found that collaborative decision making differentiated high- from low-performing elementary schools. Rowan et al. (1997) found that schools with shared decision making and common planning periods were positively associated with high school students' mathematics achievement.
	Teacher efficacy	Teacher collective efficacy to improve student achievement was positively associated with school achievement (Goddard et al., 2000).
	Teacher expectations	Teachers' high expectations for students were associated with higher middle school mathematics achievement (Frome et al., 2005). Kannapel and Clements (2005) found that high teacher expectations for students differentiated high- from low-performing elementary schools. Specific student outcome expectations marginally impacted high school students' mathematics achievement (Rowan et al., 1997).
	Teacher race	Same-race teachers improved minority students' mathematics achievement (Hanushek, 1971) and black elementary students' mathematics and reading achievement (Dee, 2004b). In an older study, neither teacher race nor gender was associated with differential student achievement in mathematics or science (Ehrenberg, Goldhaber, & Brewer, 1995).
Teacher Practices	Various practices, such as using grouping and making challenging assignments	Frome et al. (2005) used a self-constructed survey of various practices considered effective. This approach points to the problem created by nonstandard definition and measurement of teacher practices: lack of ability to compare and combine findings across studies.
	Various practices, such as using manipulatives, assigning projects, facilitating class discussion, creating academically rigorous lessons, providing clear feedback, and using grouping	Frome et al. (2005) found that practices such as group work, reporting on mathematics projects, explaining work, and using manipulatives positively impacted middle school students' mathematics achievement. Kannapel and Clements (2005) also found that frequent assessments and feedback, differentiation, and using student achievement data for staff development distinguished high- from low-performing elementary schools. Marcoulides et al. (2005) found working on projects, on problems related to their everyday lives, and discussing homework were associated with middle school student achievement in mathematics and science. Matsumura et al. (2006) found that quality of discussions, academic rigor of lessons, and clarity of expectations positively impacted middle school students' reading and mathematics achievement. Schacter and Thum (2004) also found that clarity of objectives; lesson structure and pacing; and effective questioning, feedback, and grouping positively impacted elementary student reading and mathematics achievement. Wenglinsky (2002) also found that frequent assessment positively impacted student achievement in mathematics and science.

Teacher Quality Framework	Variables Impacting Student Achievement	General Findings
Teacher Practices (continued)	Whole-class instruction	It marginally improved elementary and middle school students' mathematics and reading growth (Rowan et al., 2002).
	Alignment of instructional content with assessments	It marginally improved elementary and middle school students' reading growth and middle school students' mathematics growth (Rowan et al., 2002). Such alignment was one element of a set of practices that positively impacted Greek middle school students' mathematics and science achievement (Kyriakides, 2005; Marcoulides et al., 2005). Cohen and Hill's (1998) finding also supports this claim, as the CLAS achievement measures were designed to reflect the 1985 <i>Mathematics Framework</i> , and Kannapel and Clements (2005) found that this was one of the school-level practices that differentiated high- from low-performing elementary schools. McCaffrey et al. (2001) found that use of NCTM reform instructional practices positively impacted student achievement in NCTM reform-oriented courses.
	Cognitive engagement or challenge	This was part of a set of practices that marginally contributed to elementary student achievement in mathematics and reading (Kimball et al., 2004) and middle school achievement in mathematics and reading (Frome et al., 2005; Matsumura et al., 2006). It was part of a composite of teacher practices that positively impacted elementary student achievement in reading, mathematics, and language (Schacter & Thum, 2004; Wenglinsky, 2002).
	Interactive practices	These practices positively impacted elementary student achievement in reading and mathematics (Smith et al., 2001). Wenglinsky (2000; 2002) found hands-on teaching practices were significantly related to higher mathematics and science achievement.
	Quality of assignments	Clarity and overall quality marginally contributed to middle and high school students' reading and language achievement (Matsumura et al., 2002; Matsumura et al., 2006). Intellectually demanding assignments positively impacted elementary and middle school students' reading and mathematics achievement (Newmann et al., 2001).
	Practices aligned with <i>Framework for Teaching</i>	This was not significantly related to elementary and middle school students' reading or mathematics achievement (Borman & Kimball, 2005). It marginally impacted elementary students' literacy test scores (Gallagher, 2004). It marginally contributed to elementary student achievement in mathematics and reading (Kimball et al., 2004). It positively impacted elementary and middle school students' achievement in reading, mathematics, science, and social studies (Holtzapple, 2003; Milanowski, 2004). It positively impacted student achievement in reading and mathematics, especially at the two schools that conducted the evaluations carefully with multiple evaluators (Heneman et al., 2006).

Teacher Quality Framework	Variables Impacting Student Achievement	General Findings
Teacher Practices (continued)	Practices aligned with NCTM Standards	This positively impacted high school students' mathematics achievement but <i>only in courses designed around NCTM reforms</i> (McCaffrey et al., 2001).
	Practices aligned with 1985 <i>Mathematics Framework</i>	This positively impacted elementary school achievement in mathematics (Cohen & Hill, 1998).
	Principal assessments of teacher practice	Principal assessments are strongly related to better-than-predicted elementary student achievement in mathematics and reading (Jacob & Lefgren, 2005).
Teacher Effectiveness	<p>Overall, studies have consistently indicated that the majority of variation in teachers' effectiveness at raising student achievement scores is due to "unobserved" variables.</p> <p>These studies have also suggested that teacher effectiveness may not be stable, as indicated by large, overlapping confidence intervals between teachers of varying levels of effectiveness.</p> <p>The current literature base does not support inferences about relationships between teacher effectiveness as determined by value-added scores and observable teacher qualifications, characteristics, or practices.</p>	

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# ABOUT THE NATIONAL COMPREHENSIVE CENTER FOR TEACHER QUALITY

The National Comprehensive Center for Teacher Quality was launched on October 2, 2005, after Learning Point Associates and its partners—Education Commission of the States, ETS, and Vanderbilt University—entered into a five-year cooperative agreement with the U.S. Department of Education to operate the teacher quality content center.

It is a part of the U.S. Department of Education's Comprehensive Centers program, which includes 16 regional comprehensive centers that provide technical assistance to states within a specified boundary and five national content centers that provide expert assistance to benefit states and districts nationwide on key issues related to the goals of the No Child Left Behind Act.

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