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Abstract

One stipulation of President Bush's No Child Left Behind (NCLB) Act is that every classroom in America will be instructed by a highly qualified teacher. To date, however, no one has satisfactorily captured what it means to be highly qualified. Common sense tells us that America's best teachers are smart about the content areas they teach and how they teach students, but what other factors have helped to define highly qualified teachers within NCLB? The purpose of this inquiry is to investigate how the definition of a highly qualified teacher written into NCLB captures what researchers know about effective or highly qualified teachers.

Introduction

Within No Child Left Behind (NCLB) teacher quality is acknowledged as one of the key components to reforming America's educational system. The President and federal educational policymakers have posited that in order for students to meet the higher standards required within NCLB, highly qualified teachers must be instructing in all of America's classrooms by the 2005-2006 school year.

NCLB defines a highly qualified teacher as a teacher who holds a bachelor's degree or higher from a 4-year institution, has the content knowledge required to teach core academic subjects, and, usually based on a test of their content knowledge, a state teaching license. Preparation in effective teaching methods, classroom management, lesson and assessment development, and the like have been surpassed in importance. Effective teaching has been redefined. Now more than ever, high quality teachers are vital only to the extent that they improve student academic achievement (Cavaluzzo, 2004; Goldhaber, Perry & Anthony, 2003; Vandevoort, Amrein-Beardsley, & Berliner, 2004).

Defining a Highly Qualified Teacher

The purpose of this paper is to evaluate the extent to which criteria traditionally associated with teachers, including the criteria written into NCLB, have been empirically linked to improving student academic achievement. These criteria include teacher experience, teacher content knowledge, teacher certification as a proxy for pedagogical knowledge (or knowledge about how to teach effectively), teacher salary, and the teacher's attainment of a master's degree.

The most questionable issue with the following review of the research is whether teacher quality can be measured using student test scores (see, for example, Corcoran, Evans & Schwab, 2002; Ferguson & Ladd, 1996; Hanushek, Kain & Rivkin, 1999; Lankford, Loeb, & Wyckoff, 2002). Test scores, in addition to their imperfections in measuring students' cognitive and higher-order thinking skills, cannot capture all that it means to be an effective teacher. Test scores cannot capture things like whether a teacher is caring, motivating, engaging, demanding, or has high expectations.

An effective teacher, while including a propensity to increase academic achievement, is a dynamic concept to define. But we must use test scores to evaluate the quantifiable aspects of teacher quality as increases in academic achievement are arguably part of the teacher quality dynamic. In addition, using test scores to assess teacher quality follows the federal government's demands written into NCLB.

The following is a review of the key research linking traditional indicators of teacher quality to student achievement.

Highly Qualified Teachers Improving Student Achievement

It is commonsensical to believe that certain teacher characteristics positively affect student achievement. But since the release of the Coleman Report (1969), the extent to which teachers affect actual gains in student achievement has made policymakers and researchers question this common sense, and also shed light on what we know about the relationship between teacher quality and student achievement.

There is a significant amount of evidence to support the notion that the quality of the teacher teaching in a classroom is the single, most influential determinant of increased student academic achievement. "More can be done to improve education by improving the effectiveness of teachers than by any other single factor" (Wright, Horn & Sanders, 1997, p. 63). Teachers do make a difference. And on this, all researchers agree.

Specifically, substantial research indicates that increases in academic achievement are supported by high quality teachers. High quality teachers are defined as having more than a few years of experience in teaching; a strong grasp of the content knowledge needed to teach core academic subjects; traditional teaching certificates which, as will be discussed later, are related to pedagogical skills; higher salaries; and a bachelor's if not a master's or higher degree.

Since NCLB limits the definition of teacher quality to 3 aspects of teaching: a bachelor's degree, content knowledge, and based on an assessment of content knowledge and a background check, a traditional or alternative teaching certificate, it is important to examine whether in fact the current definition of a highly qualified teacher captures all that it means to be a highly qualified teacher. That is, what does it mean to be highly qualified? How are subcategories of teacher quality linked to student achievement? And does the federal government's definition of a highly qualified teacher capture all of the

teacher-related variables researchers suggest contribute to increased academic achievement? These questions are addressed next.

Teacher Characteristics Related to Improving Student Achievement

In order of what seems to be the most to least significant teacher factors contributing to increases in student achievement, ranked by effect size, the following is a review of the research linking components of teacher quality to increases in student achievement. Again, by no means can everything about being a qualified teacher be captured in the traditional, quantitative studies reviewed below. Nonetheless, the following may add to the ways policymakers, researchers, and practitioners think about the teaching quality - student achievement link.

Experience

The effects of teacher experience on student achievement are most frequently studied for two reasons. Teacher experience is easily accessible given the fact that years of experience are used as a key determinant of teachers' salaries. And teacher experience makes for a continuous variable valued in analyses of student achievement gains.

What we know from the research is that students learn more from teachers with more relative experience teaching in the classroom. According to a study conducted by Ferguson (1991), teacher experience is significantly related to gains in students' math and reading achievement. The more experience a teacher has, the higher the students' math and reading scores. Teacher experience accounts for about 10% of the variation in student test scores.

After a primary school teacher has five years of experience, however, the effect that teacher experience has on academic achievement plateaus. Additional years of experience do not add to teacher effectiveness in the primary years of schooling (see, also, Ferguson & Ladd, 1996; Goldhaber, 2002). Conversely, after a high school teacher has five years of experience, the effect teacher experience has on academic achievement increases, and then increases significantly again after the high school teacher has nine years of experience.

Nye, Konstantopoulos, & Hedges (2004) found the difference in gains posted by students in classrooms with "not so experienced teachers" and "experienced teachers" was over one-third of a standard deviation (0.35) in reading and almost one-half of a standard deviation (0.48) in math. These differences were more dramatic in schools with less affluent students.

Grissmer, Flanagan, Kawata & Williamson (2000) found that teachers with more relative experience produced greater gains in academic achievement than teachers with master's degrees.

Greenwald, Hedges, & Laine (1996) asserted that if resources were earmarked to select teachers based on their levels of experience, this would produce results in increased academic achievement of nearly one-sixth of a standard deviation. Students learn more from teachers with more relative experience teaching in the classroom. Teacher experience matters.

Content Knowledge

A teacher's content knowledge becomes more crucial the higher the grade level the teacher teaches. As content material becomes more complicated, so does the need for a teacher with a stronger grasp of the content material to be taught. Content knowledge is important in the elementary grade levels, but a more general sense of all school subjects is needed given the self-contained structure of the typical K-5/6 classroom. Content knowledge is of greater importance in the middle/junior high school and high school levels given the stronger content skills required to teach more difficult concepts effectively.

What we know from the research is that students learn more from teachers with stronger academic skills. Summers & Wolfe (1977) found that teachers who received their bachelor's degrees from more esteemed colleges or universities promoted greater gains in their students' achievement. In addition, students who benefited most by teachers who attended more reputable colleges were students from less affluent backgrounds.

Goldhaber (2002) found that teachers' knowledge of the subject area they teach as measured by college majors and minors, the courses taken in the subject area, and subject certification area, were significantly related to increases in student achievement, particularly in math and science. Having advanced degrees outside of subject area(s), however, was not significantly related to such gains.

Cavaluzzo (2004) found that high school math students who were taught by teachers whose primary job was not math instruction made the smallest gains of all comparable students. Having an in-subject-area teacher had the greatest effect on math achievement gains.

The Educational Testing Service found that teachers who major or minor in the subject area they teach are more likely to teach higher-order thinking skills and use authentic learning activities creating student gains in achievement (as cited in National Education Goals Panel, 2001).

Ferguson & Ladd (1996) found that the academic gains posted by students were strongly and positively related to the academic records of teachers on teacher certification tests. An increase of one standard deviation in teacher test scores was significantly related to an increase of about one-fourth of a standard deviation in student test scores.

Hanushek (1986), however, cautioned policymakers not to read too much into the certification tests used by most state departments of education to certify teachers. These

tests do not unveil enough adequate information about teacher quality (see, also, Laczko-Kerr & Berliner, 2002). A better measure of a teacher's content knowledge is likely to come from the teaching candidate's major or minor in college, his/her SAT or ACT scores, and the selectivity of the college teacher candidates attended (Goldhaber, 2002).

Not only does teacher experience make for an effective teacher, but being an effective teacher also depends on a teacher's content knowledge.

Certification Status

Certification is used across all states to ensure that teachers have met at least a minimum level of teaching- or content-based standards to be a teacher. Most states require that teachers are graduates of schools of teacher education, but they do not require these colleges to be nationally accredited (Darling-Hammond, 1995). Most states also require teachers to pass state certification exams, given the grade levels or subject areas they desire to teach.

Because of America's teacher shortage, what states have also resorted to is recruiting nontraditional candidates and offering them alternative, temporary, or emergency certificates to fill empty classrooms, usually in America's toughest-to-teach schools. Nontraditionally certified teachers are being placed to teach in classrooms where no one else can, or will, fill the job (AEL, 2003; Berry, 2004; Krei, 1998; Kozol, 2000; Lankford, Loeb, & Wyckoff, 2002; Mashburg, 2000). Under NCLB, teachers with temporary and emergency certificates do not meet the federal definition of a highly qualified teacher, but teachers with alternative certificates, fit within the federal government's definition.

Alternative teaching certificates are awarded after candidates participate in fast-track teacher preparation programs. Granting alternative teaching certificates, it is posited, will entice people with the content knowledge deemed necessary to be an effective teacher to enter the teaching profession. They will earn alternative certifications, usually after a background criminal check and 3-8 weeks of pedagogical training – training in learning theory, teaching methods, classroom management, curriculum, lesson planning, and other training activities traditional teacher candidates learn in schools of education (The race, 2001; Zernike, 2000).

In addition, because examining the relationship between a teacher's pedagogical knowledge and student performance is nearly impossible in these types of studies, conclusions must drawn about the relationship between teacher training and student achievement from the research on teacher certification. The only difference between the two certificates included in the federal government's definition of a highly qualified teacher – traditional and alternative certificates – is teacher training. Thus, if any differences are found between the relationships of these certificates and increased student learning, the differences are likely due to the pedagogical training teachers with traditional certificates receive. Teachers with nontraditional teaching certificates do not have such experiences, and if they do they are short in duration lasting no more than 8-

weeks. What we know from the research on this topic, albeit limited, is that the type of certificate a teacher holds matters when it comes to the relationship between teacher quality and student achievement.

Berry (2004) asserts that, although the use of nontraditional teaching certificates has diversified the teaching force and has helped to fill teaching positions in America's most difficult schools, the teacher recruits are not the "best and brightest" candidates as expected.

Cavaluzzo (2004) found when examining the progress grade-9 to grade-10 students made in math achievement, that students with teachers who were not certified by the state made the smallest gains in achievement after being taught by under-certified teachers. "Having an in-subject-area teacher…and regular state certification in high school mathematics had the greatest effects" on high school math achievement gains (p. 3).

Laczko-Kerr & Berliner (2002) analyzed the differences between gains made by students in urban schools with traditionally certified, alternatively certified (Teach for America), and emergency certified primary school teachers, all of whom took and passed their state certification exam. They found students of traditionally certified teachers outperformed students of teachers with emergency certified teachers, and students in classrooms with Teach for America teachers (an alternative teaching program) did no better in improving student achievement than teachers with emergency certificates. Students with teachers with traditional teaching certificates made 2 months greater gains in one school year than students with an alternative or emergency certified teacher across reading, math, and language arts.

Neither teachers with alternative or emergency teaching certificates produced academic gains comparable to teachers with traditional certificates. This is a serious issue considering the federal definition of a highly qualified teacher as having either an alternative or traditional teaching certificate. This is also practically significant in that students in schools with teachers with nontraditional teaching certificates are most likely to encounter more teachers with nontraditional teaching certificates as they progress through school, snowballing the effects of having poor quality or under-certified teachers over time.

Not only do teacher experience and a strong grasp of content knowledge make for an effective teacher, but being an effective teacher also depends on a teacher's knowledge of how to teach. If the federal government continues to be more considerate of the quantity over the quality of the teachers needed to fill America's schools, this will surely offset the government's simultaneous pursuit of reaching higher standards. Teacher certification matters when producing student gains in achievement, and teachers with traditional certificates are best at producing such outcomes.

Salary

It is difficult to refute that salaries do not make a difference when teachers are looking for teaching positions or are looking to move to new schools in which they might teach. College-graduates who become teachers are well-aware that becoming a teacher will affect their earnings for the life of their teaching careers. Unless teachers decide to make career moves somewhere within their careers, they must concede to the fact that by no means will they ever be wealthy.

Fortunately, most teachers believe there is something more to teaching than the monies they will earn. Unfortunately, however, the salary structures of teachers across the country have diverted many, possibly very qualified candidates from choosing teaching as a profession. This has caused an exponential decline in the quality of the candidates entering the teaching field (Cavaluzzo, 2004; Finn, 2003; Kozol, 2000).

Absolute and relative wages of teachers have dropped substantially over the past 4 decades. The decline in teacher salaries is more dramatic given the increase in teacher experience and the amount of teachers earning graduate degrees (Hanushek, 1986).

Furthermore, teachers in schools with the highest rates of students in poverty earn approximately 15%-25% less, depending on teacher experience, than their peers in suburban or other schools with lower proportions of students in poverty. This is a cause of concern considering that higher salaries in schools with easy-to-teach students and lower salaries in schools with hard-to-teach students likely exacerbate the low student achievement levels inevitably found in the latter types of schools (Study of education resources, 2000; see, also, Hanushek, Kain & Rivkin, 1999; Lankford, Loeb, & Wyckoff, 2002).

Research evidences that there is a significant link between salaries and student achievement. In the work of Hanushek, Kain & Rivkin (1999) they conclude that salaries have a significant positive effect on math and reading achievement controlling for student fixed effects. In addition, a salary increase causes "existing teachers to improve their performance *following* a salary increase" (p. 41). "Taken literally, this implies that salaries raise achievement primarily by increasing the work effort of experienced teachers" (p. 44).

Research also evidences that salaries, although important, are not the only reasons teachers leave schools for more desirable positions. Hanushek, Kain & Rivkin (1999) investigated how shifts in teacher salary affect a school's teaching force. They found teacher salaries had a significant, yet modest impact on teacher mobility. In other words, salaries do matter but were not the only determinants to why teachers change teaching jobs. What mattered most when teachers made decisions to move schools were the income levels, racial composition, and achievement levels of the students in the schools to which teachers moved. Teachers moved to schools where more desirable students were housed (see, also, Lankford, Loeb, & Wyckoff, 2002).

They also found that "teachers in schools in the top quartile of real salaries are 3 percentage points less likely to exit the public schools and almost 1 percentage point less likely to switch districts than teachers in the bottom quartile schools. Teachers in the top salary quartile are also somewhat less likely to switch schools within districts" (p. 23).

Nonetheless, Hanushek, Kain & Rivkin (1999) conclude that salary raises work in two ways. As mentioned, they work, modestly, to draw higher quality teachers into schools or districts, and they work, considerably, in increasing student achievement scores and by encouraging current teachers to improve their own performance as teachers.

What we know from the research is that salaries make a difference when teachers choose teaching and when current teachers move to teach elsewhere. Salaries also matter inadvertently in that a positive relationship between salary and student achievement exists. Salaries matter most, however, when teachers who experience increases in salary exert more effort towards teaching.

Although no current federal legislation exists to increase teacher salaries, this would be a desirable outcome given what the research says. The positive effects an increase in teacher salaries might have towards meeting the higher standard provisions written into NCLB is arguably substantial.

Master's Degree

In NCLB a highly qualified teacher is defined as having at least a bachelor's degree. Because all teachers across the country have at least a bachelor's degree, it is impossible to assess the effects that teachers with and without bachelor's degrees might have on student achievement absent any type of a control group. Therefore, the only way in which we can test whether a teacher's degree matters in producing greater achievement gains is by examining the effects teachers with and without master's degrees or higher might have on student achievement.

The relationship between whether a teacher has earned a master's degree or higher and student achievement is frequently examined because the data are easily accessible - a teacher's degree is used as part of school districts' salary calculations. What we know from the research is that the relationship between whether a teacher has earned a master's degree and student achievement is of questionable significance and is probably the weakest predictor of student achievement gains examined within this review.

Goldhaber (2002) found that having advanced degrees outside of the subject area(s) in which a teacher teaches is not significantly related to gains in student achievement.

Ferguson (1991) discovered that whether a teacher holds a master's degree is least related to gains in students' math and reading achievement, albeit the relationships are significant. Ferguson & Ladd (1996) verified Ferguson's (1991) earlier findings.

Hanushek (1986) found that degree level has negligible effects on student achievement. Hanushek, Kain & Rivkin (1998) seconded Hanushek's (1986) finding adding that in the policy arena merit pay should not be awarded to teachers with master's degrees in general education, counseling, or the like given such degrees did not directly impact gains in student test scores. The only master's degrees which made a difference in student achievement were master's degrees in the content areas taught.

Grissmer, Flanagan, Kawata & Williamson (2000) also found that teachers with master's degrees did not produce achievement gains greater than teachers without master's degrees. Acquiring master's degrees, particularly if they were not related to the content area(s) teachers taught, did not raise student achievement levels.

The relationship between teacher degree and student achievement is weak and of questionable significance. The work of Hanushek, Kain & Rivkin (1999) evidence this most clearly and add to the thinking on this issue suggesting that teachers should refocus their efforts from getting advanced degrees in general education to more content specific master's degrees. This may also be more desirable given master's degrees in content-specific fields will probably assist teachers in meeting the higher standards at the crux of NCLB.

In short, advanced degrees do seem to matter if the advanced degrees are specific to a teacher's content or specialty area. This makes sense, particularly given the prior discussion of the importance of a teacher's content knowledge in raising student achievement.

Discussion

There is sufficient evidence to conclude that highly qualified teachers are probably the single-most important school-level factor related to increases in student achievement. Thankfully, the federal government agrees with researchers on this end - teacher quality matters. How the federal government has defined a highly qualified teacher, however, is somewhat limited and definitely does not capture all that it means to be an effective teacher.

Beyond the scope of their definition is probably the most significant factor of the effectiveness of a teacher: teacher experience. A highly qualified teacher is not defined as one with experience, although experience probably matters most when looking at the relationship between teacher quality and student achievement gains.

This is not a major shortcoming of NCLB, however, given the fact that integrating teacher experience into the teacher quality provisions of NCLB would be highly arbitrary and unfair. New teachers without experience can still be very effective teachers, and no

policymaker in his/her right mind would exclude tenure-track teachers from the highly qualified definitions based on a mere lack of experience.

In agreement with the federal government's definition of a highly qualified teacher, teachers with strong content knowledge promote gains in academic achievement, although how content knowledge should be measured is still questionable. Although most states rely on teacher certification tests to assess a teacher candidate's subject knowledge, for reasons beyond the scope of this paper (although briefly mentioned) it is probably more valid to use a teacher candidate's college major(s) and minor(s) to determine his/her subject expertise. Other possibilities may include the reputation of the college/university the candidate attended or the candidate's college entrance exam scores.

In partial agreement with the federal government's definition of a highly qualified teacher, teacher certification matters. Teachers with traditional certificates positively affect student achievement, but teachers with alternative certificates should not be included in the federal government's definition of a highly qualified teacher. Teachers with nontraditional or alternative certifications have nowhere near the same or similar positive effects teachers with traditional certificates have on student achievement. Because teachers with alternative certifications are included within the federal government's "highly qualified" definition, this as the first major shortcoming of the teacher quality provisions written into NCLB.

More importantly, if it makes sense to use teaching certificates as a proxy for teachers who have (traditionally certified teachers) and have not (alternatively certified teachers) had training in pedagogy, or how to teach, the research findings included in this review are all the more noteworthy. Using certificates as such a proxy tells us that teachers who have training in pedagogy outperform teachers without such training – teachers who might have been graduated from top-tier colleges and universities with core subject knowledge. Teaching teachers *what* to teach AND *how* to teach makes a difference.

Beyond the scope of the focus of NCLB is a teacher's salary. Increasing teacher salaries across the country to ensure every classroom is lead by a highly qualified teacher would be extremely costly. This, perhaps, is the main reason that no mention is made of the link between teacher quality and teacher salary. In short, salaries matter when it comes to increasing teacher quality. Salaries work, modestly, to draw higher quality teachers into schools or districts, and they work, considerably, in increasing student achievement scores and by encouraging current teachers to improve their own performance in the classroom. Yet no mention, not surprisingly, is made towards increasing teacher salaries.

In partial agreement with the federal government's proposition, the degree a teacher earns matters, albeit it matters the least of all of the teacher quality variables mentioned in this review. In NCLB a highly qualified teacher is defined as having at least a bachelor's degree. Because teachers across the country have at least a bachelor's degree, it is impossible to assess the effects that teachers with and without bachelor's

degrees might have on student achievement. Therefore, the only way in which we can test whether a teacher's degree matters in producing greater achievement gains is by examining the effects teachers with and without master's or higher degrees might have on student achievement. Advanced degrees do seem to increase student achievement, particularly if the advanced degrees are specific to a teacher's content or specialty area. Advanced degrees do not seem to increase student achievement, however, if the degrees are in more general education areas (e.g. administration or counseling).

Policy Implications

The degree to which teacher quality can make a difference in improving student achievement depends on the context in which a teacher teaches. NCLB requires that states outline plans to ensure that poor and minority children are not being taught by inexperienced, unknowledgeable, under-certified, substitute, or out-of-field teachers. Unfortunately, when examining the schools where teacher quality matters most - the schools in which poor and minority children are educated - the state of teacher quality is no better than grim.

Teachers who are often younger and less experienced do end up teaching in these schools, until they can get enough experience to transfer out into schools with less difficult-to-teach students. Students from economically disadvantaged backgrounds often have teachers who have neither a major OR a minor in the subject areas they teach. Teachers with emergency and alternative teaching certificates are more often found in these schools, and the proportion of under-certified teachers in these schools is growing, in some states, exponentially. Teachers who teach in schools with higher relative percentages of students from racial minority and economically disadvantaged backgrounds are less likely to hold master's degrees than their teacher peers who teach in more affluent schools. Although some of the best and most hard-working teachers teach in the inner-cities, they teach with some of the most grossly under-qualified teachers in the country.

Ironically, as teacher effectiveness increases so does the academic achievement of students in inner-city schools. These students are the first to benefit from being taught by a highly qualified teacher and benefit more than any other subpopulation of students. The fact of the matter is that teacher quality matters most for the students who need the most, particularly in the elementary years.

It only makes sense to focus on educational policies which will ensure that every student, particularly in America's neediest school, is taught by a highly qualified teacher. Students in inner-city schools would be the first to benefit if concerted federal or state policies were devised to ensure that teachers in these schools were highly qualified – not under-qualified, not under-certified, not under-trained, not substitutes, and not ignorant about the subject(s) they teach in schools.

Policies such as these might provide highly qualified teachers with the incentives needed to teach in tough-to-teach schools for a certain number of years. These teachers

might simply be provided with incentives to move within the districts in which they currently teach to schools which would benefit from their expertise the most. Within-district transfers would be feasible given teachers willing to transfer would not undergo a pay decrease or loss of benefits.

Policies such as these might help to identify highly qualified teachers who already teach in tough-to-teach schools and provide them with the incentives to stay in their schools for a certain number of years. These teachers could share their expertise with other, less-qualified teachers in professional development activities, training activities, structured coaching, mentoring relationships, and the like adding to the professional capital of all teachers at these schools.

Policies such as these might provide incentives to highly qualified teachers to remain in teaching. If an incentive structure was built into particular policies to match what these teachers might realize by moving out of teaching, they might reconsider leaving teaching as a profession. Although in a more administrative role they would surely have a positive impact in schools, they would not have the direct positive impact on student learning that is most desired. In particular, policies which might entice high quality teachers who currently teach in poor and urban schools to remain in teaching would undoubtedly help to improve the student achievement levels of students in these schools.

Policies such as these would arguably contribute to solving the achievement crisis in America's inner-city schools. The most important thing our nation can do to improve student achievement is to improve the quality of teachers teaching in America's least fortunate schools. Specifically, the most important thing our nation can do to improve student achievement is to focus on the recruitment and retention of experienced, regularly certified teachers who are experts in what they teach AND are knowledgeable about how they teach it.

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