Running Head: National Board Certified Teachers and Capacity

Increasing Capacity to Improve Instruction: Are National Board Certified Teachers the Answer?

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Introduction

The attraction and retention of high quality teachers are believed to be the most important policy alternatives by which schools can improve student achievement. Indeed, a growing number of research studies have identified the teacher as the single most important school-related input to improve student achievement (Cawelti, 1999; Jordan, Mendro, & Weerasinghe, 1997; Kaplan & Owings, 2002; Sanders & Rivers, 1996; Wright, Horn, & Sanders 1997; Darling-Hammond, 1997). While agreement exists that specific teachers have a strong, positive impact on student achievement, there is less agreement about effects of specific teacher attributes (Loeb, 2001). Given state and federal mandates to increase school accountability, the proper allocation of resources to maximize student achievement is of paramount interest to educational practitioners. The purpose of this study is to extend the knowledge base about policy-relevant variables for teacher quality and their relationship to student achievement. Policy-relevant variables are those attributes of teaching quality that are measurable and can be advanced by policies to attract and retain high quality teachers in the nation's classrooms. The research described in this article examines effects of teacher certification by the National Board for Professional Teaching Standards (NBPTS). Current research on the effectiveness of National Board Certified Teacher is decidedly mixed although more current research is beginning to show positive effects. One questions whether or not there are *enough* teachers holding national board certification and if the small percentage of teachers holding this certification is not a reason that their effects have not been more pronounced. As such, this study does not ask *if* National Board Certified Teachers add to student achievement, but rather *when* National Board Certified Teachers begin to impact student

achievement. The study considers the prevalence of National Board Certified Teachers in schools in an attempt to draw preliminary conclusions as to the increased capacity to deliver instruction to assist schools to reach proficiency targets.

Current literature on teacher quality can be grouped in three categories: preservice qualities of teachers, teacher practice, and teacher impact on student achievement. The predominant methodology used in these studies is the education production function (King Rice, 2003). These studies have included measurable variables for teacher quality such as teacher certification, performance on certification exams, years of experience, content knowledge (Rebell & Wardenski, 2004) and student-teacher ratio (Krueger, 1999; Rivkin, Hanushek, & Kain, 2005). The least studied measure of teacher quality is teacher practice (Smith, Desimone, & Ueno, 2005). What is needed is an understanding of specific teacher and teaching characteristics associated with student learning that during the course of instruction influences achievement levels of students (Odden, Borman, & Fermanich, 2004). National Board certification for teachers has potential as a measurable variable that could serve both as an input (the number of teachers with this certification) and a process (teaching practice) variable.

Theoretical Framework

Teacher quality is the ability to interact with students and advance what students know and are able to do. The value added to learning by teachers depends on what they know, what they do, and how they interact within the context of their work. As defined for this paper, high quality teaching practice means effective application of subject content and pedagogical knowledge and skills consistent with student needs and research based practices that advance student achievement within a specific classroom and school

context. The variable National Board Certified Teachers is used as a proxy for teacher practice.

Review of Related Literature on Teacher Quality

The No Child Left Behind Act of 2001 and the Teaching Commission report (2004) increased accountability for student performance and reinforced the effort to place the best teachers possible in all classrooms. The recent focus on recruiting and retaining high quality teachers stemmed, at least in part, from a number of research studies that reported the teacher as the single most important school effect on student learning (Cawelti, 1999; Johnston, 1999; Jordan, Mendro, & Weerasinghe, 1997; Sanders & Rivers, 1996; Wright, Horn, & Sanders, 1997). The quality of teaching matters (Rivkin, Hanushek, & Kain, 2005; Sanders & Rivers, 1996; Stronge & Tucker, 2000). Students taught by good teachers progress academically at higher rates than do students in classrooms with poor teachers (Sanders, 2000; Sanders & Horn, 1998; Sanders, Wright, & Ross, 1999; Topping & Sanders, 2000). Furthermore, teacher effects on student learning are additive and cumulative over grade levels (Sanders, 2000).

The distribution of high quality teachers across schools and districts varies. Teachers with less experience, education, and lower test performance are most likely to work in high minority, high poverty, and low-performing schools (Knoeppel, 2007; Wyckoff, 2003). Additionally, teacher quality has a greater impact on poor students than on high income students (Coleman, 1990; Goldhaber & Anthony, 2004). Therefore, identification of teacher quality and quality teaching practice is important not only for teacher recruitment but also to assure equitable distribution of excellent teachers for at-risk children.

The least studied measure of teacher quality is teacher practice. Teaching practice is rarely examined as part of teacher quality research (Smith, Desimone, & Ueno, 2005). "A critical part of determining the appropriateness of different observable indicators of teacher quality is examining the relationship of the indicators with different types of instruction to allow determination of the extent to which the indicators are proxies for 'better' instruction" (p. 76). Rather, teacher quality is most often defined by presage variables when investigating effects on student achievement (Rowan, Correnti, & Miller, 2002) and has been examined by the use of production function research (King Rice, 2003). The literature base includes extensive evidence related to variables representing teacher characteristics that are measurable and important to teacher quality, including teaching experience (Archibald, 2006; Rockoff, 2004; Rowan, Correnti & Miller, 2002; Darling Hammond, 1999; Hanushek, Kain & Rivkin, 1998; Hanushek, 1997; Ferguson & Ladd, 1996; Greenwald, Hedges, & Laine 1996; Haunshek, 1992; Murnane, 1983; Murnanae & Phillips, 1981), teacher preparation programs and degrees (Goldhaber & Anthony, 2004; Wyckoff, 2003; Goldhaber & Brewer, 1997), and teacher coursework (Laczko-Kerr & Berliner, 2002; Adams & Krockover, 1997; Goldhaber & Brewer, 1997; Monk & King, 1994; Ferguson & Womack, 1993; Hawk, Coble & Swanson, 1985). While results of these studies are decidedly mixed, there appears to be support for the conclusion that teaching experience appears to have an effect on student learning, but that these effects are found after the first few years of teaching. Experienced teachers may not continue to grow unless they are situated in schools that emphasize continuous learning and collaboration (Rosenholz, 1986). Teacher advanced degrees may matter, but positive benefits are found at specific grade levels (eighth through tenth) and in specific

content areas (science and math). Course content knowledge seems to matter at the high school level, however after a level of teacher competency has been attained, courses in pedagogical training may be more important to student success.

Some studies have employed the variable student-teacher ratio to study how class size affects education quality. These studies may allow one to infer teacher practice because teachers have reported report that the classroom environment is better, students receive more attention and participate more, and the smaller classed enable teachers to develop better relationships with their students. It is acknowledged that findings from these studies may be limited because the variable student-teacher ratio, however. The studies showed significant effects of class size for both mathematics and reading achievement gains, although the recorded gains diminished over time (Rivkin, Hanushek, & Kain, 2005; Nye, Hedges & Konstantopoulos, 2000; Finn & Achilles, 1999; "Reducing Class Size," 1999). Strong evidence exists for the benefits of small class size for kindergarten and through grades 1 to 3 (Word, Johnson, Bain, et al., 1990). Further, significant effects of class-size reduction appear when the number of students is from 15 to 20 students and continue increasing as class size approaches a one-to-one tutorial. Although not a magic number, research makes it fairly clear that class size must get below 20 to make a difference. The greatest benefit of small class size appears with groups of students who are disadvantaged (Biddle & Berliner, n.d.).

Value-added research is one approach that has been used to measure school effects on student learning (e.g. Sanders & Rivers, 1996). Loeb (2001) notes that this method defines teacher quality in a way that is of most interest to the public: student achievement gains. Potential problems with this method are nonrandom teacher

assignment that may confound results (Loeb, 2001) and the complexity of the research design. Nonrandom teacher assignment may cause the impact of the teacher to be underestimated because some teachers may be more likely to teach students who have difficulty learning. A report by RAND researchers extensively reviewed the value-added model (Southeast Center for Teaching Quality, 2004) and cautioned against its use to rate individual teachers or as the sole basis for high-stakes school decisions. They also caution that current studies using this model do not always account for bias from school context, effect of previous teachers, or missing data.

Teacher process as Teacher Quality

While teacher preservice and years of experience are linked to student achievement in much of the previous research, teacher process is the least studied method. If teacher quality is to be viewed as a key component of student learning and research has found that teacher characteristics such as years of experience and level of education are not primary influencers of student achievement, then an alternate measure of instructional quality must be employed. Using standards-based teacher evaluation scores that focus on instructional practice in the classroom may help to determine what specific teacher characteristics result in higher student achievement (Archibald, 2006). Educational reform agendas rely heavily on teacher quality research and focus on the very significant relationship between teaching and student learning, but education stakeholders have failed to iterate cohesive goals that can transform standards-based evaluation systems into increased student learning (Cawyer & Caldwell, 2002). It would seem that a stronger link between quality instructional practices and student learning must dictate accountability-based reform efforts.

Human resource studies indicate that management systems should be designed to help support teacher competencies, since it is those behaviors that theory and research suggest are directly linked to student achievement (Heneman & Milanowski, 2004). The five core propositions articulated by National Board Professional Teacher Standards (NBPTS) were developed for just this purpose and are designed to support student learning. Instructional behaviors help to define teacher quality and the classroom practices that promote student learning, including maintaining student interest and providing appropriate learning assessments (Kaplan & Owings, 2001). In addition to defining teacher quality through instructional behaviors, research also suggests that quality teaching be examined in terms of both good teaching—what is being done by the teacher to affect student learning—as well as successful teaching—the realization of learning outcomes (Fenstermacher & Richardson, 2005). The variable of student achievement must be examined, then, in order to ensure both good and successful teaching. The identification of "a credible and versatile measure of teacher quality," however, poses a difficult "hurdle for teacher education researchers to surmount" (Blanton, Sindelar, & Correa, 2006, p. 115). As previously mentioned, the bulk of educational research has focused on teacher attributes such as experience and preparation and degrees, but with standards-based curricula and accountability at the forefront of the educational agenda, it is important to identify those aspects that are significantly linked to improvements in student achievement (Blanton, Sindelar, & Correa, 2006).

There is an emerging literature base, however, examining the relationship between teacher evaluation systems and student achievement. The Consortium for Policy Research in Education (CPRE) addressed this issue through research analyzing the

relationship between teacher composite scores on teacher performance evaluation systems and student achievement. Preliminary studies suggest that teacher composite scores are significant with regard to student achievement. The evaluation systems highlighted in the studies reflect the four different teaching domains found in Danielson's *Framework for Teaching* and include Planning for Instruction, Managing the Classroom, Instruction, and Professional Activities (White, 2004). Teachers receive scores in each of the domains as well as a composite score reflecting those aspects of instruction that have the strongest impact on student learning (Kimball, White, & Milanowski, 2003). Not surprisingly, research indicates that high quality teaching appears to be linked to improvements in learning outcomes (Borman & Kimball, 2004). The authors caution, however, that more research needs to be done to demonstrate the validity of teacher evaluation models with regard to student achievement before these scores can be used as determinants of teacher quality. If the standards by which teachers are evaluated are not indicative of quality teaching, then teacher scores on such evaluations tools will not predict student achievement (Milanowski, Kimball, & White, 2004). Evidence to support the link between teacher quality and student achievement is needed to identify "a significant empirical relationship between teaching according to the standards (as measured by the teacher evaluation scores) and value-added measures of student achievement" (Milanowski, Kimball, & White, 2004, p. 3). The majority of sites studied by the CPRE researchers utilized Danielson's *Framework for Teaching* in the design of standards-based evaluation systems, and the results from these studies suggest that the composite scores teachers receive through standards-based teacher evaluation systems may have a substantial relationship with regard to student achievement (Milanowski,

Kimball, & White, 2004). Replications of this study indicate the significance of the link between teacher quality and student learning and were consistent in finding that teacher quality, based on composite scores from standards-based evaluation systems, can be positively and often statistically tied to student learning (Archibald, 2007). This is strong evidence that standards-based evaluation systems may be used to help predict and ultimately improve student achievement.

If the evaluation standards utilized by a district represent quality teaching, then the instructional practices aligned with the new teacher evaluation standards should ensure improvements in student achievement (Kimball, White, & Milanowski, 2003). Using a research-based model for teacher evaluation may help to improve teacher practice with regard to teaching standards, thereby contributing to gains in student achievement. The instructional feedback provided to teachers through the evaluation process should: (1) establish a framework for discussion of classroom practice and (2) promote teacher reflection on instructional behaviors (Milanowski, Kimball, & White, 2004). The initial evidence in studies of the criterion-related validity of teacher evaluation scores indicates that standards-based evaluation methods may help identify those teachers whose instructional practices produce significant gains in student achievement (White, 2004). This is a crucial finding that speaks to the purpose of the current study. If research in standards-based evaluations systems can help determine those teacher characteristics that have a direct impact on improvements in student learning, then those instructional practices may be used as a measure of teacher quality. Valid measures of teacher quality assessed through standards-based evaluation, therefore, may serve the dual purpose of improving classroom instruction and validating

educational accountability (Borman & Kimball, 2004). Evaluation scores from well-designed and implemented standards-based teacher evaluation systems do have the potential to measure teacher quality, assess student achievement with regard to instructional practice, and improve learning. (Milanowski, Kimball, & White, 2004).

If teachers are indeed the most important school level resource associated with student achievement, it becomes imperative for research to identify those skills that assist teachers to be effective in classrooms. What is needed is an understanding of specific teacher and teaching characteristics associated with student learning that during the course of instruction influences achievement levels of students (Odden, Borman, & Fermanich, 2004). Current literature on the practice of educational leadership identifies effective schools as those characterized by a culture wherein there is a shared purpose, decisions are made collaboratively, responsibilities are distributed among teacher leaders and capacity exists to create and sustain change. Research suggests that the placement of NBCT clearly has an impact on instruction. Elfers and Plecki (2006) found that NBCT report greater understanding of the connections between curriculum, instruction, and assessment, greater preparedness to teach intended curriculum, greater preparedness to prepare students for state assessments, and greater preparedness to manage diverse learning needs in their classrooms. Because National Board Certification was created to identify and recognize accomplished teaching, this variable is included in this study as a proxy for teacher practice and is examined as a variable that may capacity to improve instruction so that all children may have an opportunity to achieve.

National Board Certification

The National Board for Professional Teaching Standards was founded to: advance the quality of teaching and learning by maintaining high and rigorous standards for what accomplished teachers should know and be able to do, provide a national voluntary system certifying teachers who meet these standards, and advocate related education reforms to integrate National Board certification in American education and to capitalize on the expertise of teachers certified by the National Board (NBPTS, n.d.). Five core propositions were articulated by the National Board: teachers are committed to students and their learning, teachers know the subjects they teach and how to teach these subjects to students, teachers are responsible for managing and monitoring student learning, teachers think systematically about their practice and learn from experience, and teachers are members of learning communities (Harman, 2001). Applicants for national certification must meet course level and subject area standards that were developed by committees of teachers and other experts to demonstrate what the most accomplished teaching professionals are able to do in the classroom.

Goldhaber (2006) introduces this variable as an indicator for teacher quality. Because the certification process has been identified as a means to identify accomplished practice, an emerging body of literature has examined the validity of this designation (McColskey, Stronge, et al, 2006).

The strongest support to date for the effect on student learning comes from a large-scale study in North Carolina (Goldhaber & Anthony, 2004). This study found that in “both reading and mathematics, NBCTs were more effective than non-certified

applicants" and concluded that "NBPTS is in fact identifying the more effective of those teachers that they actually evaluate" (p. 17).

Vandervoort, Amrein-Beardsley, & Berliner (2004) analyzed four years of reading, mathematics, and language scores in Arizona and found National Board Certified Teachers' (NBCTs') students outperformed non-NBCTs' students on 72.9% of the measures over a four-year period. Some students of NBCTs had over one month advantage in achievement compared to non-NBCTs' students. Effect sizes were greater in mathematics and reading than in language.

Bond, Smith, Baker, and Hattie (2000) compared teachers who successfully attained national certification with teachers who unsuccessfully attempted this certification. Their study used onsite visits to classrooms, interviews with teachers and students, and samples of student work. In this sample, National Board Certified Teachers demonstrated expert teaching to a greater degree than did the non-certified teachers. Further findings demonstrated a richer understanding of unit objects for high school and middle school students than teaching outcomes for non-certified teachers, although writing samples showed only marginal differences.

Critics of research of NBCT and student achievement have noted methodological and statistical issues, most notably small samples that lack statistical power; large samples that result in statistical significance but not meaningful differences; designs that fail to consider student attributes and the correlation between these attributes and teacher assignment; and lastly, inaccurate links between student data and teacher assignment (McColskey, Strong, et al, 2006). The fact that most NBCTs are not placed in hard-to

staff schools (Goldhaber, 2006; Humphrey, Koppich, & Hough, 2004) also may skew study results.

Method and Results

This study considered the research question, are there significant mean differences for measures of student achievement between schools with a higher percentage of national board certified teachers after controlling for student demographics and other measures of teacher quality? The research on the effects of teachers holding national board certification are decidedly mixed, although they tend to find that national board certified teachers are a significant predictor of student achievement. One questions not *if* national board certification matters, but rather *when* a critical mass of teachers with national board certification exists in a school so that the necessary capacity to improve instruction is present. Previous inquiries regarding NBCT have examined the extent to which teachers participate in the NBCT selection process, the impact on measures of student achievement, teacher effectiveness, and the impact on teacher career path. This study examined the impact that NBCT's have on student achievement but also sought to examine issues of teacher capacity. Specifically, do schools with a higher percentage of NBCT's perform better than schools with a smaller percentage of NBCT's?

The study made use of analysis of covariance, included a sample of 359 schools in Kentucky, and included school level data. Analysis of covariance is a statistical method that enables the researcher to evaluate the significance of mean differences on a dependent measure between two or more treatment groups while simultaneously controlling for the effect of concomitant variables. According to Tabachnick & Fidell (1996), there are three major purposes for the use of analysis of covariance. The first is

to increase the sensitivity of the *F*-tests of main effects and interactions by reducing the error variance, primarily in experimental studies. The second purpose is to statistically adjust the means of the dependent variable in each group wherein those means reflect what they would be if all groups had scored equally on the covariate. The third purpose is to interpret differences in levels of the independent variable when there are several dependent variables in the analysis. The second purpose applies to the research question posed in this study and is appropriate due to the fact that the research design does not include random assignment.

For the purposes of this study, schools were assigned to groups based upon the percentage of teachers in the building holding national board certification. A total of six groups were created for the study: group 1 contained schools with between 0 and 2% of teachers holing national board certification (N=39), group 2 contained schools with between 2 and 4% of teachers holing national board certification (N=152), group 3 contained schools with between 4 and 6% of teachers holing national board certification (N=65), group 4 contained schools with between 6 and 8% of teachers holing national board certification (N=39), group 5 contained schools with between 8 and 10% of teachers holing national board certification (N=28), and group 6 contained schools with greater than 10% of teachers holing national board certification (N=36).

Using 2004 CATS index as the dependent variable, an analysis of covariance was conducted using group as the independent variable and measures of student demographics (%LEP, %Free and Reduced Lunch, and %Special Education) and measures of teacher quality (average years teaching experience, major or minor in the content area, and teacher education level) as the covariates. These covariates were

chosen based on a review of the literature identifying student demographics and teacher quality as significant predictors of student achievement. After controlling for student demographics and other indicators of teacher quality, measures of student achievement varied significantly with group assignment, $F(5, 347)=5.665$, $p\leq.000$, partial $\eta^2=.075$. Comparison of adjusted group means revealed increasing scores on the CATS index as the percentage of teachers holding national board certification increased (group 1= 72.12, group 2=77.42, group 3=79.89, group 4=78.69, group 5=80.14, group 6=80.95). The largest increase in measures of student achievement took place in schools with greater than 2% of the teachers holding national board certification. The pattern of growth in achievement scores continues to grow but begins to become flat when more than 6% of teachers in the building hold NBCT.

To discern the differences between groups, a Tukey post hoc test was performed with the following significant differences between groups: CATS performance in group 6 was significantly higher than groups 1 and 2, all groups were significantly different in the percentage of teachers holding national board certification, group 1 was significantly different than groups 3 and 4 in percentage of students classified as limited English proficient, group 3 was significantly different than group 6 in percentage of students classified as limited English proficient, and group 1 was significantly different than group 2 in percent of teachers holding a major or a minor in the content area taught. These findings were considered to be important. First, it was noteworthy that schools with the highest percentage of teachers holding national board certification were performing at a significantly higher level than schools with a smaller percentage of teachers holding national board certification. The results from the study suggest that the only real

difference in the measures of teacher quality was the prevalence of teachers holding national board certification. Only groups 1 and 2 differed significantly in one measure of teacher quality: percent of teachers with a major or a minor in the content area, however, both group means were both over 95% (group 1=95.95%; group 2=98.75%). As such, none of the group means of teacher quality were significantly different other than percentage of teachers holding national board certification. Further, the demographic measures of the schools did not differ significantly either. The only demographic measures of student achievement that were significantly different were group means in percentage of students classified as limited English proficiency. Certainly, all children that are members of historically underrepresented populations are important in public schools, especially in an era of standards based reform. However, the incidence of limited English proficiency students in Kentucky is extremely small (1.2% of the total population in this study) and this variable has not been found to be a significant predictor of student achievement in the public schools in Kentucky.

Conclusions and Implications

All 50 states offer bonuses and/or incentives for national board certification (NBPTS, 2004a). Mixed results in studies examining the relationship between board certification and student achievement have caused many to question the effectiveness of these costly policies. Due in large part to criticisms of previous studies and questions regarding the distribution of national board certified teachers, this study was conducted to discern not only *if* NBCT was a significant predictor of student achievement, but *when* the resource mattered. In Kentucky, merely 1.8% of all teachers in the state hold national board certification. The relatively small number of teachers holding this certification

coupled with the sporadic distribution of the resource around the state may have masked the impact that national board certification had with regard to student achievement. Results from the study indicated a significant difference in measures of student achievement in schools based on the percentage of teachers holding national board certification. The largest jump in achievement scores happened in schools with at least 2% of teachers holding national board certification and continued to grow as the percentage of national board teachers increased. Although achievement scores did increase, the trend becomes relatively flat when 4% to 6% or more of the instructional staff hold national board certification. As such, I suggest that a critical mass of at least 4% to 6% of teachers holding national board certification may become necessary to change the instructional culture of a building in order to improve student performance.

As educational leaders consider the proper allocation of resources to maximize student achievement, it appears that the percentage of teachers holding national board certification is related to increased student achievement. I speculate that the existence of this resource in schools may have spillover effects on teacher practice even for non-certified teachers. The focus of national board teachers on reflection and the establishment of professional learning communities would appear to change practice in schools where the critical mass has been reached so that student learning is maximized. Further research is required on identifying improved classroom level measures of teacher practice and the interaction of the process of teaching and learning.

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