

SB

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SB 188: Teacher National Board Certification

(bill packet)

Senator Bill Wielechowski

30th Alaska State Legislature

ALASKA STATE LEGISLATURE

Session

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SENATOR BILL WIELECHOWSKI

Sponsor Statement SB 188

An Act Providing for Payment and Loan Incentives to Public School Teachers for National Board Certification

An excellent education system requires discerning and responsive educators. SB 188 will support Alaskan public-school teachers seeking to attain professional excellence by incentivizing them to pursue and complete the National Board Certification process. SB 188 aligns with the Alaska Department of Education & Early Development's (DEED) vision for transforming the state's education system outlined in the Alaska's Education Challenge report. This document sets a goal to "triple the number of National Board Certified Teachers (NBCTs) in Alaska, and specifically increase the number of NBCTs in hard-to-staff schools and districts, both through the provision of salary incentives."

With SB 188, the legislature takes two steps to encourage more certifications and attain DEED's goal: providing for interest-free loans to cover the certification program costs and establishing an annual stipend. A loan fund will provide the zero interest loans to teachers in the amount of up to \$2,500, covering the full cost of the certification program. NBCTs working in Alaskan public schools will receive an annual stipend of \$1,500, for the duration of their certification (10 years), and if employed in a low-performing high-poverty district, will receive an additional \$1,000 annually. In these high-need areas, a teacher can receive up to \$1000, paid directly to the national certifying board, to offset the cost of certification. Incentive programs like SB 188 have been implemented in twenty-seven states and the proposed program in Alaska is fiscally modest in comparison to many other state programs. For example, seven states provide teachers with annual stipends of \$5000 or more.

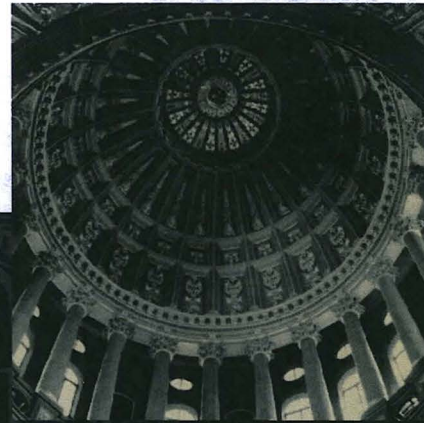
Research shows that NBCTs improve education systems. A study in Georgia concluded that NBCTs outperformed their peers with the same experience levels. Another study suggested that burnout rates may be lower among NBCTs than their peers and many other studies correlate NBCTs directly to student learning outcomes. NBCTs represent the top of their profession: a teacher must have three years of classroom experience and a current state teaching certificate to seek this credential. To gain certification, teachers must complete four components in their certificate area: three portfolio entries and a computer-based assessment. Teachers remain active in the classroom throughout this intensive and reflective process. NBCTs in Alaska can use this certification toward obtaining a "Master Teacher Certificate" from DEED. Increasing our number of NBCTs will help the state sustain a resilient teacher workforce and support essential student development.

Supporting SB188 will positively impact teachers, students, and Alaska's education system.



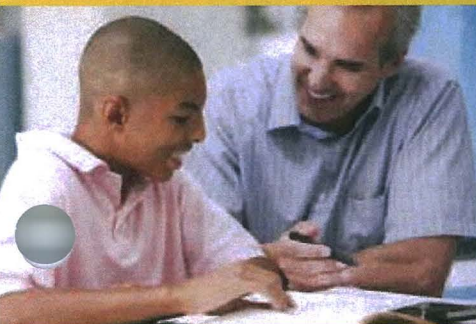
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National Board for Professional Teaching Standards Certification

What Legislators Need to Know



Introduction

States today are facing deep cuts to education while struggling to close the achievement gap and turn around low-performing schools. State legislators well know that education must be a priority for workforce development and economic competitiveness. The challenges lie in determining which programs are most effective and where money can be best invested.

National Board for Professional Teaching Standards certification for teachers is one program that many state legislators continue to embrace. Although this program to provide voluntary rigorous national teacher certification has been in existence since 1987, state and local education policymakers, teachers and school leaders now are recognizing its promise and potential for addressing challenges in 21st century classrooms.

State legislators want to be armed with reliable information to make the best decisions about state resources. This guide provides a thorough overview of National Board certification so legislators can determine if this is a tool they wish to use to improve student achievement. Legislators will learn about the certification process, research on the program's effectiveness, state policies to support and best use the program, and examples of successful implementation.

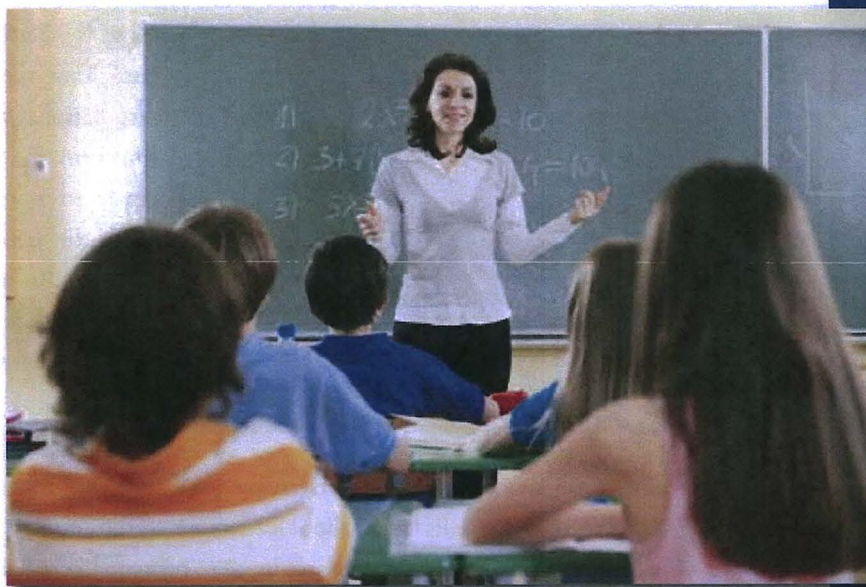


This voluntary program does not replace state prekindergarten through grade 12 teacher licensure or certification. Instead, it offers a much more rigorous national teacher credential that is recognized and rewarded nationwide. More than 91,000 teachers are National Board certified nationwide—just under 3 percent of the nation’s teachers. California, Florida, North Carolina, South Carolina and Washington have the most.

Take One! is another program offered by the National Board. This job-imbedded, school reform program is available to all teachers and to induction or pre-service teachers, principals, administrators and professors in colleges of education. It can be used as professional development for an individual or a school-wide effort, which has been shown to transform a school into a professional learning community. Educators do not receive full National Board certification through this program—it is only an initial step—but can transfer the score within two years to pursue National Board candidacy. Because this program is less intensive, requires less time outside of work and costs less, it can be a more viable option for some educators.

“Take One! is important for pre-service and beginning teachers. It is cost-effective, yet will give a foundation for National Board certification and an understanding of how that can be used in the classroom.”

—Oregon Representative
Betty Komp





Times are very different and more challenging than when we attended school, and we want and need the brightest and the best teachers possible to meet these challenges. The rigorous National Board certification addresses these needs and challenges. Teachers—and now principals—who elect to participate in this program are to be commended for doing so. The requirements to receive this certification are in addition to their other responsibilities, and it takes a dedicated, well-organized and highly motivated person to complete and receive this certification.

We—as legislators, parents and grandparents—want the most effective teachers for our students, and we want the most effective principals to be the educational leaders of our schools. Even during these difficult economic times, National Board certification is one of the best investments we can make. When our teachers and principals have earned and are awarded this certification, we know they are the best of the best. Our students are the future leaders of tomorrow, and they deserve the best education they can get.

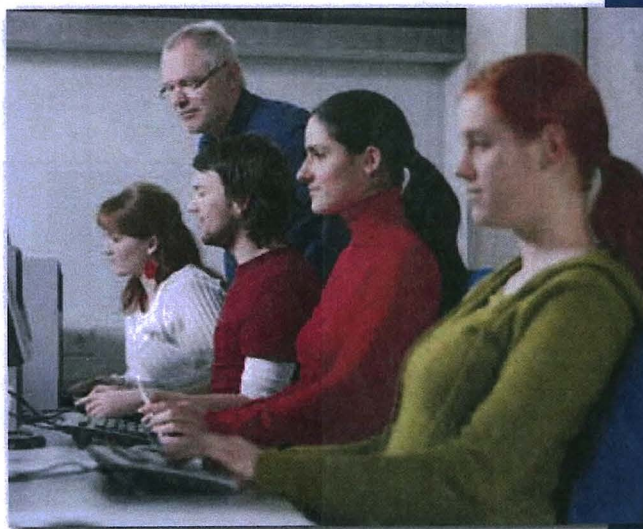
—North Carolina Representative Maggie Jeffus

Research Question	Findings	Research Reports
Does certification improve teacher retention?	Board certification was found to keep the most highly accomplished teachers in the classroom. In Florida, nearly 90 percent of these teachers remain in teaching, far exceeding the average 60 percent retention for teachers statewide. In Ohio, 52 percent of board-certified teachers surveyed report they plan to stay in teaching as long as they can, compared to 38 percent of non-certified teachers. South Carolina reports similar results.	Florida Department of Education, 2008; Sykes, et al., 2006 ¹⁶
Does certification equip teachers for traditionally low-performing students and schools?	In 2008, 42 percent of board-certified teachers were teaching in schools eligible for Title I funding. Nearly 46 percent taught in schools where more than 40 percent of students were eligible for free and reduced lunches.	National Board for Professional Teaching Standards, 2008
	The National Board's Targeted High-Need Initiative and Take One! programs are increasing board-certified teacher diversity and impact in high-need schools. A large majority of teachers in high-need schools report that Take One! improved the quality of their instructional planning and implementation by enhancing their approach to analyzing and reflecting on their teaching practices.	Learning Point Associations, 2008
Do board-certified teachers teach in low-performing schools?	This examines the distribution of board-certified teachers in the six states—California, Florida, Mississippi, North Carolina, Ohio and South Carolina. Except for California, board-certified teachers are not equitably distributed across schools that serve different populations of students. In five of the six states examined, poor, minority, and lower-performing students are far less likely to have the opportunity to benefit from the teaching of a National Board-certified teachers than are their more affluent, majority, and higher-performing peers.	Humphrey, Koppich and Hough, 2004 ¹⁷
Does certification create teacher leaders?	Board-certified teachers give input on curricular decisions, organize professional development opportunities, chair departments, engage with the community, reach out to parents, and serve as a faculty voice to policymakers and other stakeholders.	Sykes, et al., 2006 ¹⁸
	Board-certified teachers take on leadership roles that include mentoring and coaching others and developing programs aimed at improve student learning.	Freund, Russell and Kavulic, 2005; ¹⁹ Yankelovich Partners, 2001 ²⁰

- Offer salary increases for the life of the certificate.
- Offer additional salary for board-certified teachers and principals who serve in low-performing, hard-to-staff schools.
- Offer mastery or top-tier state licensure or certification to board-certified teachers and principals.
- Publicly recognize teachers and principals who achieve certification and provide leadership opportunities to leverage their knowledge and skills.

State legislators might also consider the following policies to make better use of National Board certification.

- Use National Board standards to define effective teaching.
- Include board certification as an indicator of effective teaching for purposes of teacher and principal evaluations.
- Create career ladders for board-certified teachers, removing barriers and encouraging them to serve in such leadership roles as mentors, team leaders, curriculum leaders and instructional coaches.
- Allow board certification to qualify as or replace traditional professional development requirements.
- Require teachers and principals in low-performing schools to complete Take One! as a whole school professional development program and provide incentives for choosing to seek full board certification.
- Require teachers who receive state support for National Board certification to serve in low-performing schools.



“We in Washington believe that the quality of teacher is the most important thing. Over the last five or six years, we have encouraged our teachers to become even better through National Board certification. In fact, we have thousands of teachers that are now going through that process, and we are paying them up to \$5,000 or \$10,000 more to teach because we know that is the quintessential place where our investments can make the difference.”

—Washington Representative
Kathy Haigh

ring National Board Certification

State	Fee Support	Financial Incentives	Release Time	License Portability	License Renewal or CEUs	Total Number of Teachers*	NBCTs Certified in 2009-2010	Total NBCTs	% of NBCTs to Teachers
IL	State and federal funds combine to pay up to \$2,000 per candidate as funds are available	\$3,000 annual stipend and mentor compensation as funds are provided		X	X	135,704	771	4,692	3.5%
IN				X	X	62,668	5	149	0.2%
KS	State and federal funds combine to pay up to \$2,000 per candidate as funds are available	By statute, districts are responsible for paying \$1,000 to NBCTs for the life of the certificate		X	X	35,883	20	344	1.0%
KY	75% fee reimbursement upon certification	Annual \$2,000 salary supplement for the life of the certificate; \$400 for candidate preparation	5 days	X	X	43,451	316	2,156	5.0%
LA	\$750 from Louisiana Department of Education grant	\$5,000 annual increase for life of certificate, funded by districts				49,377	148	1,681	3.4%
MA				X	X	70,398	17	518	0.7%
MD	Two-thirds of fee for up to 1,000 candidates	State will match up to \$1,000 offered by local school districts and \$2,000 for NBCTs assigned to specific low-performing schools			X	58,940	302	1,976	3.4%
ME		No stipend for 2010, fixed funds for 2011-2012.		X	X	15,912	20	201	1.3%
MI	State and federal funds are combined to pay the application fee as funds are provided			X	X	94,754	29	348	0.4%
MN					X	53,083	14	352	0.7%
MO	State and federal funds are combined to pay the application fee as funds are provided	School district policy often uses the career ladder to award NBCTs up to \$5,000 annually for the life of the certificate	2 days	X		68,015	73	670	1.0%
MS	Reimbursement of unsubsidized portion of fee upon completion for public school teachers	\$6,000 annual increase for life of certificate		X	X	33,358	120	3,222	9.7%
MT		One-time \$3,000 stipends for up to 20 NBCTs as funding is approved each biennium		X	X	10,467	7	92	0.9%

g National Board Certification

State	Fee Support	Financial Incentives	Release Time	License Portability	License Renewal or CEUs	Total Number of Teachers	NBCTs Certified in 2009-2010	Total NBCTs	% of NBCTs to Teachers
SD				X		9,244	3	74	0.8%
TN		Stipends by school districts only			X	64,926	71	484	0.7%
TX				X	X	327,905	83	627	0.2%
UT				X		23,657	21	204	0.9%
VA		Initial \$5,000 award, with a subsequent annual award of \$2,500 for the life of the certificate, contingent upon continued funding		X	X	71,415	184	2,180	3.1%
VT				X	X	8,766	3	124	1.4%
WA	State offers interest free conditional loan for \$2,000 of the \$2,500 fee	\$5,000 annual bonus upon certification; NBCTs in challenging schools, as defined by the state, will receive an additional \$5,000 annual bonus. Proposed two-year suspension in funding program		X	X	54,428	1,272	5,232	9.6%
WI	Reimbursement of fee-related expenses up to \$2,000 in first year of certification	\$2,500 annual grant upon application for subsequent nine years; additional \$2,500 grant for NBCTs in high-need schools (60% free or reduced lunch) as funds are provided. Additional incentives also provided by local school districts			X	59,401	101	783	1.3%
WV	Reimbursement of 50% upon application, and remainder upon certification, for up to 200 candidates; \$600 toward retakes	Reimbursement of \$600 for certification expenses; annual \$3,500 supplement for life of certificate		X		20,209	86	580	2.9%
WY		\$4,000 salary increase for each year as funding is approved each biennium		X	X	7,000	60	314	4.5%

Key: NBCT = National Board-Certified Teacher

Source: National Board for Professional Teaching Standards. This information is accurate as of March 24, 2011.

Montgomery County Public Schools, Maryland

Montgomery County Schools is Maryland's largest school district. Students are 40 percent white, 23 percent black and 23 percent Hispanic; about one-third are considered low income. Although the district is located in one of the nation's most affluent areas just outside Washington, D.C., pockets of low-performing, high-need schools and students exist. About a decade ago, district officials developed a strategy to provide an effective educator and promote college and career-ready standards for every student. The district provided incentives and support for teachers to become board-certified. District leadership also created a partnership with the Montgomery County Education Association, the local affiliate of the National Education Association, to embed the National Board's Five Core Propositions—what teachers should know and be able to do—into professional development, hiring and evaluation for all teachers. The effort is showing results. Student achievement has improved, and the achievement gap has narrowed in elementary school reading and math. The district now has the highest graduation rate among large school districts in the nation. Participation rates in Advanced Placement exams have increased. Nearly 95 percent of national-board certified teachers remained in the district during the past five years.

Mitchell Elementary School, Arizona

Mitchell Elementary School is located in Isaac School District in Phoenix. This school serves a low-income neighborhood with high crime rates, fewer than 25 percent of adults have a high school education, and 96 percent of students qualify for free or reduced lunch. In 2000, less than 34 percent of those enrolled completed ninth grade, and less than 22 percent graduated from high school. As a result of these difficult working and learning conditions, teacher quality and retention has traditionally been very low. In 2008, more than 60 percent of the teachers in the school decided to do all they could to make a difference—they committed to completing National Board certification to improve their teaching and equip them with the tools needed to turn around this impoverished, low-performing school. They were determined to make a difference in their students' lives. Although some teachers have completed the program and others are still working on it, students already are making progress, and collaborative professional learning community within the school is strong. This unique story about the power of teachers is garnering attention nationwide. Policymakers and education experts—from U.S. Secretary Arne Duncan, NEA President Dennis Van Roekel, and former Governor Bob Wise to education expert Barnett Berry—are paying close attention to this effort.

“Test scores alone do not determine effective teaching. As an instructional coach, I have to look at the thinking that goes into teaching minute by minute. Teachers must be consciously competent—we have to know what we are doing, how we do it, and why. We must make existing teachers the best they can be through effective professional development, such as National Board certification.”

—Daniela Robles, *National Board Certified Teacher, Instructional Coach, former Mitchell Elementary teacher*

17. Daniel C. Humphrey, Julia E. Koppich, and Heather J. Hough, *Sharing the Wealth: National Board Certified Teachers and the Schools that Need Them Most*. (Menlo Park, Calif.: SRI International, November 2004); http://www.nbpts.org/UserFiles/File/NB_Sharing_Wealth_Paper_D_-_Humphrey.pdf.

18. G. Sykes, et al., *National board Certified Teachers as an Organizational Resource* (Ann Arbor, Mich.: University of Michigan, 2006).

19. M. Freund, V. K. Russell, and C. Kavulic, *A Study of the Role of Mentoring in Achieving Certification by the National Board for Professional Teaching Standards* (Washington, D.C., the George Washington University Graduate School of Education and Human Development, 2005).

20. Yankelovich Partners, *Leading from the Classroom: Highlights from the 2001 NBPTS National Board Certified Teacher Leadership Survey* (Chapel Hill, N.C.: Yankelovich Associates, 2001); [http://www.nbpts.org/UserFiles/File/leading_from_the_classroom\(1\).pdf](http://www.nbpts.org/UserFiles/File/leading_from_the_classroom(1).pdf).

New Studies Affirm Impact of Board-Certified Teachers

Policy implications of research weighed

By Stephen Sawchuk

The evidence continues to mount that teachers who earn national-board certification are more effective than other teachers, both at the high school and elementary levels.

Two recently released studies show higher test scores by students who are taught by board-certified teachers. The findings are in line with previous research.

That's a boon for the National Board for Professional Teaching Standards, the group that runs the certification program. Its president, Ronald Thorpe, has been making the case that, as in other professions, board certification should be the aspiration—indeed, a professional norm—of the nation's 3.5 million teachers, rather than an exception.

"There definitely seems to be a predictable trend that when you have teachers who have this understanding about their job, this depth of their knowledge, their skills set, they get these results and they're replicable," Mr. Thorpe said.

Candidates seeking board certification must take a series of assessments in content and pedagogy, including submitting videotape docu-

menting their teaching skills. The process takes an estimated 200 to 400 hours, sometimes over the course of several years, and costs \$1,900.

There are currently about 110,000 board-certified teachers in the United States.

Hoping to drum up numbers, the NBPTS has taken steps to make the certification process easier and cheaper to negotiate. It's currently piloting a leaner set of exams, though board officials insist they will maintain the same validity.

An Effective "Signal"

The first study, funded by the NBPTS and conducted by the Arlington, Va.-based CNA Analysis and Solutions, is based on the analysis of scores of thousands of Chicago and Kentucky secondary students between 2000 and 2012 linked to their teachers—an important addition to the research, because most prior studies have been based in Florida and North Carolina and focused on the lower grades.

In addition to looking at student performance on an ACT suite of assessments, the researchers also observed a subsample of teachers pursuing board certification and used a common framework to track growth in their abilities.

In all, the study found that board certification served as an effective "signal" of teacher qual-

ity, with students taught by those teachers doing better than students not taught by them, controlling for a variety of background characteristics.

A second study released last month, by James Cowan and Dan Goldhaber, both of the Center for Education Data & Research at the University of Washington Bothell, looked at the test scores of students taught by elementary and middle school teachers in Washington state; it found similar results to those of the CNA study.

The overall effect sizes of holding the certification were fairly small, across the two studies, but they were statistically significant.

One new wrinkle surfaced by the University of Washington researchers had to do with the board's policy of allowing teachers who don't initially achieve certification to retake the elements that tripped them up. Researchers found that, except in middle school math, those teachers' performance, even after they obtained certification, was statistically indistinguishable from teachers who never sat for the exams.

"To me, that suggests that the signal of being board-certified is not as strong for those who fail the first time. Maybe it's because you can bank your scores," Mr. Goldhaber said. "I think it's an important result for them to consider."

So far, the NBPTS does not have

plans to revisit its retake policies, officials said.

Obliquely, the studies also underscore how challenging it may be for the more than 25-year-old organization to incite education leaders to build policy off the positive findings. All else being equal, board certification matters—but there are far fewer proof points on the best way to use it as a lever to improve teacher quality more widely, the researchers note.

Neither study found definitive evidence that going through the board-certification process itself improved teachers' skills, meaning that good teachers may just be more likely to choose to pursue certification. And while data from NBPTS suggest board-certified teachers are taking leadership roles in schools, most of those transitions seem to be the result of informal rather than strategic decisions.

The CNA analysis postulated that districts and states might do better by attaching the certification more formally to teacher-quality structures than they currently are.

"For example, school systems could use National Board certification as a gatekeeper for tenure, implemented at a later point in the teaching career path than the criteria most school systems currently use for those decisions," its authors suggest.

National-board leaders said they are eager for more schools and

districts to reach a critical mass of board-certified teachers, which would set the stage for policymakers to embrace such policy ideas.

"The numbers are so paltry," Mr. Thorpe said. "There is some num-

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There definitely seems to be a predictable trend that when you have teachers who have this understanding about their job, this depth of their knowledge, their skills set, they get these results and they're replicable.”

RONALD THORPE

President, National Board for Professional Teaching Standards

ber out there and when you hit that number, something changes in the whole way the school functions with kids, and it shows up in their learning and their achievement.”

Incentives Matter

Some new research also suggests a promising, if costly way, to help boost the number of board-certified teachers in low-income schools, which have tended to have fewer teachers holding the credential.

A second study by Mr. Goldhaber and Mr. Cowan, for example, looked at a Washington state bonus program in effect since 2007 that was designed to encourage board-certified teachers to work in high-poverty schools. The program paid out up to \$5,000 to the teachers in those schools who became certified.

The quasi-experimental study compared the staffing outcomes of schools eligible for the bonuses with those schools that fell just below the eligibility threshold for awarding the bonuses.

The bonus did help boost the number of board-certified teachers in the participating high-poverty schools by about 2 to 3 percent over the first year of implementation, both by helping the schools recruit more of those teachers up front, and increasing the probability that teachers at the bonus-eligible schools decided to pursue certification, the study found.

The two CEDR papers were partly funded by the Bill & Melinda Gates Foundation, which also provided \$3.7 million in grants to help the NBPTS tighten its certification process. (The philanthropy also helps support *Education Week's* coverage of the implementation of college- and career-ready standards.)

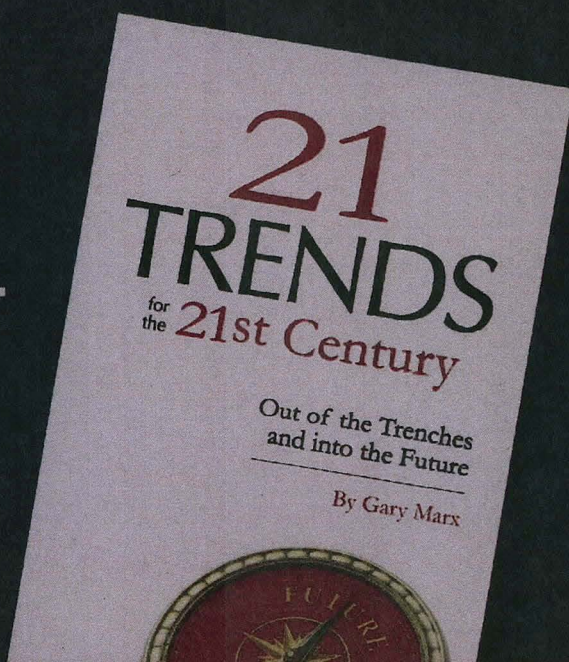
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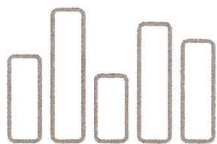
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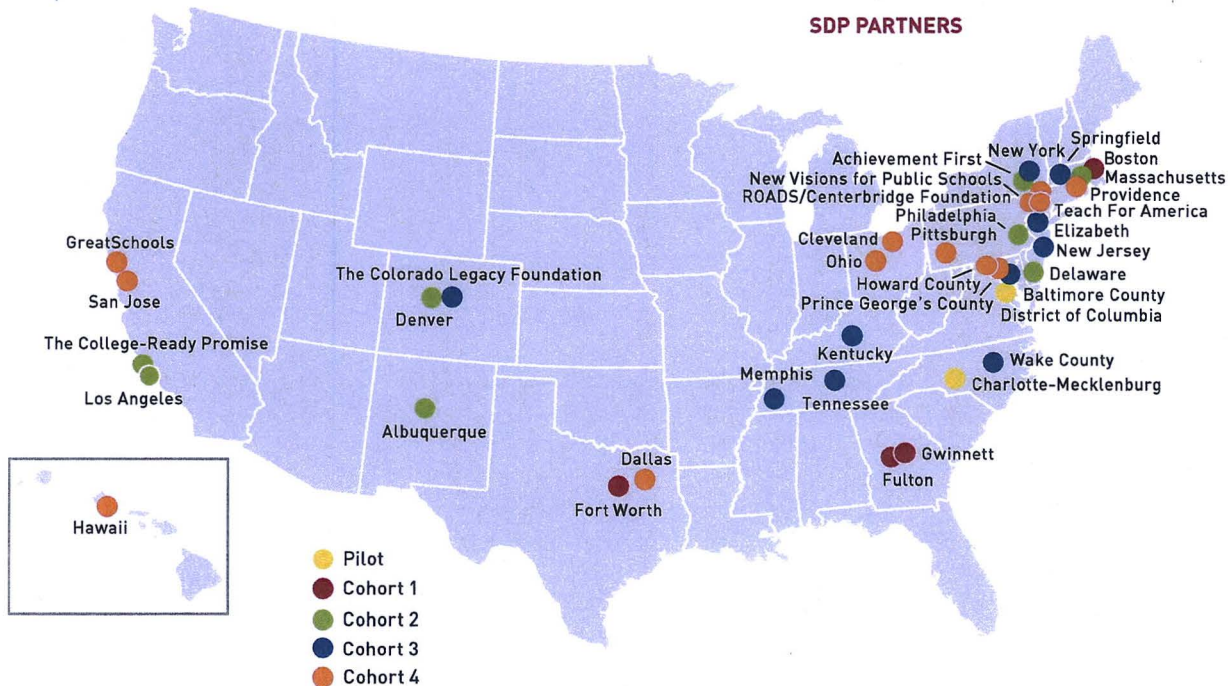
STRATEGIC **DATA** PROJECT

SDP HUMAN CAPITAL DIAGNOSTIC

Los Angeles Unified School District

November 2012





THE STRATEGIC DATA PROJECT

The Strategic Data Project (SDP), housed at the Center for Education Policy Research at Harvard University, partners with school districts, school networks, and state agencies to bring high-quality research methods and data analysis to bear on management and policy decisions.

SDP's theory of action is that if we are able to bring together the right people, the right data, and the right analysis, educational leaders can significantly improve decisions, thereby increasing student achievement.

SDP fulfills this theory of action with three primary strategies:

1. conducting rigorous "diagnostic" analysis on teacher effectiveness and college-going success using agency data,
2. placing and supporting data strategists in partner agencies, and
3. distributing our analytic results and learnings to support broad adoption of methods and data use practices throughout the education sector.

SDP was launched in June 2009 and currently partners with over thirty-five states, school districts, networks of charter schools, and nonprofit organizations. The project is supported by the Bill & Melinda Gates Foundation.

SDP HUMAN CAPITAL DIAGNOSTIC

INTRODUCTION AND BACKGROUND

Teachers play a critical role in student learning and achievement. Research has shown that a teacher's effectiveness has more impact on student achievement than any other factor controlled by school systems, including class size or the school a student attends.¹ Only recently, however, has the data become available to measure teacher effectiveness in ways that can inform education policy and practice.

To this end, we at the **Strategic Data Project** designed the human capital diagnostic as a means to:

- 1 better inform district leaders about the distribution of teachers within the district, and
- 2 identify potential focus areas in human capital management that could result in improved student achievement.

This report illuminates patterns of teacher effects in the Los Angeles Unified School District (LAUSD) and compares these patterns across a combination of teacher, school, and student characteristics.

The Human Capital Diagnostic is not an exhaustive set of analyses, nor does it contain specific recommendations for the district to implement. It is intended as a representative set of analyses that can help the district better understand its current performance and set future goals. We believe that clearly understanding where you are is a prerequisite to developing focused strategies for improvement.

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A	SDP PATHWAY FOR HUMAN CAPITAL
B	SUMMARY FINDINGS
C	UNDERSTANDING TEACHER EFFECTS
D	DETAILED FINDINGS

The diagnostic is also meant to demonstrate how districts can capitalize on existing data to better inform decision making. For the diagnostic, researchers connected student data, including demographics and test scores, to human resources data about certificated teachers. By doing this, researchers were able to calculate teacher effect measures for a subset of teachers. Many of the diagnostic analyses explore the relationship of these measures with characteristics of teachers, schools, and students. They are not intended to draw conclusions about the overall contribution made by any individual teacher.

These analyses were completed by members of the research team at the Center for Education Policy Research at Harvard University with the support of LAUSD staff and the LAUSD SDP Fellows.

Many of the findings included in this brief have also been completed in other SDP partner districts. Leveraging the Strategic Data Project's extensive network of partners, SDP periodically publishes comparative results, called strategic performance indicators (SPIs), with the goal of establishing a set of common human capital indicators for education systems. The SPIs can be found online at:

www.gse.harvard.edu/sdp/strategic-performance-indicators.

SDP HUMAN CAPITAL DIAGNOSTIC

THE SDP PATHWAY FOR HUMAN CAPITAL

The **SDP Pathway for Human Capital** is a framework that is used to examine teacher employment patterns from recruitment until separation.

Five key components of a teacher’s career are included in this framework.

SDP HUMAN CAPITAL PATHWAY	
	<p>The recruitment process is a district’s first opportunity to secure a highly effective teaching force for its students. Understanding the pace of hiring and how new hires are allocated across the district can inform the development of recruitment strategies that maximize the district’s ability to attract effective teachers.</p>
RECRUITMENT	
	<p>Teachers are not randomly assigned to students. Examining teacher placement patterns can identify opportunities to raise student achievement and reduce achievement gaps through a more equitable distribution of the most effective teachers across the system and within schools.</p>
PLACEMENT	
	<p>Teachers have long and varied careers in the profession. Along the way, many encounter opportunities to develop their teaching skills and increase their instructional effectiveness. SDP explores the extent to which methods of development commonly accessed by teachers—such as earning graduate degrees or learning from experience—are associated with gains in student achievement.</p>
DEVELOPMENT	
	<p>Performance evaluations that are currently in place in most districts make few distinctions among teachers. Examining the distribution and predictive power of teacher effects provides perspective for how a district can recognize and learn from especially effective teachers and target struggling teachers for additional support.</p>
EVALUATION	
	<p>Many urban districts lose half of their new teachers within their first five years of teaching. High attrition rates among new teachers may lower student achievement as teachers improve most in their first years in the classroom. It would also be problematic if more effective teachers leave at higher rates than less effective teachers. SDP examines retention patterns across various teacher characteristics, including classroom effectiveness, to understand how attrition impacts student achievement.</p>
RETENTION/ TURNOVER	

SDP HUMAN CAPITAL DIAGNOSTIC

SUMMARY FINDINGS

HUMAN CAPITAL PATHWAY

1. Teacher effects vary substantially in LAUSD, more than in many other districts. The difference between a 25th and 75th percentile elementary math teacher is over one-quarter of a standard deviation, which is roughly equivalent to a student having eight additional months of instruction in a calendar year.



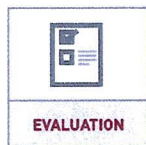
2. Teach for America and Career Ladder teachers have higher math effects on average than other novices in their first year by 0.05 and 0.03 standard deviations respectively, which is roughly equivalent to one to two months of additional learning. These differences persist over time.
3. LAUSD has increased its reliance on extended substitutes in the last several years. Relative to other new hires in middle school, extended substitutes have large positive effects in math, though not in other subjects.



4. First-year teachers are assigned to students who begin the year academically behind students assigned to more experienced teachers.
5. Early-career elementary teachers change grade assignments at higher rates than more experienced teachers. Teachers have slightly lower effects after a change in grade assignment than those who do not change grades.



6. LAUSD math teachers show substantial growth in effectiveness during their first five years in the classroom with a 0.12 standard deviation gain in their average teacher effect, which is roughly equivalent to three additional months of instruction in a calendar year.
7. LAUSD teachers with advanced degrees do not have higher effects, on average, than their colleagues without such degrees.
8. On average, National Board Certified teachers outperform other teachers with the same levels of experience by 0.07 and 0.03 standard deviations in elementary math and English/language arts (ELA) respectively, which is roughly equivalent to two months of additional math instruction and one month of additional ELA instruction.



9. Performance in the first few years of teaching, as measured by teacher effects, is predictive of later performance. In fact, in the third year of teaching, teachers who previously had high teacher effects for two years (the top 25 percent) outperform teachers who previously demonstrated low teacher effects (the bottom 25 percent) by almost seven months of instruction.



10. Teachers who were laid off in 2008-09 and 2009-10 had similar average teacher effects as their colleagues who were not laid off.

SDP HUMAN CAPITAL DIAGNOSTIC

UNDERSTANDING TEACHER EFFECTS

■ What is a teacher effect and how is it estimated?

In the LAUSD Human Capital Diagnostic teacher effects are based on students' performance on the California Standards Tests (CSTs). Teacher effects are estimated by statistically isolating the effect a teacher has on his or her students' learning and separating it from factors teachers have no control over, such as student poverty, English-learner status, and the prior academic performance of classroom peers.² This implies that teacher effects are relative, not absolute, measures. Even if LAUSD teachers as a group were amongst the most effective in the nation, half would still have negative teacher effects because they are being compared to the average teacher in LAUSD. Teacher effects can only be estimated for teachers who can be linked to a classroom roster of students in grades for which CST information is available on student performance from the previous and current year.

■ What is considered a large effect size?

Throughout this report we will present findings in student test score standard deviation units, or effect sizes. However, there is no specific cut-off for determining whether an effect size is large or small. Effect estimates greater than 0.20 are often considered large for educational interventions. One point of comparison is the achievement gap between Latino and White students in LAUSD, which is 0.65 standard deviations in fifth-grade math.

We also convert effect sizes into a months of learning measure in this report. On nationally normed standardized tests, research has shown that an effect size of 0.20 is roughly equivalent to six additional months of learning above the average year's learning in math.³ To come to this estimate, the average annual student gains in math were calculated from six nationally normed standardized tests and averaged across grade transitions from third to eighth grade. While the CSTs are not nationally normed tests, we use these estimates as a rough approximation to translate effect sizes into a months of learning measure.

■ How is LAUSD's measure of Academic Growth Over Time related to the teacher effects used in this report?

SDP's teacher effects model is very similar to the model used to calculate Academic Growth Over Time (AGT), which is measured at the school- and teacher-level in LAUSD. There are two primary differences. First, the scale used to report teacher effects in this brief is different from that used to report AGT. Teacher effects in this brief will be reported in test score standard deviation units, where zero represents the average teacher effect, a negative estimate represents a below average teacher effect, and a positive estimate represents an above average teacher effect. In contrast, AGT estimates range from 1 to 5, where a 3 represents a teacher effect that is not significantly different from the average teacher. Second, AGT is intended to be used as a measure of individual teachers' impact, while analyses in this report are focused on the average effects of groups of teachers.

■ What teachers are included in this report?

In this report, we primarily present results for math teachers tied to students in grades three through eight from 2004–05 to 2010–11. We conducted similar analyses for ELA teachers in grades three through nine during the same timespan. In total, teacher effects were estimated for a little over 30% of certificated teachers. All data for the analyses come from LAUSD administrative records.

Generally, we do not present ELA results in this report for two reasons. First, the variation in effects among ELA teachers is substantially smaller than that among math teachers. This finding is consistent with other research on teacher effects and may suggest that other factors outside of the classroom have a larger influence on children’s ELA performance than is the case in other subjects. Current research also suggests that ELA state tests may also be less sensitive to instruction.⁴ Second, we do not present results among ELA teachers because, in most instances, they are very similar to our findings concerning math teachers (though some are smaller in magnitude). We explicitly make note of instances where ELA and math results diverge.

■ What are the limitations of teacher effects?

Teacher effects are valuable measures because they attempt to objectively capture the impact that individual teachers have on students while not holding teachers responsible for things out of their control (most importantly, prior academic achievement of students). As with any performance measure, however, they come with several caveats.

- Teacher effects measure teachers’ performance only as it relates to student achievement on the CST. Effective teachers do more than raise student test scores. Further, teacher effects are only as good as the assessment used to formulate them. Assessments that are insufficiently challenging or that are poorly aligned to the curriculum that the district expects its teachers to cover will not yield useful estimates.
- Some students may receive supplemental instruction (such as working with reading specialists or math coaches) that influences students’ academic progress. Supplemental instructors’ influence is not accounted for when estimating teacher effects. This is primarily a concern when estimating individual teacher effects. When looking at the effects of large groups of teachers, such supplemental instruction would only be problematic for estimating teacher effects if students receiving supplemental instruction are not randomly distributed across classrooms. For example, if students receiving supplemental instruction are placed with novice teachers at much higher rates than other students, this would present a problem for interpreting the relative effects of novice teachers.
- SDP analyses aim to elucidate aggregate trends, not to evaluate individual teachers. Even so, care is required when interpreting results concerning group averages of teacher effects. Although we often report findings concerning differences in average teacher effects of teachers from different groups, there is often far more variation in teacher effects within these groups than between them. As shown in Figure 15, teachers who previously had high teacher effects (the top 25 percent) are, on average, more effective than their peers who previously had low teacher effects (the bottom 25 percent). Yet, some bottom quartile teachers outperform top quartile teachers in their third year.

It is important to note that while teacher effects have limitations, none of the other widely used measures that are used as proxies for teacher effectiveness are strongly related to improvement in student outcomes. The most commonly rewarded indicators of teacher quality—years of experience and advanced degrees—account for little of the variation in teachers’ performance in improving student achievement.⁵ Until very recently, most teacher evaluation systems used in the vast majority of school districts did a very poor job of differentiating teachers at all—with up to 99% of teachers rated as “satisfactory.”⁶

SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS

1. How much do teacher effects vary among LAUSD math teachers?

Teacher effects vary substantially in LAUSD, more than in many other districts. The difference between a 75th and 25th percentile elementary math teacher is over one-quarter of a standard deviation, which is roughly equivalent to a student having eight additional months of instruction in a calendar year.

Nationwide, research has shown that teacher effects vary widely and can account for an important share of the differences in the academic progress made by students.⁷ In LAUSD, math teacher effects vary substantially as well. The difference between a 75th and 25th percentile elementary math teacher is over one-quarter of a standard deviation (Figure 1), which is larger than observed in many other SDP districts and much of the research literature.⁸ In middle school math, the difference between a 75th and 25th percentile teacher is smaller at 0.18 standard deviations (Figure 2).

To illustrate the practical importance of the spread of math teacher effects, consider that students assigned to a 75th percentile elementary teacher will have learned on average 0.28 standard deviations more in math than students assigned to a 25th percentile teacher. How large is the elementary math difference? A 0.28 standard deviation improvement is equivalent to an 11 percentile point increase on the CST math exam for a fourth-grade student at the 50th percentile. Another way of looking at this is that an effect size of 0.28 standard deviations is roughly the same as an additional eight months of learning beyond the typical year's learning.

Nationwide, ELA teacher effects do not vary as much as math teacher effects. Other factors outside of the classroom may have a larger influence on ELA performance, and ELA state tests may be less sensitive to instruction.⁹ Variation in ELA teacher effects are smaller in LAUSD relative to math effects as well. The difference between a 75th and 25th percentile teacher is 0.16 standard deviations in elementary school and 0.08 standard deviations in middle school (not shown).

Figure 1: Distribution of Elementary School Math Teacher Effects

Grades 3–5 Math Teachers, 2004–05 to 2010–11

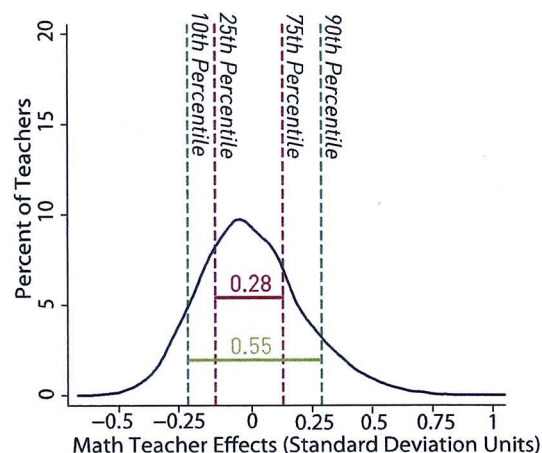
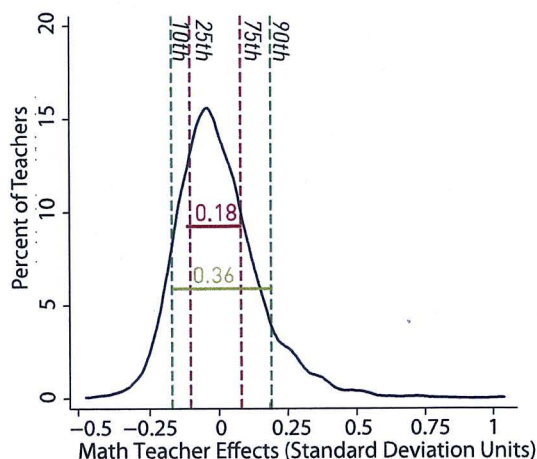


Figure 2: Distribution of Middle School Math Teacher Effects

Grades 6–8 Math Teachers, 2004–05 to 2010–11



SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS: RECRUITMENT

2. How do teacher effects differ for Teach for America and Career Ladder teachers compared to other novice and more experienced teachers?



Teach for America and Career Ladder teachers have higher math effects on average than other novices in their first year by 0.05 and 0.03 standard deviations respectively, which is roughly equivalent to one to two months of additional learning.

Figure 3: Teacher Effects Estimates for Career Ladder and Teach for America First-Year Teachers Relative to Other Novice Teachers

Grades 3–9 Novice Teachers, 2004–05 to 2010–11

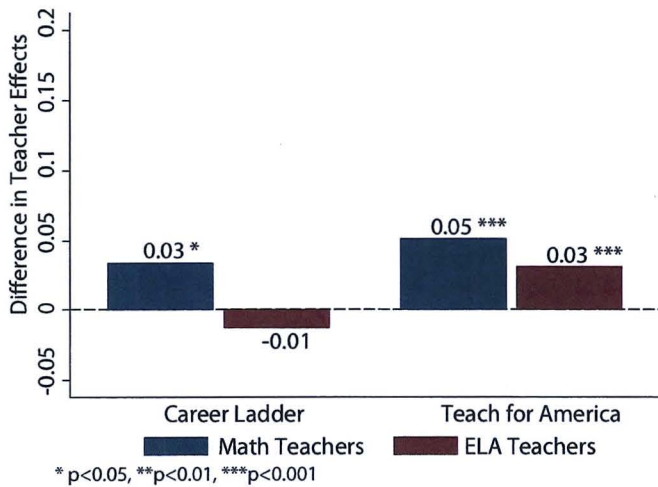
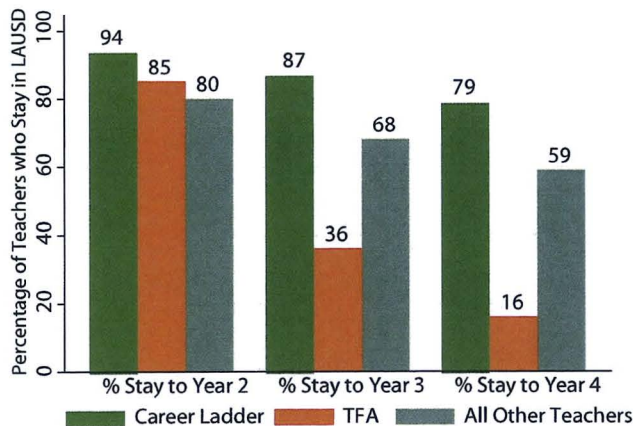


Figure 4: Percentage of First-Year Teachers Who Remain Teaching in LAUSD for Years 2, 3, and 4

Novice Teachers, 2004–05, 2005–06 and 2006–07 Cohorts



Teach for America (TFA) and the LAUSD Career Ladder program are two of the pathways into teaching in the district. TFA is a competitive national program that recruits and trains recent college graduates and professionals to teach in high-needs schools. The Career Ladder program provides a pathway for LAUSD paraprofessionals to become certificated teachers. Collectively, these programs have provided 13% of all new hires to the district in the last six years.

TFA and Career Ladder teachers have modestly higher math effects than other novices in their first year, and these differences persist over time. Career Ladder math teachers outperform other novice math teachers by 0.03 standard deviations, which is roughly equivalent to an additional month of math instruction (Figure 3). TFA math teachers outperform their peers by 0.05 standard deviations, which is roughly equivalent to a month and a half of additional math instruction.

The results are mixed, however, for ELA teachers. Novice Career Ladder ELA teachers perform similarly other novice ELA teachers on average. TFA ELA teachers slightly outperform other novice ELA teachers. The magnitude of this effect is smaller than in math.

As Figure 4 illustrates, retention rates are much higher for Career Ladder teachers compared to other teachers returning for their third and fourth years. While 87% of Career Ladder teachers stay in the classroom for their third year of teaching, only 36% of TFA teachers and 68% of all other newly hired LAUSD teachers stay.

These findings examine only two of the many sources of LAUSD's teachers. LAUSD should also examine the effects of teachers coming from other credentialing programs. However, data on the other programs is currently incomplete.

SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS: RECRUITMENT

3. What effects do extended substitute teachers have in comparison to teachers newly hired into the district and teachers with district experience?



LAUSD has increased its reliance on extended substitutes in the last several years. Relative to other new hires in middle school, extended substitutes have large positive effects in math, though not in other subjects.

Due to ongoing budget challenges, the percentage of new hires in LAUSD has decreased dramatically over the past few years from 7% of the teacher workforce in 2007–08 to 1% in 2010–11. At the same time, extended substitute teaching has become more prevalent, increasing from 0.1% to 3% of the teacher workforce in the same timespan (Figure 5). It may be that extended substitutes are, to some degree, substituting for permanent hires or serving as an alternative to laying off experienced teachers. Given these trends, it is important to understand both the backgrounds of extended substitutes and their teacher effects in comparison to other LAUSD teachers.

In middle school math, extended substitutes have higher teacher effects compared to all teachers. Their students outperform new hires by 0.13 standard deviations and other experienced teachers by 0.05 standard deviations on average (Figure 6). However, in middle school English, extended substitutes have slightly lower teacher effects compared to other experienced teachers.

Extended substitutes are less prevalent in LAUSD elementary schools. However, extended substitute elementary teachers have lower math effects as compared to new hires by 0.11 standard deviations and lower ELA effects as compared to experienced teachers by 0.04 standard deviations (not shown).

The extended substitute pool is not homogeneous in LAUSD. Half of extended substitutes have experience within LAUSD as teachers prior to being hired as extended substitutes, and the other half are new to the district and to teaching. Therefore, the implication of these finding is not necessarily that the district should employ more extended substitutes at the middle school level. The above findings suggest that district should further explore the characteristics of successful extended substitutes and the reasons for hiring extended substitutes at all levels.

Figure 5: Percent of LAUSD Workforce Who Are New Hires or Extended Substitutes

All Certificated Teachers, 2007–2008 to 2010–11

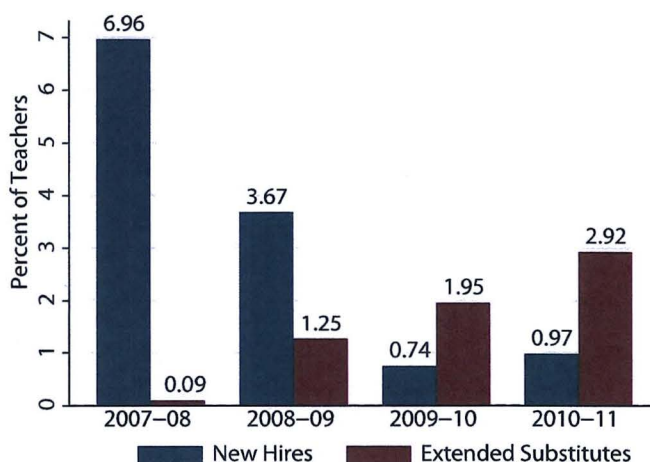
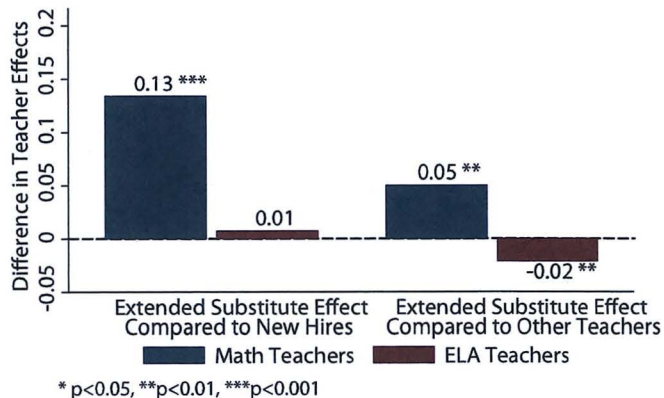


Figure 6: Average Teacher Effects of Extended Substitutes in Middle School as Compared to New Hires and All Other Teachers

Grades 6-8 Teachers, 2007-08 to 2010-11



SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS: PLACEMENT

4. How academically prepared are students who are placed with inexperienced teachers?



First-year teachers are assigned to students who begin the year academically behind students assigned to more experienced teachers.

Figure 7: Difference in Average Prior Math Performance of Students Assigned to Early-Career Teachers Compared to Teachers with More than Six Years of Experience

Grades 3-5 Teachers Districtwide, 2004-05 to 2010-11

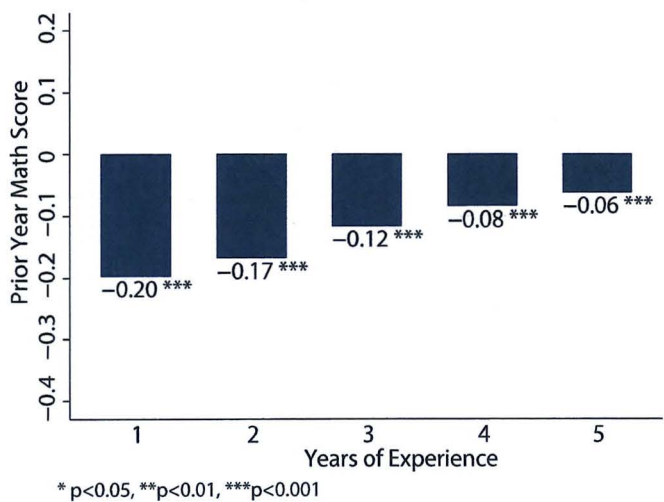
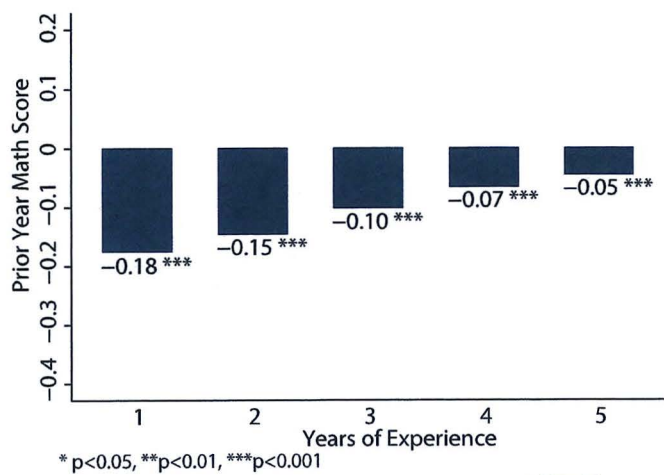


Figure 8: Difference in Average Prior Math Performance of Students Assigned to Early-Career Teachers Compared to Teachers with More than Six Years of Experience

Grades 3-5 Teachers Within Specific Schools, 2004-05 to 2010-11



Across the country and in LAUSD, novice teachers have been shown to have lower effects than their more experienced peers.¹⁰ Therefore, placing students who are already academically behind their peers with novice teachers is likely to exacerbate achievement gaps. Districtwide, novice and early career elementary teachers disproportionately teach students with lower standardized math scores from the previous year. In fact, first-year elementary teachers are assigned to students who begin the year approximately 0.2 standard deviations, or about six months, behind students placed with more experienced teachers in terms of academic proficiency (Figure 7).

If schools with lower-performing students also have a high teacher turnover rate, these results might hold districtwide, but not within individual schools. To learn more about that, we restricted the analysis to compare only teachers within the same school. The same patterns are evident *within* individual elementary schools, indicating that new teachers systematically receive students who begin the year academically behind the students assigned to more experienced teachers *in their same building* (Figure 8). Findings are similar, yet more pronounced, for middle school teacher and student placements, where there is more explicit placement based on academic achievement levels (not shown).

Districtwide findings in LAUSD are comparable with findings from other SDP school districts.¹¹ When examining differences within schools, however, many other SDP districts see less sorting by prior achievement between novice and experienced teachers' students than is evident in LAUSD.

SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS: PLACEMENT

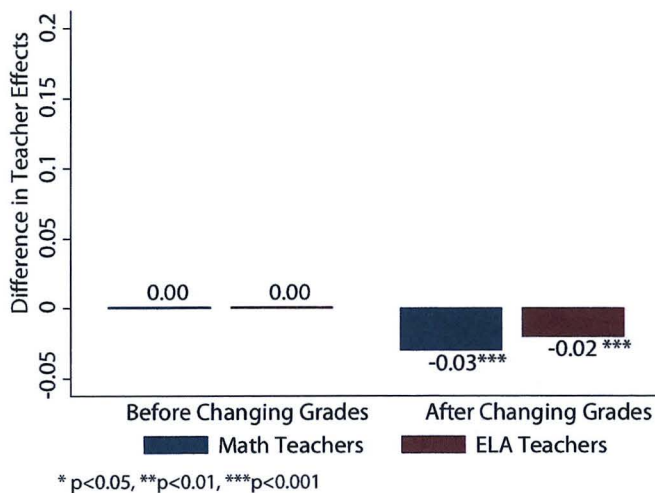
5. How is grade changing related to teacher experience and effects at the elementary level?



Early-career elementary teachers change grade assignments at higher rates than more experienced teachers. Teachers have slightly lower effects after a change in grade assignment than those who have not changed grades.

Figure 9: Average Teacher Effects of Teachers Changing Grades Relative to Teachers Who Do Not Change Grades (Controlling for Experience)

Grades 3–5 Teachers, 2004–05 to 2010–11



Turnover in LAUSD reflects national trends, with between 10 and 20% of teachers exiting their schools or leaving the district each year.¹² However, this understates the amount of teacher movement occurring in the district. Teacher movement is higher when considering teachers changing grades within schools. At the elementary level, early-career teachers change grades at higher rates than their more experienced peers with more than three years of experience. 32% of early-career teachers change grades as compared to 25% of experienced teachers.

Grade changing is related to slightly lower teacher effects, on average, in the year after the change. In fact, students in classrooms with elementary teachers who have changed grades experience 0.03 standard deviations less growth in math and 0.02 less in ELA, on average, in the year after the teacher changes grades as compared to performance of students who had teachers that did not switch grades (Figure 9). The lower teacher effects after grade changing correspond to about a month less of math or ELA instruction. This finding has implications for both teachers and students, especially when combined with other dynamics. For example, novice teachers have lower effects on average and movement between grades may compound this.

We note that there was more grade-changing in the last several years due to layoffs and declining and shifting student enrollment. However, these findings hold true when the analysis was restricted to earlier years of the analysis period.

SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS: DEVELOPMENT

6. How do teacher effects change over the course of a teacher's career?



LAUSD math teachers show substantial growth in effectiveness during their first five years in the classroom with a 0.12 standard deviation gain in their average teacher effect, which is roughly equivalent to an additional three months of instruction.

Studies in other districts show that early-career teachers make gains in terms of effects as they accrue the first few years of additional experience, while the returns largely plateau around year four for the average teacher.¹³ We largely see a similar pattern in LAUSD. In both math and ELA, LAUSD teachers generate the largest gains in terms of teacher effects during their first five years of teaching and appear to continue to improve over time. For example, fifth-year math teachers typically have made gains of 0.12 standard deviations since their first year of teaching, which is roughly equivalent to three months of additional math instruction (Figure 10). There is a similar upward trajectory for ELA teachers, although not as steep as that experienced by math teachers. On average, fifth-year ELA teachers have made gains of 0.06 standard deviations since their first year of teaching (not shown).

7. What effects do teachers with advanced degrees have as compared to teachers with bachelors degrees?

LAUSD teachers with advanced degrees do not have higher effects, on average, than their colleagues without such degrees.

Like other districts, LAUSD's teacher salary schedule compensates teachers for pursuing advanced degrees. Over a quarter of LAUSD teachers have master's or doctoral degrees, and a larger percentage have course credit beyond a bachelor's degree. However, the average effects of elementary and middle school math and ELA teachers with advanced degrees are not substantially different than their counterparts lacking such degrees (Figure 11). This result is consistent with findings in the national literature.¹⁴ Because LAUSD's salary schedule also compensates teachers for credit accrual, we investigated credit attainment as well and saw no consistent relationship with teacher effects (not shown).

Figure 10: Math Teachers' Returns to Experience
Grades 3–8 Math Teachers, 2004–05 to 2010–11

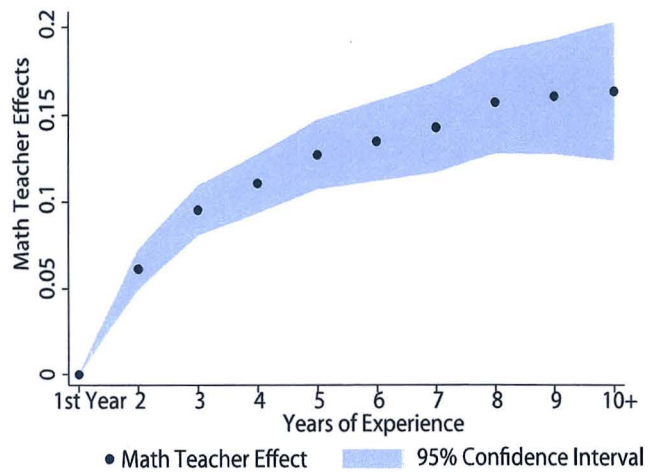
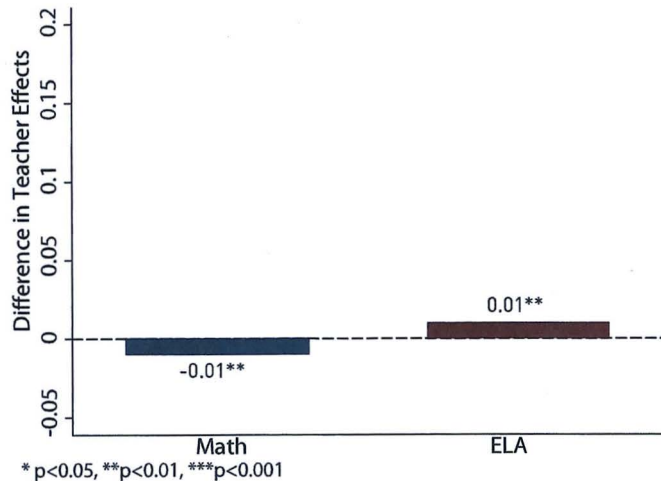


Figure 11: Teacher Effect Estimates of Teachers with an Advanced Degree Relative to Teachers with only a Bachelor Degree (Controlling for Teacher Experience)

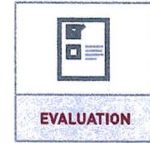
Grades 3–9 Teachers, 2004–05 to 2010–11



SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS: EVALUATION

9. Among novice teachers, do estimates of teacher effects predict future performance?



Effect estimates from the first two years of a teacher's career are predictive of teacher effects in the third year.

When considering an average novice teacher's performance, it is important to consider the stability of the teacher effect estimate in order to make decisions about professional development and strategic placements. Figure 14 groups third-year teachers into quartiles based on their teacher effect scores over the prior two years combined. Each bar represents the average teacher effect score in a teacher's third year. Teachers who ranked in the top quartile after the first two years continued to exhibit larger teacher effect estimates in their third year than teachers ranked in the three lower quartiles.

This result suggests that performance in the first few years of teaching is predictive of later performance, as measured by teacher effects. In fact, in the third year of teaching, teachers who previously had high teacher effects for two years (the top 25 percent) outperform teachers who previously had low teacher effects (the bottom 25 percent) by 0.24 standard deviations in math, which is roughly equivalent to seven months of learning. This finding holds true for ELA teachers as well. ELA teachers who previously demonstrated high performance outperform ELA teachers who previously demonstrated low performance by 0.12 standard deviations (not shown).

We note that prior teacher effect estimates and rankings, while informative, are imperfect. Teacher effects in the third year can vary widely for individual teachers. Figure 15 plots the distributions of third-year teacher effects for teachers who previously demonstrated high and low performance (the top and bottom quartiles). The ranges in teacher effects overlaps such that some bottom quartile teachers outperform top quartile teachers in their third year and vice versa.

Figure 14: Average Math Teacher Effect in Third Year By Ranking After First Two Years

Grades 3–8 Novice Math Teachers, 2005–06

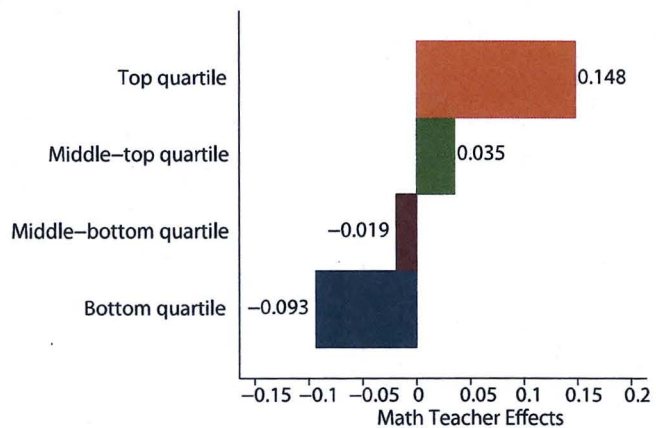
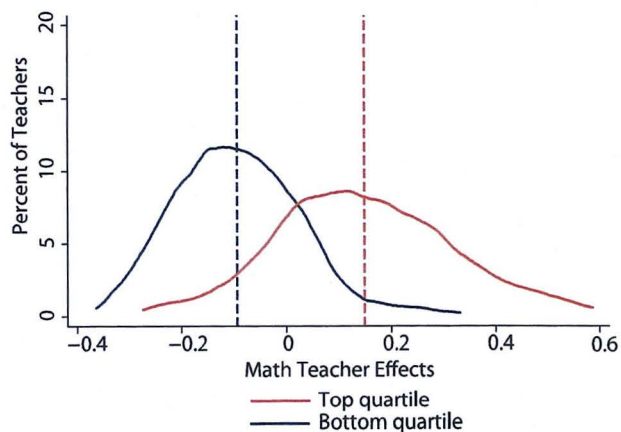


Figure 15: Distribution of Math Teacher Effect Estimates in the Third Year of Teaching By Ranking After First Two Years

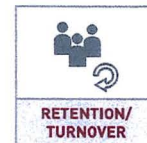
Grades 3–8 Novice Math Teachers, 2005–06



SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS: RETENTION/TURNOVER

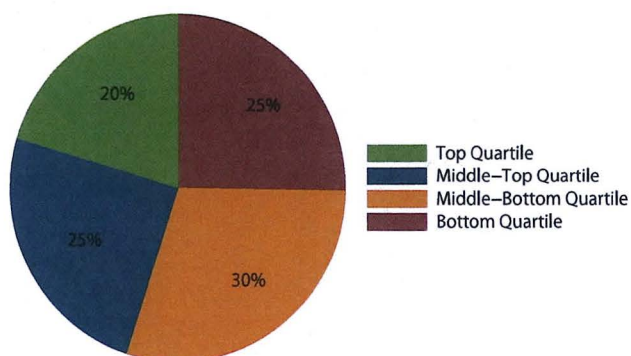
10. How are layoffs related to teacher effects?



Teachers who were laid off in the past several years had similar average teacher effects as their colleagues who were not laid off.

Figure 16: Distribution of Laid-Off Teachers, By Prior Year's Math Teacher Effect Quartile

Grades 3-8 Laid-Off Teachers, 2008-09 and 2009-10



Due to budget shortfalls and declining student enrollment, LAUSD has been forced to layoff large numbers of teachers since the 2008-09 school year. Generally, teacher seniority is the primary criterion for determining who is laid off, although there are notable exceptions. These exceptions include LAUSD's decisions to lay off teachers out of seniority order if they did not meet No Child Left Behind's Highly Qualified Teacher certification requirements and, in 2011, to protect teachers with less seniority who taught in the district's highest need schools.

Figure 16 illustrates that, as expected, layoffs driven primarily by seniority did not have a strong relationship to teacher effects. In both 2008-09 and 2009-10, laid-off teachers were slightly less effective on average compared to those teachers that were not laid off. Still, 45% of laid-off teachers were in the top two quartiles of teacher effectiveness.

If a district goal is to ensure that students are taught by the best possible teachers, basing layoff decision primarily on seniority rather than on performance is unlikely to further that goal. Of course, seniority and teacher effects estimates alone are both limited measures of teacher performance. Ideally, the district would have access to multiple measures to ensure that critical decisions such as layoffs are handled to minimize potential harm to student achievement.

SDP HUMAN CAPITAL DIAGNOSTIC

DETAILED FINDINGS

How can findings from this brief help to inform human capital strategies?

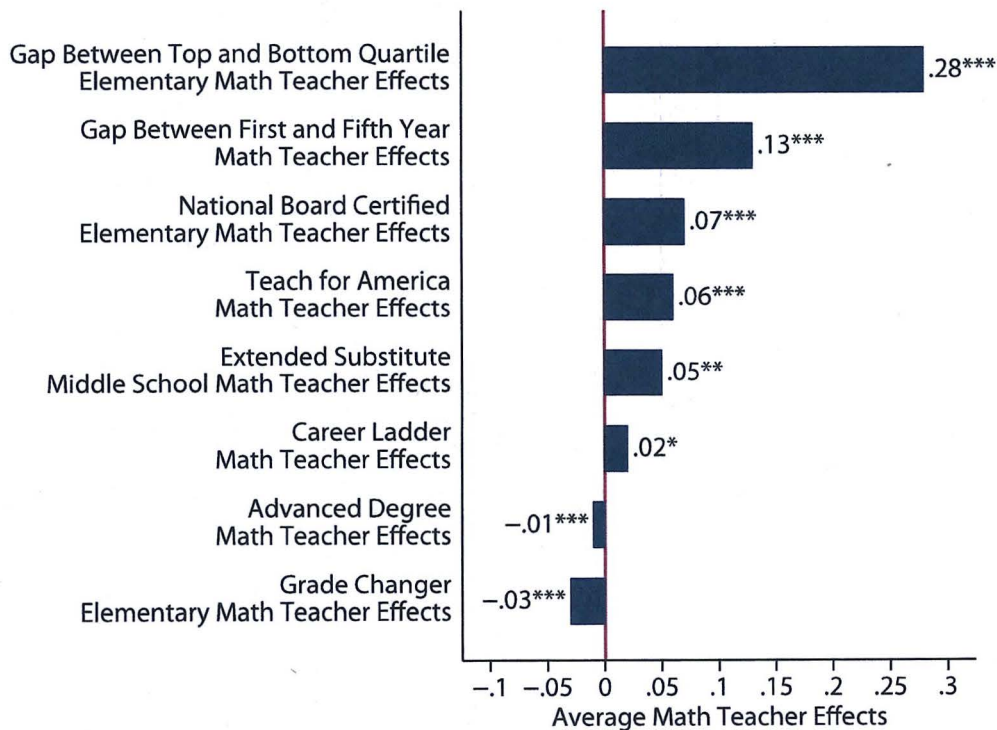
Multiple human capital strategies will need to be pursued in order to reduce and eliminate the achievement gaps in LAUSD.

Achievement gaps in LAUSD remain large. In fact, the difference between Black and White students' performance and Latino and White students' performance in fifth-grade math is 0.85 and 0.65 standard deviations respectively. These Black-White and Latino-White gaps are roughly equivalent to differences of over one and a half years of learning.

The achievement gaps in LAUSD can provide context for the findings in this brief. The effect sizes from several findings are summarized in Figure 17. Note that no

single effect on its own is large enough to eradicate LAUSD's test score gaps. Yet, teachers remain a critical school-based input for improving student performance. Therefore, the district will need to consider multiple strategies to close achievement gaps. While the findings in this brief only scratch the surface of potential human capital strategies, they illustrate that teacher recruitment, placement, development, evaluation, and retention make significant impacts on student performance in the district.

Figure 17: Overview of Relative Effect Sizes in LAUSD, Findings from Human Capital Brief



* p<0.05, **p<0.01, ***p<0.001

SDP HUMAN CAPITAL DIAGNOSTIC

NOTES

Endnotes

1. Rivkin, S.G., Hanushek, E.A., and Kain, J.F. (2005). Teachers, Schools, and Academic Achievement. *Econometrica*, 73(2): 417-458.
2. At the student level, the model controls for prior achievement, gender, race/ethnicity, participation in free or reduced price lunch, English language learner classification, homelessness, special education classification, gifted program participation, whether a student was retained, and whether the student was new to the school (this includes a control for structural transitions from elementary to middle schools as well as a control for non-structural changes). In addition, the student-level variables are averaged by a student's classroom peers and a student's grade-level peers (cohort) in the same school. The peer and cohort averages are also included in the model.
3. Hill, C.J., Bloom, H.S., Black, A.R., and Lipsey, M.W. (2008). Empirical Benchmarks for Interpreting Effect Sizes in Research. *Child Development Perspectives*, 2(3):172-177.
4. Kane, T., & Cantrell, S. (2010). Learning about teaching: Initial findings from the measures of effective teaching project. *MET Project Research Paper, Bill & Melinda Gates Foundation*, p. 9.
5. Gordon, R., Kane, T.J., and Staiger, D.O. (2006). Identifying Effective Teachers Using Performance on the Job. *Hamilton Project Discussion Paper, The Brookings Institution*.
- Rivkin, S.G., Hanushek, E.A., and Kain, J.F. (2005). Teachers, Schools, and Academic Achievement. *Econometrica*, 73(2): 417-458.
6. The 2009 New Teacher Project study, the Widget Effect, found that in evaluation systems with ratings of "satisfactory" and "unsatisfactory" 99% of teachers earned "satisfactory." In evaluation systems with more than two ratings, 94% of teachers received one of the top two ratings and less than 1% were rated unsatisfactory.
7. Aaronson, D., Barrow, L. and Sander, W. (2007). Teachers and Student Achievement in the Chicago Public Schools. *Journal of Labor Economics*, 25(1): 95-135.
- Rivkin, S.G., Hanushek, E.A., and Kain, J.F. (2005). Teachers, Schools, and Academic Achievement. *Econometrica*, 73(2): 417-458.
- Rockoff, J. E. (2004). The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data. *American Economic Review*, 94(2): 247-52.
- Staiger, D. and Rockoff, J. (2010). Searching for Effective Teachers with Imperfect Information. *The Journal of Economic Perspectives*, 24 (3): 97-117.
8. Hanushek, E.A and Rivkin, S.G. (2010). Generalizations about Using Value-Added Measures of Teacher Quality. *American Economic Review*, 100(2): 267-271.
- Center for Education Policy Research. (2012). Learning About Teacher Effectiveness: SDP Human Capital Diagnostic, Gwinnett County Public Schools, Georgia, Strategic Data Project. Cambridge, MA: Center for Education Policy Research at Harvard University.
- Center for Education Policy Research. (2011). Learning About Teacher Effectiveness: SDP Human Capital Diagnostic, Fulton County Public Schools, Georgia, Strategic Data Project. Cambridge, MA: Center for Education Policy Research at Harvard University.
9. Kane, T., & Cantrell, S. (2010). Learning about teaching: Initial findings from the measures of effective teaching project. *MET Project Research Paper, Bill & Melinda Gates Foundation*.
10. Clotfelter, C.T., Ladd, H.F., and Vigdor, J.L. (2006). Teacher-Student Matching and the Assessment of Teacher Effectiveness. NBER Working Paper 11936.
- Jacob, B. (2007). The Challenges of Staffing Urban Schools with Effective Teachers. *The Future of Children*, 17(1): 129-54.
11. Center for Education Policy Research. (2012). Do Low-Performing Students Get Placed with Novice Teachers? Strategic Data Project. Cambridge, MA: Center for Education Policy Research at Harvard University.
12. Keigher, A. (2010). Teacher Attrition and Mobility: Results from the 2008-09 Teacher Follow-Up Survey. NCES 2010-353. U.S. Department of Education, Washington, DC: National Center for Education Statistics, p. 6.
13. Boyd, D.J. (2006). How Changes in Entry Requirements Alter the Teacher Workforce and Affect Student Achievement. *Education Finance and Policy*, 1(2):176-216.
- Harris, D. and Sass, T.R. (2011). Teacher Training, Teacher Quality, and Student Achievement. *Journal of Public Economics*, 95(7-8): 798-812.
14. Gordon, R., Kane, T.J., and Staiger, D.O. (2006). Identifying Effective Teachers Using Performance on the Job. *Hamilton Project Discussion Paper, The Brookings Institution*.

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NOTES CONTINUED

Figure Notes

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1. Sample: Third- through fifth-grade unique math teachers in 2004–05 through 2010–11. N=11,871.

2. Sample: Sixth- through eighth-grade unique math teachers in 2004–05 through 2010–11. N=2,799. Figures are based on three-year pooled estimates of teacher effects for each teacher.

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3. Sample: Third- through eighth-grade unique math teachers and third- through ninth-grade unique ELA teachers in 2004–05 through 2010–11 who were newly hired at the district within the same time period. Math teachers=1,686; ELA teachers= 2,036.

4. Sample: All unique teachers newly hired between 2004–05 and 2006–07. Career Ladder=442; TFA=423; All Other Teachers=7347. Note: We restricted to earlier cohorts because retention rates from 2008 onward were affected by reductions in force (RIFs).

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5. Sample: Extended substitutes and teachers newly hired into LAUSD elementary, middle, and high schools between 2007–08 and 2010–11. New hires=3,682; Extended substitutes=1,714.

6. Sample: Sixth- through eighth-grade extended substitutes and teachers newly hired into LAUSD middle schools between 2007–08 and 2010–11. Math teacher-year records=8,881; ELA teacher-year records=14,613.

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9. Sample: Third- through fifth-grade math and ELA teachers from 2004–05 to 2010–11 with teacher effect estimates. Math teacher-year records=31,016. ELA teacher-year records=31,019.

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10. Sample: Third- through ninth-grade math and ELA teachers from 2004–05 to 2010–11 with teacher effect estimates. Math teacher-year records=50,293; ELA teacher-year records=56,064. Effects are estimated using teacher fixed effects.

11. Sample: Third- through ninth-grade math and ELA teachers from 2004–05 to 2010–11 with teacher effect estimates and information regarding their advanced degree status. Math teacher-year records=44,168; ELA teacher-year records=49,403. Degree information is based on salary grade. Having a master, specialized, or doctoral degree all count as an advanced degree. Additional analyses were conducted to see if there were differential effects amongst all advanced degree types. Because there were no differential effects, this analysis focuses on the aggregate effect of having an advanced degree.

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12, 13. Third- through fifth- grade math and ELA teachers from 2006–07 to 2010–11 with teacher effect estimates and information regarding National Board Certification. Math teacher-year records=35,426; ELA teacher-year records=39,166.

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14, 15. Sample: Third- through eighth-grade novice math teachers in 2005–06 who stay and teach for at least three years (through 2007–08) and who have teacher effect estimates in all three years. Unique teachers=197.

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16. Sample: Third- through eighth-grade math teachers in 2007–08 and 2008–09 with teacher effect estimates who were laid off in 2008–09 and 2009–10. We use the prior year effects estimates because of the potential that receipt of Reduction-in-Force (RIF) and layoff notices may affect current year estimates. Bottom quartile: N=145; middle-bottom quartile: N=171; middle-top Quartile: N=142; top quartile: N=116.

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17. Compilation of significant effect sizes from Figures 1, 3, 6, 9, 11, 12, and 14.

The Strategic Data Project thanks Emily Mohr, Hansheng Chen, and LAUSD staff members who participated in the LAUSD Human Capital Steering Committee for their input and guidance. These analyses were conducted by Julia Bloom and Nicole Wagner. Jared Serwer created this report.



Center for Education Policy Research

HARVARD UNIVERSITY

THE IMPACT OF

National Board Certified Teachers
on the Literacy Outcomes of
Mississippi Kindergarteners
and Third Graders

May, 2017



MISSISSIPPI STATE UNIVERSITY
NATIONAL STRATEGIC PLANNING
& ANALYSIS RESEARCH CENTER

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INTRODUCTION

Mississippi's Literacy-Based Promotion Act (2013) established new statewide academic performance requirements designed to ensure that Mississippi public school students meet reading ability standards by the end of third grade. The LBPA's stipulations have focused the attention of the educational community on how to improve the reading skills of early-grade Mississippi public school students. Reflecting this development, the National Board for Professional Teaching Standards (NBPTS) recently launched an initiative to enhance the literacy outcomes of K-3 students in Mississippi by more fully utilizing the instructional abilities of National Board Certified Teachers (NBCTs). National Board Certification (NBC) is a voluntary certification program established by NBPTS to distinguish educators who meet defined standards for accomplished teaching. The new NBPTS effort in Mississippi raises the question of whether reading teachers possessing National Board Certification provide higher quality instruction and improve student literacy skills more than other reading teachers within the early grades.

To examine this issue, the current study compares the performance on literacy assessments of Mississippi public school students taught by a National Board Certified reading teacher with that of peers not taught by an NBC reading teacher. The focus is on kindergarteners and third graders attending Mississippi public schools during academic year 2015-2016. To preview findings, the results provide evidence that students receiving reading instruction from a National Board Certified Teacher is associated with more favorable literacy outcomes on their part. Kindergarteners with an NBC reading teacher were approximately five percentage points more likely than other kindergarteners to achieve a proficient score on the MKAS2 reading assessment and around two percentage points more likely to achieve performance growth on the test. Likewise, third graders with an NBC reading teacher were nearly 11 percentage points more likely than other third graders to score proficiently on the Mississippi Assessment Program (MAP) English test. The students of National Board Certified Teachers continued to display these advantages in literacy skills after various student-, teacher-, and school-level factors were controlled for.

BACKGROUND

In 2013, the Mississippi Legislature passed the Literacy-Based Promotion Act (LBPA). The LBPA's goal is to enhance the literacy skills of K-3 Mississippi public school students so that they are capable of reading at or above grade level by the end of the third grade. The law mandates (beginning with academic year 2014-2015) that reading screeners be administered to Mississippi public school students in each of these grades and that remediation resources be directed to those students identified as possessing a reading deficiency. Furthermore, the LBPA requires that third graders score above the lowest achievement category on the reading component of the state annual accountability assessment, or qualify for an approved exemption, in order to be promoted to the fourth grade (Ciurczak 2016).

The Literacy-Based Promotion Act has drawn greater attention to the need for improving the reading skills of early-grade Mississippi public school students. It is in this context that the National Board for Professional Teaching Standards (NBPTS) has proposed a strategy to boost the literacy abilities of K-3 Mississippi public school students by means of National Board Certified Teachers (NBCTs). The NBPTS plan involves more broadly harnessing the teaching capacities of NBCTs with the goal of increasing the overall quality of literacy instruction provided to students.

National Board Certification is a voluntary, professional certification program that NBPTS created to distinguish and cultivate effective teachers (National Board for Professional Teaching Standards 2017a). An educator's acquisition of

and professional characteristics; and school/community attributes. Likewise, Cowan and Goldhaber (2015) find that fourth through eighth grade Washington students taught by an NBCT displayed significantly higher levels of reading achievement during 2006-2013 than their counterparts lacking an NBCT after accounting for student demographics and prior academic performance.

Although an appreciable amount of research has been conducted on the effectiveness of National Board Certified Teachers, existing studies are of limited value in assessing the viability of the NBPTS strategy to improve the literacy outcomes of K-3 students in Mississippi. There are two reasons for this. First, it appears that none of the NBCT analyses carried out up to this point examine the outcomes of students in the earliest grades (i.e., before 3rd grade) or 3rd grade outcomes separately from outcomes for higher grade levels. Second, no previous studies analyze the effect of NBCTs on the achievement of Mississippi students in particular. These gaps point to the need for research that specifically examines the impact of National Board Certified Teachers on the literacy outcomes of early-grade Mississippi public school students.

CURRENT STUDY

The current study seeks to expand the body of knowledge concerning NBCT effectiveness by examining whether National Board Certified Teachers promote the literacy abilities of kindergarten and third grade students attending Mississippi public schools. The outcomes of first and second grade students are also of interest, but there is not sufficient data to examine these grades. The analysis focuses on whether kindergarten and third grade students taught by a National Board Certified reading teacher tend score higher on standardized literacy assessments than same-grade counterparts not provided reading instruction by an NBCT. The results are intended to provide insight on whether NBCTs could serve as an important component of efforts to enhance the literacy skills of Mississippi public school students in early grades.

METHODOLOGY

Data

The analysis relies on data from the Mississippi Department of Education (MDE) and the National Board for Professional Teaching Standards (NBPTS). The MDE data consists of de-identified individual-level records for kindergarten and third grade students attending Mississippi public schools during academic year 2015-2016. These records contain information on students' demographic characteristics, school of attendance, grade level, teachers, and academic performance, among other characteristics. The NBPTS data consists of a file containing information on individuals residing in Mississippi who have achieved National Board Certification. The MDE and NBPTS data were merged so that kindergarten and third grade Mississippi public school students with an NBC reading teacher could be distinguished from their peers without an NBC reading teacher.

Table 1 presents summary figures on the students included in the analysis. The dataset encompasses 29,170 kindergarteners—1,702 of whom (5.83 percent) had an NBC reading teacher—and 37,929 third graders—2,842 of whom (7.49 percent) had an NBC reading teacher.

of both regressions assumes that the data possesses three levels: students (Level 1) are nested within teachers (Level 2), who in turn are nested within schools (Level 3).

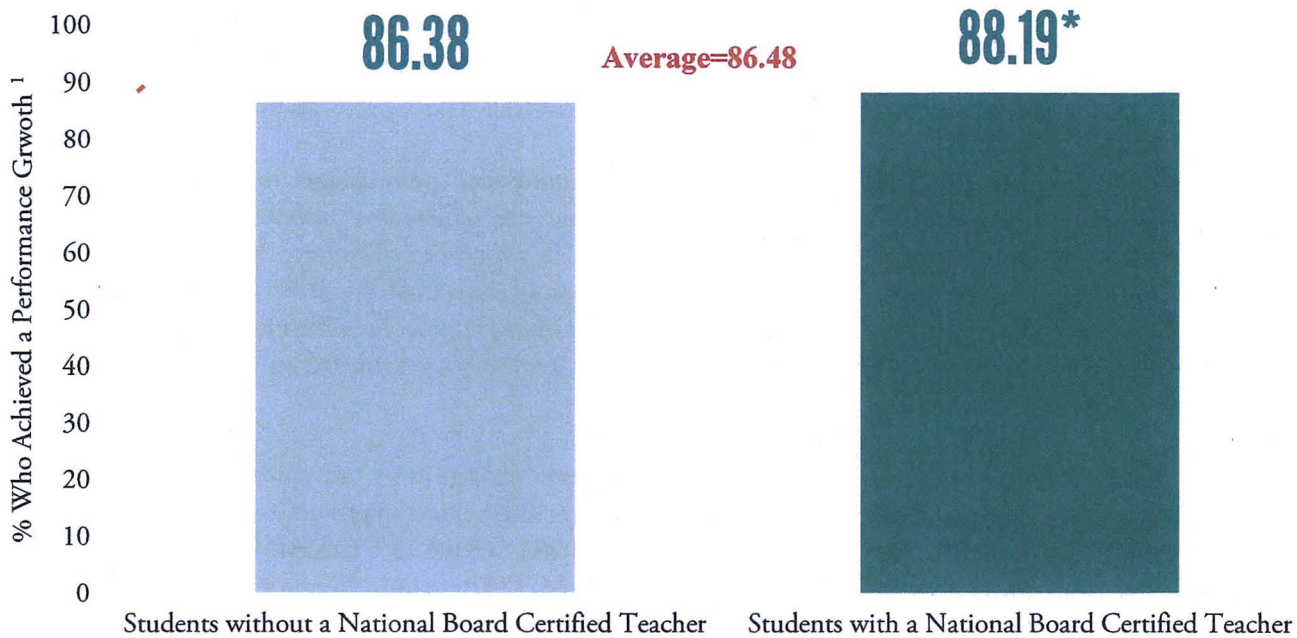
Third grade students. The relationship between third grade students having a National Board Certified reading teacher and their literacy performance is also examined using both descriptive and multivariate statistics. Regarding the descriptive analysis, the percentage of students achieving a proficient score on the third grade MAP test in English Language Arts, disaggregated by the NBCT status of their reading teacher, is calculated.

Regarding the third grade multivariate analysis, a multilevel hierarchical regression is performed to identify the relationship between a student having an NBC reading teacher and their literacy ability, after controlling for other characteristics. The outcome variable for the regression is a binary variable coded 1 if the student achieved a proficient test score on the third grade MAP English test and code 0 otherwise. The key explanatory variable is a binary term in which students with an NBC reading teacher are coded 1 and other students are coded 0. Among the factors included in the regressions as control variables are student's race, gender, school absenteeism record, and grade retention history; teacher's teaching experience; and school's performance level as determined by the Mississippi State Board of Education (see Table 2 for the definitions of the control variables). The hierarchical design of the regression assumes that the data possesses three levels: students (Level 1) are nested within teachers (Level 2), who in turn are nested within schools (Level 3).

Table 2. Definitions of the Control Variables: Academic Year 2015-2016

Variable	Definition
Race	Three categorical variables control for whether the student was white (reference category), black, or another race.
Gender	Binary variable equals one if the student was female and zero if they were male.
School Absenteeism Record	Binary variable equals one if the student was absent for 18 or more days during the 2015-2016 school year and zero if they had not been absent for this amount of time.
Grade Retention History	Binary variable equals one if the student was retained in the same grade between academic years 2014-2015 and 2015-2016 and zero if they were not retained over this period.
Pre-Test Performance (kindergarten regressions only)	Four categorical variables control for the student's performance level on the MKAS2 pre-test: early emergent (lowest), late emergent, transitional, and probable reader (highest) (reference group).
Teaching Experience	Binary variable equals one if the teacher had five or more years for teaching experience and 0 if they had less than five.
School Performance	Four categorical variables control for the school's "accountability status" grade as determined by the Mississippi State Board of Education: (1) A, (2) B, (3) C, and (4) D or F (reference group). Accountability status is an official measure of school performance based on students' achievement and growth levels on standardized tests and (in the case of high schools) their graduation rates. Schools scoring highest on these measures receive a grade of "A" while those scoring lowest receive an "F."

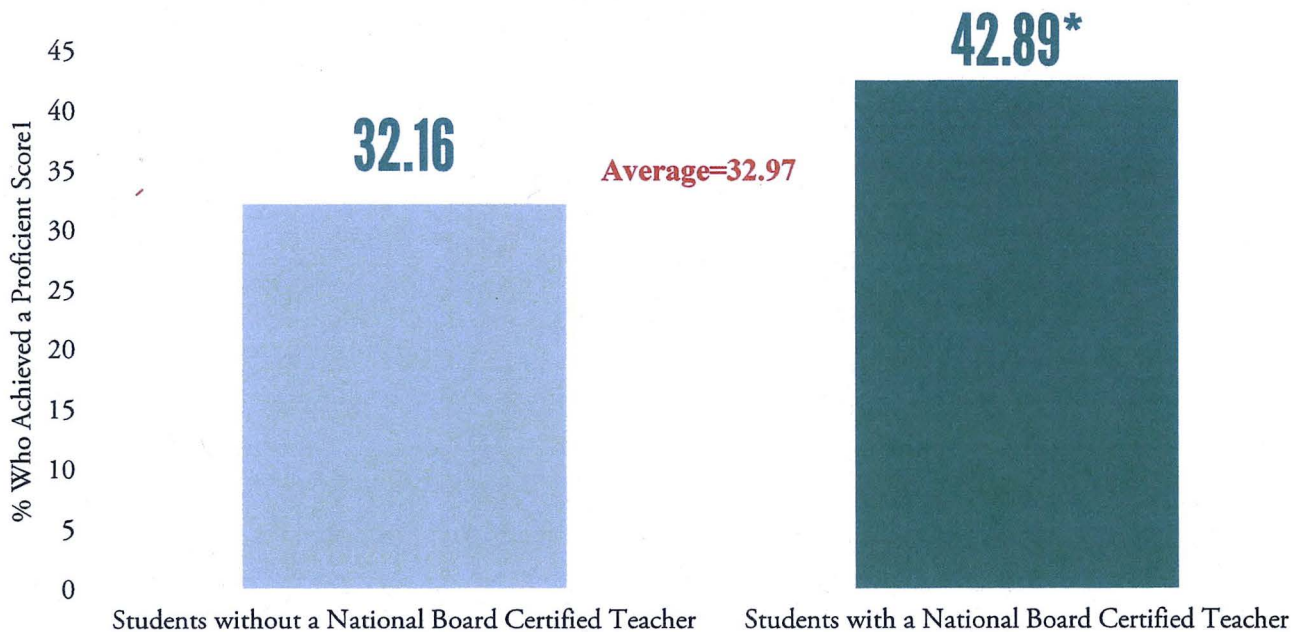
Figure 2. Student Performance Growth on the MKAS2 Kindergarten Readiness Assessment, by Teacher's National Board Certification Status: Academic Year 2015-2016



¹ The Kindergarten Readiness Assessment has four official score categories: early emergent (lowest), late emergent, transitional, and probable reader (highest). Students who scored within the early emergent (lowest), late emergent, or transitional range in pre-test and moved up at least one more level in post-test score, or the probable reader range were staying at the same level are classified here as having achieved a growth.

*Differences in performance growth between students with a National Board Certified Teacher and those without a National Board Certified Teacher are statistically significant at the $p < 0.05$ level.

Figure 3. Student Performance on the 3rd Grade Mississippi Assessment Program Test in English Language Arts, by Teacher's National Board Certification Status: Academic Year 2015-2016



¹ The 3rd Grade Mississippi Assessment Program Test in English Language Arts has five official score categories: minimal (lowest), basic, pass, proficient, and advanced (highest). Students who scored in either the proficient or advanced range are classified here as having achieved a proficient score.

*Differences in proficiency between students with a National Board Certified Teacher and those without a National Board Certified Teacher are statistically significant at the $p < 0.001$ level.

Table 3. Binary Logistic Regression of Kindergarteners' Achievement of a Proficient MKAS2 Literacy Assessment Score

Effect	B	SE	Odds Ratio
Intercept	2.279***	0.254	9.763
NBC Status of Reading Teacher (Non-NBCT as Reference)			
NBCT	0.268***	0.069	1.307
Control Level 1 (Student level)			
Race (White as Reference)			
<i>Black</i>	-0.676***	0.039	0.509
<i>Other Race</i>	-0.327***	0.059	0.721
Gender (Male as Reference)			
<i>Female</i>	0.087**	0.029	1.091
School Absenteeism Record (Not Chronically Absent as Reference)			
<i>Chronically Absent</i>	-0.438***	0.048	0.645
Grade Retention History (Not Retained in School as Reference)			
<i>Retained in School</i>	-1.135***	0.056	0.322
Pre-Test Level (Probable Reader (highest level) as Reference)			
<i>Early Emergent</i>	-4.032***	0.243	0.018
<i>Late Emergent</i>	-2.338***	0.242	0.097
<i>Transitional Reader</i>	-0.853***	0.250	0.426
Control Level 2 (Teacher Level)			
Teaching Experience (Less Than 5 Years as Reference)			
<i>Five years or more</i>	0.055	0.042	1.057
Control Level 3 (School Level)			
School performance (reference = D/F)			
<i>A</i>	0.387**	0.127	1.472
<i>B</i>	0.129	0.097	1.138
<i>C</i>	0.159!	0.096	1.172

Note: ! $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed test)

Table 5. Binary Logistic Regression of Third Graders' Achievement of a Proficient Score on the MAP Literacy Assessment

Effect	B	SE	Odds Ratio
Intercept	-0.693***	0.061	0.500
NBC Status of Reading Teacher (Non-NBCT as Reference)			
NBCT	0.102*	0.051	1.107
Control Level 1 (Student level)			
Race (White as Reference)			
<i>Black</i>	-1.199***	0.031	0.301
<i>Other Race</i>	-0.593***	0.048	0.553
Gender (Male as Reference)			
<i>Female</i>	0.260***	0.024	1.297
School Absenteeism Record (Not Chronically Absent as Reference)			
<i>Chronically Absent</i>	-0.390***	0.048	0.677
Grade Retention History (Not Retained in School as Reference)			
<i>Retained in School</i>	-1.479***	0.086	0.228
Control Level 2 (Teacher Level)			
Teaching Experience (Less Than 5 Years as Reference)			
<i>Five years or more</i>	0.038	0.034	1.038
Control Level 3 (School Level)			
School performance (reference = D/F)			
<i>A</i>	0.987***	0.093	2.863
<i>B</i>	0.628***	0.068	1.873
<i>C</i>	0.218**	0.070	1.244

Note: ! $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed test)

REFERENCES

- Cantrell, Steven, Jon Fullerton, Thomas J. Kane, and Douglas O. Staiger. 2008. "National Board Certification and Teacher Effectiveness: Evidence from a Random Assignment Experiment." *National Bureau of Economic Research*. Retrieved March 3, 2017 (<http://www.nber.org/papers/w14608>).
- Ciurczak, Ellen. 2016. "Prohibiting Social Promotion: The Third-Grade Gate." *The Clarion-Ledger*. Retrieved April 2, 2017 (<http://www.clarionledger.com/story/news/local/2016/12/18/prohibiting-social-promotion-third-grade-gate/95594932/>).
- Clotfelter, Charles T., Helen F. Ladd, and Jacob L. Vigdor. 2006. "Teacher-Student Matching and the Assessment of Teacher Effectiveness." *Journal of Human Resources* 41(4):778-820.
- Clotfelter, Charles T., Helen F. Ladd, and Jacob L. Vigdor. 2007. "Teacher Credentials and Student Achievement: Longitudinal Analysis with Student Fixed Effects." *Economics of Education Review* 26(6):673-682.
- Cowan, James, and Dan Goldhaber. 2015. "National Board Certification and Teacher Effectiveness: Evidence from Washington." *Center for Education Data & Research*.
- Goldhaber, Dan, and Emily Anthony. 2007. "Can Teacher Quality Be Effectively Assessed? National Board Certification as a Signal of Effective Teaching." *The Review of Economics and Statistics* 89(1):134-150.
- Harris, Douglas N., and Tim R. Sass. 2009. "The Effects of NBPTS-Certified Teachers on Student Achievement." *Journal of Policy Analysis and Management* 28(1):55-80.
- Mississippi Department of Education. 2015. "The MDE Literacy Coach Handbook." Retrieved June 5, 2017 (http://www.mde.k12.ms.us/docs/curriculum-and-instructions-library/public-literacy-coach-handbook-9-17-15_final-2_20150918081529_617122.pdf?sfvrsn=2).
- National Board for Professional Teaching Standards. 2017a. "About Certification." Retrieved April 2, 2017 (<http://boardcertifiedteachers.org/about-certification>).
- National Board for Professional Teaching Standards. 2017b. "Guide to National Board Certification, Version 1.9." Retrieved April 4, 2017 (http://www.boardcertifiedteachers.org/sites/default/files/Guide_to_NB_Certification.pdf).
- Vandevoort, Leslie G., Audrey Amrein-Beardsley, and David C. Berliner. 2004. "National Board Certified Teachers and Their Students' Achievement." *Education Policy Analysis Archives*. 12(46).

Table A2: Descriptive Statistics: Third Grade Students

Variable	All third graders	Third graders w/ NBC reading teacher	Third graders w/ non-NBC reading teacher
Gender			
<i>Male</i>	51.04%	50.81%	51.06%
<i>Female</i>	48.96%	49.19%	48.94%
Race			
<i>White</i>	42.46%	58.37%	41.17%
<i>Black</i>	50.62%	33.64%	52.00%
<i>Other Race</i>	6.91%	7.99%	6.82%
Teacher's level of teaching experience			
<i>Less than five years</i>	21.31%	0%	23.04%
<i>Five years or more</i>	78.69%	100%	76.96%
School absenteeism record			
<i>Not chronically absent</i>	92.45%	92.93%	92.41%
<i>Chronically absent</i>	7.55%	7.07%	7.59%
Grade retention history			
<i>Not retained a grade</i>	94.42%	95.50%	94.33%
<i>Retained a grade</i>	5.58%	4.50%	5.67%
School performance			
<i>A</i>	13.65%	20.97%	13.06%
<i>B</i>	30.20%	41.63%	29.28%
<i>C</i>	27.12%	22.03%	27.53%
<i>D/F</i>	29.02%	15.38%	30.13%



National Board Certification and Teacher Effectiveness: Evidence from Washington

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February 11, 2015

Abstract: We study the effectiveness of teachers certified by the National Board for Professional Teaching Standards (NBPTS) in Washington State, which has one of the largest populations of National Board Certified Teachers (NBCTs) in the nation. Based on value-added models in math and reading, we find that NBPTS certified teachers are about 0.01-0.05 student standard deviations more effective than non-NBCTS with similar levels of experience. Certification effects vary by subject, grade level, and certification type, with greater effects for middle school math certificates. We find mixed evidence that teachers who pass the assessment are more effective than those who fail, but that the underlying NBPTS assessment score predicts student achievement. Finally, we use the individual assessment exercise scores to estimate optimal weights for value-added prediction.

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Individual teachers have substantial influences on both immediate outcomes, such as standardized test scores, behavioral outcomes, and long-term outcomes, such as high school graduation, college attendance, and earnings.¹ Yet, the credentials typically rewarded in the labor market, advanced degrees and experience, do not explain much of the variation in teacher quality.² The National Board for Professional Teaching Standards (NBPTS), established in 1987, represents one strategy for recognizing teacher quality. The National Board is a voluntary system for assessing accomplished teaching. NBPTS offers an assessment process across several subject areas that is meant to signify teachers have achieved a high level of practice. NBPTS certification relies on an authentic, or “portfolio,” assessment process, which means that it uses artifacts of teacher practice, including videos of classroom lessons, student work, and reflective essays. Over the past two decades, both the program and the reach of National Board Certified Teachers (NBCTs) have grown substantially. Today, NBCTs number more than 100,000 and represent about 3 percent of the national teaching force (National Board of Professional Teaching Standards, 2010).

As of 2010, 30 states either offered financial incentives for teachers to complete the NBPTS assessment process or bonuses for certified teachers (Exstrom, 2011). Despite the extensive state interest in using the NBPTS assessment as a marker of teacher quality for human capital purposes, the extant research on the effectiveness of National Board Certified Teachers (NBCTs) has generated inconsistent results. Most of the studies using long longitudinal samples of students in states or districts with large populations of NBCTs have found that the difference in value-added between NBCTs and non-NBCTs of about 0.01-0.03 student standard deviations, which corresponds to about 20-30% of the returns to the first five years of teaching experience or about 2-10% of annual achievement gains in the elementary grades (Atteberry et al., 2013; Bloom et al., 2008; Harris and Sass, 2011; Wiswall, 2013).

We add to this literature with a study of NBCTs in Washington, a state with a large population of certified teachers that has not heretofore been studied. Our study is unique in that we consider heterogeneity in teacher effectiveness both by NBPTS assessment type and by whether candidates pass on their first attempt. We believe this is also one of only a few studies that use statewide data to specifically study the performance of teachers certified under the second generation NBPTS assessment regime introduced in 2002.³ We find that teachers who possess the National Board credential are about 0.01-0.05 standard deviations more effective than non-NBCTS with similar levels

¹ See Aaronson et al. (2007), Chetty et al. (2014a, 2014b), Jackson (2012), Nye et al. (2004), Rivkin et al. (2005).

² See Goldhaber et al. (1999), Goldhaber and Hansen (2013), Harris and Sass (2011), and Kane et al. (2008).

³ Harris and Sass (2009), who break out NBCTs by their licensure cohort and include some cohorts licensed under both the first and second generation of assessments, find some evidence of differential effects by cohort. Chingos and Peterson (2011) study teacher credentials in Florida between 2002 and 2009, but do not explicitly break out NBPTS credentials by certification type.

of experience depending on the classroom level and subject. Comparing our results to the average achievement gains estimated from vertically aligned, nationally normed assessments, we estimate that NBCTs produce annual learning gains that are about 4-5% of normal learning gains at the elementary school level, about 15% of annual learning gains in middle school math, and about 4% of annual learning gains in middle school reading (Bloom et al., 2008). We additionally find evidence that performance on the most common certificates at the elementary and middle school levels predicts student achievement. Finally, the National Board for Professional Teaching Standards allows candidates who initially fail the assessment to bank their scores and retake portions of the examination process. In our data, teachers who initially failed represent about 30% of NBCTs. We therefore consider the effectiveness of National Board candidates based on whether they gained certification on their first attempt or on a retake. Except in middle school mathematics, we do not find evidence that teachers earning certification through a retake are more effective than non-NBCTs.

I. Background and Previous Findings on NBPTS Teachers

The National Board for Professional Teaching Standards was established in 1987 to offer a national teaching credential signifying the accomplishment of a high level of professional teaching. As National Board Certification is one of the few *national* teaching credentials in the United States, prior research has documented the effectiveness of NBCTs in several states.⁴ The relatively small body of literature on average differences in value-added by NBCT status has thus far yielded mixed results using states or districts with large populations of NBCTs. On the other hand, the few papers that have assessed differences in teacher effectiveness within the pool of NBCT applicants have found clearer evidence that teachers who do better on the NBPTS assessment tend to be more effective teachers.

Observational studies of NBCT effects have generally yielded point estimates in the range of 0.01-0.03 standard deviations on statewide assessments, or about 2-10% of an average year's learning gains, with not all studies finding statistically significant effects. In a study of elementary classrooms in North Carolina, Goldhaber and Anthony (2007) find that NBCTs raise student achievement in reading by about 0.02 standard deviations more than non-NBCTs with similar credentials. Results for math are smaller and statistically insignificant.⁵ They additionally find that recently certified NBCTs appear to be about 0.06-0.08 student standard deviations more effective with poor children, although this result does not appear to hold for teachers certified in previous years. Using a longer panel of elementary school data from North Carolina, Clotfelter et al. (2007) estimate statistically significant effects of 0.02-0.03 standard deviations for

⁴ As of 2010, 39 states accept the NBPTS credential as a means to fulfill state licensing or continuing education requirements (Exstrom, 2011).

⁵ On the other hand, they consistently find that future NBCTs are more effective than teachers who never become certified.

certified teachers in math. In reading, the effects are about 0.01 standard deviations, but the statistical significance varies by the model specification. However, in a companion paper that focuses more intently on the potentially non-random sorting of students to teachers in elementary school classrooms, Clotfelter et al. (2006) find no evidence of NBCT effects in their most conservative models. Among high school teachers in North Carolina, Clotfelter et al. (2010) find that NBCTs are about 0.05 standard deviations more effective than non-certified teachers. Evidence from Florida, another state with a large NBCT population, is also mixed. Chingos and Peterson (2011) document positive effects of NBCTs of about 0.02-0.03 standard deviations in both math and reading on the FCAT. Harris and Sass (2009) find no general effect of NBCTs, but do find some statistically significant results depending on the certification cohort and test. In the only existing experimental evaluation of NBCT effectiveness, Cantrell et al. (2008) find no statistically significant differences between students in classrooms randomized to NBCTs and those in classrooms randomized to non-applicants. However, compared to the statewide longitudinal samples in other research, their randomized sample contains a relatively small number of certified teachers.

The NBCT effects estimated in the above papers compare successful applicants for board certification both to unsuccessful applicants *and* to teachers who never apply for certification. If teachers who apply for certification are more effective than other teachers, the observed NBCT effects may be due to the selection of teachers who apply for certification rather than to the discrimination of the actual assessment process. Alternatively, if less effective teachers tend to apply, the above findings would understate the power of the NBPTS process to discern differences in teachers' value added. While the results comparing certified and non-NBCTs are mixed, it appears that the NBPTS assessment does differentiate between more and less effective teachers. Goldhaber and Anthony (2007) find that successful applicants are about 0.13 standard deviations more effective in math and about 0.07 standard deviations more effective in reading than unsuccessful applicants. And Cantrell et al. (2008) find that successful applicants outperform unsuccessful applicants by about 0.22 standard deviations in math and 0.19 standard deviations in reading. They further find that the scaled score predicts student achievement in both subjects, with a one standard deviation difference in performance on the NBPTS assessment translating into a 0.11 standard deviations difference in student achievement in math and a 0.05 standard deviations difference in reading.

In sum, point estimates suggest that NBCTs are about 0.01-0.03 standard deviations more effective than non-NBCT elementary school teachers, with mixed statistical significance. An effect of this size is comparable to roughly 20-30% of the returns to the first five years of teaching experience or about 2-10% of annual student achievement gains in reading (Atteberry et al., 2013; Bloom et al., 2008). While the difference in value-added between NBCTs and non-NBCTs may vary by state, subject, and grade level, it does appear that performance on the assessment predicts student achievement.

II. Data

We base our study of National Board teachers on data from Washington State. Although Washington has only the 15th largest population of K-12 public school students in the United States, it has the fourth most NBCTs of any state and produced the most newly certified teachers in 2014 (National Board of Professional Teaching Standards, 2014a, 2014b; Snyder and Dillow, 2013). This is likely due in part to the fact that Washington incentivizes National Board certification in a number of ways. In 2000, the state introduced a bonus of 15% of base salary for NBCTs.⁶ This was changed to \$3,500 in 2002 and \$5,000 in 2008. In the same year, the state introduced the Challenging Schools Bonus, an additional \$5,000 bonus for NBCTs working in high-poverty schools.⁷ Both the state and districts provide various incentives and support for NBPTS candidates. The state also provides a \$2,000 conditional loan for teachers who apply for certification, awards professional development credit for participation, and considers National Board Certification an acceptable way to satisfy the state's advanced certification requirement.⁸ Many districts offer their candidates additional incentives in the form of financial support, release for certification activities, or mentoring. Since the introduction of the bonuses, the number of NBCTs has increased dramatically. Between 2008 and 2012, the cumulative number of NBCTs statewide increased from 2,703 to 6,739 (National Board of Professional Teaching Standards, 2012).

We obtain teacher records in Washington State from the S-275, which is a survey of district personnel by the Office of the Superintendent of Public Instruction (OSPI). The S-275 contains information on teacher demographic characteristics, such as age, sex, and ethnicity, and teacher credentials, such as experience and educational attainment. Pearson, which manages the assessment of teacher candidates for NBPTS, provided us with a database of assessment results for teachers in Washington State. We matched the NBPTS data to the S-275 using full name and date of birth. We matched 94% of NBCT candidates working in public schools using full name and date of birth and an additional 4% using last or maiden name, first initial, and date of birth. Minor misspellings of names in the S-275 data are not uncommon; we additionally matched by hand another 1% of candidates using names, dates of birth, and schools of employment. Overall, we matched 12,189 of the 12,309 NBPTS candidates (99%) to employment records in the S-275.

In this study, we analyze candidates for all of the certificates offered by the NBPTS. However, we focus much of the analysis on four of the most common certificates at the elementary and middle school levels: the Middle Childhood: Generalist (MC/Gen), Early/Middle Childhood: Literacy, Reading and Language Arts (EMC/LRLA), Early

⁶ Throughout this paper, we refer to school years by the calendar year of the spring term.

⁷ The Challenging Schools Bonus pays teachers a maximum of \$5,000 and is prorated by the amount of time a teacher spends in an eligible school.

⁸ Washington revised its certification process in 2000 and accepts the National Board certificate as a substitute for the requirements for the "Professional" teaching certificate, which requires teachers to complete a portfolio assessment.

Adolescence: English Language Arts (EA/ELA), and Early Adolescence: Math (EA/Math) certificates. These account for 43% of the certificates awarded in Washington State. Because the NBPTS assessment process changed in the early 2000s, we additionally focus on teachers certified under the second-generation assessment process, which account for most of the NBCTs in Washington.⁹

We obtain student records from student longitudinal databases maintained by OSPI. The state requires standardized testing in math and reading in grades 3-8, and these test scores form the basis of our analysis. For school years 2006 to 2009, the student data system included information on students' registration and program participation but did not explicitly link students to their teachers. We therefore matched these students to teachers using the proctor identified on the end-of-year assessment. To ensure that these are likely to represent students' actual teachers, we limit the 2006-2009 sample to elementary school classrooms (grades 4-6), which tend to be self-contained, with between 10 and 33 students where the identified teacher is listed in the S-275 as 0.5 FTE in that school, taught students in no more than one grade, and is endorsed to teach elementary education.¹⁰ Between 2009-2010 and 2012-2013, the student longitudinal data system explicitly links students to their teachers in all grades. Our sample therefore additionally includes classrooms in grades 6-8 for these school years.¹¹

We present summary statistics for our analytical dataset in **Table 1**. Despite the large incentive to teach in high-poverty schools, at both the elementary and middle school level, National Board Certified teachers have classrooms with significantly higher baseline student achievement. In elementary grades, students of NBCTs have baseline achievement of about 0.05 standard deviations higher in math and 0.03 standard deviations in reading than those of non-NBCTS. At the middle school level, students of NBCTs have baseline achievement 0.17 standard deviations higher in math and 0.10 standard deviations higher in reading. The demographic composition of classrooms taught by NBCTs and non-NBCTs is similar.

⁹ That is, when we break out certificates by type, we only consider teachers certified under the second generation assessment who received certificates between 2002 and 2013. Therefore, some teachers with "other" certificates possess an earlier version of the same certificate. Given the small number of teachers certified in Washington before 2002, this does not encompass many teachers.

¹⁰ Some of the data related to students and teachers used in this study are linked using the statewide assessment's "teacher of record assignment", a.k.a. assessment proctor, for each student to derive the student's "teacher". The assessment proctor is not intended to and does not necessarily identify the sole teacher or the teacher of all subject areas for a student. The "proctor name" might be another classroom teacher, teacher specialist, or administrator. For the 2009-2010 school year, we are able to check the accuracy of these proctor matches using the state's new Comprehensive Education Data and Research System (CEDARS) that matches students to teachers through a unique course ID. Using the restrictions described above, our proctor match agrees with the student's teacher in the CEDARS system for about 95% of students in both math and reading.

¹¹ As some schools in Washington State use self-contained classrooms in grade 6, we split the sample based on the class type rather than the grade level. Both elementary and middle school samples therefore include some students in 6th grade.

At the elementary level, the MC/Generalist certificate is by far the most common. In our sample, 7 percent of all classrooms and 71 percent of classrooms taught by an NBCT are taught by a teacher holding this credential. Also common is the EMC/LRLA certificate, which accounts for 18 percent of all classrooms taught by an NBCT. For middle school students, the EA/Math and EA/ELA certificates are the most common. Among all math classrooms, 9 percent are taught by an NBCT, and 7 percent are taught by a teacher with the EA/Math credential. In reading, NBCTs teach 11 percent of middle school classrooms, and teachers with an EA/ELA certificate teach nearly 7 percent of classrooms.

III. Board Certification and Teacher Effectiveness

Following prior research on the student achievement effects of teacher characteristics, we estimate a value-added model that includes teachers' National Board certification status:

$$A_{ijt} = \rho A_{ijt-1} + X_{ijt}\beta + NBCT_{jt}\delta + T_{jt}\gamma + X_{jt}\pi + \epsilon_{ijt} \quad (1)$$

We control for lagged achievement using a vector that includes a cubic expansion of prior test scores in both math and reading. We additionally include in X_{ijt} student gender, race and ethnicity, FRL eligibility, learning disabled status, and participation in special education, English language learning, or gifted programs; we include in X_{jt} the teacher-year means of all of these variables.¹² In our most basic model, $NBCT_{jt}$ simply indicates whether teacher j is an NBCT in year j . In some models, we replace the NBCT indicator with a vector indicating the teachers' certificate area. The vector T_{jt} includes an indicator for each year of experience. In all models, we cluster standard errors at the teacher level. As the NBPTS assessment relies on artifacts of student learning from a teacher's classroom, we drop all school years in which teachers submitted an NBPTS portfolio in order to avoid mechanical correlation between the assessment results and student achievement. We additionally estimate models with both school and school-by-grade-by-year (cohort) fixed effects in order to explicitly make comparisons of NBCTs to other teachers in the same school. The state incentive program for NBCTs to work in high-poverty schools may bias estimates of the NBCT effect if attendance at such schools is associated with unobserved factors that influence student achievement.

Consistent estimation of the NBCT effect in Eq. (1) requires student assignment to an NBCT to be exogenous conditional on the student characteristics included in X . Whether teacher assignments satisfy this assumption in practice remains a contentious

¹² Using district-level data that permits better identification of discrete classrooms, Johnson et al. (2014) find that teacher value-added models that rely on teacher-year means of control variables produce teacher effects estimates with correlations of between 0.93 and 0.98 with models using classroom means.

point. At the elementary level, Rothstein (2010) presents evidence of sorting into future classrooms based on unobserved shocks to student achievement. However, such empirical findings may be consistent with assignment policies that result in relatively unbiased estimates of teacher effects, and there is some experimental and quasi-experimental evidence that this is the case (Chetty et al., 2014a; Goldhaber and Chaplin, 2014; Kane et al., 2013; Kane and Staiger, 2008). However, grouping of students by ability may be more common at higher grade levels, and such tracking may still bias estimates of teacher effects (Jackson, 2014; Protik et al., 2013).

Even if value-added measures produce unbiased predictions of future student achievement on average, it remains possible that teacher effects are biased for certain subgroups of teachers. There are two related threats to validity in the context of estimating NBCT effects. First, as shown in Table 1, NBCTs teach students with higher lagged achievement, particularly at the middle school level. To the extent that measured student performance is correlated with unobserved contemporaneous inputs, estimated NBCT effects may be biased upward. For instance, higher-achieving students assigned to NBCTs may have greater intrinsic motivation or may receive better extracurricular or home instruction. Second, NBCTs are also more likely to teach gifted and honors students and, at the middle school, less likely to teach special education students. Even if such students do not differ in unobservable ways from similar students not assigned to such courses, there may still be effects associated with the grouping of such students in classrooms. These may be due to specific interventions, like assignment to better teachers in other subjects or access to additional school resources, or due solely to the exposure to higher-achieving peers (Jackson, 2014; Lavy et al., 2012; Lefgren, 2004). While some of the grouping effects may be captured by including teacher-year averages of lagged achievement measures, the classroom peer effects may not be constant across the student ability distribution. For instance, higher achieving students may benefit disproportionately from enrolling in classes with other high achieving students (Burke and Sass, 2013; Duflo et al., 2011). Thus, inclusion of peer characteristics alone may fail to capture important unobserved differences across classroom types that are associated with teacher certification status.

We implement two approaches aimed at generating comparisons of NBCTs to other teachers who teach in similar classrooms. For the elementary school classrooms, we follow the approach of Clotfelter et al. (2006) and re-estimate our models with cohort effects on samples of schools for which there is little evidence of classroom sorting by observable student characteristics, i.e. the demographic breakdown of classrooms in a school looks similar to the student demographics of the whole school. We classify students according to their prior test scores, gender, race, ethnicity, and participation in gifted, ELL, or special education programs and conduct chi-square tests assuming equal representation of students across classrooms within the same school, grade, and year.¹³ In

¹³ Our chi-square tests include indicators for whether the student scored above the median on each of the

our analysis sample, we use cohorts for which we have at least two classrooms and fail to reject all eight hypothesis tests as our restricted sample.¹⁴ As classrooms at the middle school level are much more likely to exhibit evidence of sorting on observables, this approach becomes untenable. Instead, to account for the possibility that student grouping or track-based interventions bias our estimates of the NBCT effects, we follow the approaches of Jackson (2014) and Protik (2013) and include cohort-by-track fixed effects for our middle school sample.¹⁵ This approach limits comparisons of NBCTs to other teachers in the same school, grade, and year who also teach students of the same level. Thus, we assume that omitted peer effects or track-based interventions have constant effects across classrooms within tracks and cohorts.

We present the results of these models for elementary classrooms in **Table 2**. In models with controls for observed student and classroom covariates, we find that NBCTs are 0.035 standard deviations more effective in math and 0.027 standard deviations more effective in reading than the average teacher with similar experience. In our preferred specification, which includes school-by-grade-by year fixed effects, these coefficients decrease to about 0.02 standard deviations for both math and reading.¹⁶ For the sample with balanced classrooms and cohort fixed effects, the coefficients are similar to those in the full sample, albeit not statistically significant in reading. We estimate coefficients of 0.018 in math, which is only statistically significant at the 0.10 level, and 0.007 in reading. The majority of the NBCTs in our elementary school sample (70%) have the Middle Childhood: Generalist (MC/Gen) certificate. We find that these teachers are 0.02 standard deviations more effective in math and 0.01 standard deviations more effective in reading than the average teacher; however, only the math result is statistically significant at the 0.05 level. Nearly 20% of certified teachers hold the Early and Middle Childhood: Literacy, Reading, and Language Arts (EMC/LRLA) certificate. We estimate an effect of

state standardized tests from the prior year; whether the student is female; whether the student is white; whether the student participates in gifted programs; whether the student participates in ELL programs; and whether the student participates in special education programs.

¹⁴ Clotfelter et al. (2006) pool estimates to the school level using classrooms in grades 3-5 in one school year. As they point out, the chi-square test may lack power to detect if schools do in fact sort students. To test whether we are actually identifying cohorts with balanced classrooms, we regress the baseline student characteristics on cohort and classroom fixed effects in the restricted sample and test the joint significance of the classroom fixed effects. Using a p-value of 0.10 in the chi-square tests to determine non-random assignment, we find that none of the models rejects the null hypothesis of no classroom effects at any conventional level.

¹⁵ Jackson (2014) uses a finer designation of tracks at the high school level by using groups of students who take the same courses. As our dataset does not permit the identification of individual courses at the middle school level, we follow Protik et al. (2013) and use indicators for course type to identify tracks. In our data, we identify a track as a unique combination of school, grade, school year, honors status, and remedial status. Honors and remedial courses are not identified at the elementary school level.

¹⁶ Because they implicitly limit comparisons of NBCTs to teachers within the same school and grade, models with cohort effects may be conservative estimates if there are differences in true teacher effectiveness across schools.

certified teachers of about 0.025 standard deviations in both subjects with the reading result statistically significant.

The results of the middle school analysis are described in **Table 3**. The middle school math results suggest that middle school NBCTs are somewhat more effective than average teachers and have a greater effect than elementary school NBCTs. We find that NBCTs are about 0.05 standard deviations more effective in teaching middle school math than non-certified teachers with similar levels of experience. Both results are robust to the inclusion of cohort and track fixed effects. When we disaggregate by certificate type, we find the coefficient on Early Adolescence: Math (EA/Math) drives the larger effect in the middle school math sample. These teachers comprise about 70% of our board certified teachers and are, on average, 0.065 standard deviations more effective than non-certified teachers. Overall, NBCTs are 0.01 standard deviations more effective than the average teacher in middle school reading education. The most common certificate at this level is the Early Adolescence: English Language Arts (EA/ELA) certificate (62%), and teachers who possess this credential are about 0.013 student standard deviations more effective than non-NBCTs.¹⁷

The NBPTS allows candidates who fail their assessment to bank their scores and reattempt one or more exercises. Because candidates can keep the scores from exercises in which they did particularly well and drop the exercises in which they did particularly poorly, it may be easier to earn certification on a retake than if candidates were forced to resubmit an entirely new application. We explore whether candidates who initially fail the assessment but later earn certification are more effective than non-NBCTs in Panel C in both Tables 2 and 3. We replace the indicator for NBCTs with an indicator for a teacher who has earned certification on the first attempt and an indicator for a teacher who has earned certification on a subsequent attempt.¹⁸ These models therefore compare NBCTs who earn certification on a first attempt and those who earn certification on a subsequent attempt to teachers who never earn certification. For elementary classrooms and middle school reading, we find two sets of common findings. First, we do not find evidence that initially unsuccessful applicants that go on to earn certification are more effective than non-NBCTs. The coefficients are small or negative and not statistically significant. Second, it appears that NBCTs who were initially unsuccessful applicants are less effective than NBCTs who earn certification on their first attempt. Tests of equality of the

¹⁷ An open question is whether participation in the National Board process improves teacher practice. We additionally estimate models that include teacher fixed effects and a censored experience profile at 10 years to test whether participation in the National Board process improves teacher value-added. We find small and imprecisely estimated within-teacher differences in effectiveness. These results are consistent with most of the prior results using student test score data and specifications with teacher fixed effects (Chingos and Peterson, 2011; Goldhaber and Anthony, 2007; Harris and Sass, 2009). Results are available from the authors upon request.

¹⁸ At the elementary school level, 4.9% of students have an NBCT who earned certification on the first attempt and 1.7% have an NBCT who earned certification on a retake. At the middle school, level these numbers are 8.1% and 2.6% for math and 9.9% and 3.0% for reading.

coefficients on passing on the first and subsequent attempt reject the hypothesis that the two groups are equally effective at the 10% level for all three subject-grade level groups.¹⁹ However, these results do not hold for middle school math teachers: those who pass the NBPTS assessment on a second take are still about 0.04 standard deviations more effective than other middle school math teachers. Furthermore, we fail to reject the hypothesis that the two groups of NBCTs are equally effective.²⁰ While there is some variation by certificate type, it appears that the first attempt generally contains more useful information about teacher effectiveness than subsequent attempts, which is consistent with Cantrell et al. (2008). We revisit this question in the section on NBPTS assessment results below.

Overall, we find that certified teachers are more effective than non-certified teachers with similar experience. The differences in average value-added range from 0.01-0.05 standard deviations depending on the subject and level. Our estimates for elementary school teachers in math and reading are of the same magnitude as those found for teachers in North Carolina (Clotfelter et al., 2007; Goldhaber and Anthony, 2007) and Florida (Chingos and Peterson, 2011). For middle school teachers, our results for the EA/Math certificate are closer in magnitude to those found at the high school level (Clotfelter et al., 2010), while the effects for teachers credentialed under the EA/ELA assessment are similar to the results for elementary school teachers. The additional learning gains produced by NBCTs for elementary students and middle school reading students are approximately 3-5% of annual achievement growth, while those produced by NBCTs in middle school math represent about 15% of annual learning gains in math (Bloom et al., 2008). This suggests NBCTs produce additional learning gains of about 1-2 weeks at the elementary school level and for middle school reading and about 5 weeks for middle school math.²¹

Exploring Heterogeneity in NBPTS Effects Across Student Sub-Groups

The National Board standards include the proposition that teachers should understand how to assess student learning and employ instructional techniques appropriate for their particular students. Teachers certified by the National Board may therefore be particularly adept at teaching students with extraordinary needs. Prior research suggests that National Board teachers are more effective with disadvantaged students and that participation in the National Board certification process improves

¹⁹ Note that these are two-sided tests. For models with cohort fixed effects, the F-statistic for the test of the equality of the coefficients is $F = 11.6$ ($p < 0.01$) for elementary math, $F = 3.75$ ($p = 0.05$) for elementary reading, and $F = 3.48$ ($p = 0.06$) for middle school reading. When we stack data across elementary and middle schools, we reject the hypothesis that the two groups are equally effective at the 5% level in both math and reading.

²⁰ The F-statistic from the test of equality of the coefficients is $F = 1.67$ ($p = 0.20$) for middle school math.

²¹ We convert gains on standardized tests to weeks or months of learning by averaging the results of Bloom et al. (2008) over the relevant grade range and assuming a 36 week school year. These results suggest annual learning gains of 0.50 and 0.36 standard deviations for elementary math and reading, respectively, and 0.34 and 0.27 standard deviations for middle school math and reading.

teachers' student assessment skills (Goldhaber and Anthony, 2007; Sato, Wei, and Darling-Hammond, 2008).

The relative efficacy of NBCTs for disadvantaged student subgroups has particular policy relevance. Previous work has documented that schools with large populations of impoverished children tend to have fewer NBCTs (Goldhaber, 2006; Humphrey et al., 2005). This finding is consistent with other evidence, based both on observed teacher credentials and teacher value-added, that high-quality teachers are not equitably distributed across or within schools (Clotfelter et al., 2007; Chetty et al., 2014a; Goldhaber et al., 2014; Sass et al., 2012). Yet, Koppich et al. (2007) suggest that teacher quality in low-performing schools was an early concern of the NBPTS and that some of its founders believed states or districts might develop financial incentives for NBCTs to teach in high-needs schools. In Washington State, NBCTs have been awarded a \$5,000 bonus since 2008 to teach full-time in high-poverty schools. Such policies at least implicitly assume that the effectiveness of NBCTs observed generally carry over to students in high-poverty schools.

In order to better understand the effectiveness of NBCTs for disadvantaged students, we add interactions between student characteristics and the NBCT indicator in Eq. (1):

$$A_{ijt} = \rho A_{ijt-1} + X_{ijt}\beta + NBCT_{jt}\delta + NBCT_{jt} \times X_{ijt} \lambda_{subgroup} + T_{jt}\gamma + \epsilon_{ijt}. \quad (2)$$

In Eq. (2), the $\lambda_{subgroup}$ test whether National Board Certified teachers are more or less effective for particular groups of students. We include interactions between NBCTs and indicators for gifted and talented students, English language learners, students receiving special education services, and students eligible for free and reduced price lunches. As with Eq. (1), the regression models additionally include school-by-year-by-grade effects.

The interaction effects $\lambda_{subgroup}$ estimated in Eq. (2) give the average difference in achievement for students of the given subgroup relative to other students with an NBCT. The total effect of NBCTs for that subgroup can be obtained by summing $\delta + \lambda_{subgroup}$. Thus, a negative coefficient $\lambda_{subgroup}$ suggests that students of the particular subgroup have lower achievement than other students assigned to an NBCT; only if the aggregate effect $\delta + \lambda_{subgroup}$ is negative would we conclude that students of this subgroup have lower achievement than other students of the same subgroup assigned to a non-NBCT. Supposing our estimates reflect the causal contributions of teachers to student learning, there are two possible explanations for finding evidence of differential effects of NBCTs for certain student subgroups. First, it may be the case that the teaching skills assessed by the NBPTS process are differentially important for students with particular needs. For instance, Sato et al. (2008) suggest that the certification process improves teachers' ability to use student assessment to support instruction. Alternatively, it may be the case that the most effective NBCTs are more likely to be assigned to certain kinds of students. Suppose

we find a positive interaction between NBCT status and giftedness. It may not be the case that individual NBCTs are more effective for gifted students, but that the more effective NBCTs are more often assigned to teach gifted students. This second possibility is consistent with the evidence on the within-school variation in teacher quality (Goldhaber et al., 2014). In order to differentiate between these two possibilities, we additionally estimate Eq. (2) with classroom fixed effects to control for any fixed teacher quality component.²² The interaction terms $\lambda_{\text{subgroup}}$ in these models compare the differences in achievement between students of particular subgroups and the reference category in NBCT classrooms to the difference in achievement between students of particular subgroups and the reference category in non-NBCT classrooms.²³ For instance, if the difference in achievement (conditional on prior test scores and other covariates) between gifted and non-gifted students is larger in NBCT classrooms than non-NBCT classrooms, we would conclude that NBCTs are relatively more effective at teaching gifted students.

We present the results of the student-level heterogeneity regressions in **Table 4**. In general, we find mixed evidence regarding student disadvantage and NBCT effectiveness. In elementary classrooms, we find that NBCTs are about 0.03 standard deviations less effective with English language learners than with other students in reading (the point estimate is negative but statistically insignificant in math). The estimated interaction is nearly identical when we include classroom fixed effects, which suggests that this reflects something about the teaching methods employed by NBCTs rather than their classroom assignments. With the inclusion of classroom fixed effects, we also find that elementary teachers are about 0.05 standard deviations more effective with gifted students, about 0.02 standard deviations more effective with special education students, and about 0.02 standard deviations less effective with FRL students than with omitted students. The same patterns are reflected in the reading results, although the coefficients are not statistically significant. Because the state incentive policy likely affects the distribution of NBCTs across student demographic groups and this may influence our findings, we also estimate models in columns (3) and (6) that additionally include an interaction between the NBCT effect and an indicator for school-wide eligibility for the Challenging Schools Bonus. The interaction with the Challenging Schools Bonus is positive but not statistically significant, which suggests that the difference in teacher effectiveness between NBCTs and non-NBCTs in challenging schools is similar to other schools.

At the middle school level, there is less evidence of subgroup heterogeneity. We find that NBCTs are actually less effective with special education students in math at the middle school level by about 0.04 student standard deviations, and this difference persists when we include classroom fixed effects. The discrepancy between the elementary and middle school math results may reflect differences in the curriculum or the fact that only

²² Specifically, we control for teacher-by-track fixed effects, which may not uniquely identify classrooms in middle schools (Johnson et al., 2014).

²³ In this case, the reference category is students not receiving gifted, English language learner, special education, or FRL services.

about half as many students are labeled as receiving special education services at the middle school level. As with the elementary school case, when we rely on within-classroom variation, we find that NBCTs are about 0.02 standard deviations less effective with FRL students. For middle school reading, none of the interaction terms is statistically significant. As with the results for elementary school teachers, we find that NBCTs at challenging schools are no more effective than NBCTs in other schools.

Our estimates of the subgroup heterogeneity of NBCT effects are somewhat at odds with prior research on the subject. Goldhaber and Anthony (2007) find that NBCTs appear to be more effective with FRL-eligible students, while Harris and Sass (2009) find little evidence, positive or negative, of effects for FRL students. By contrast, our estimates suggest that, in mathematics, NBCTs produce smaller gains for FRL students and, in reading, for English language learners, than other students in the same classroom. These results are robust to the sample of schools with apparently random assignment at the elementary level. While it is unclear what drives the differences in subgroup effects we estimate, there are two important policy differences between the North Carolina and Washington studies worth mentioning. First, Goldhaber and Anthony (2007) study teachers certified under the first-generation NBPTS assessment, which placed less emphasis on the assessment center exercises. Second, Washington incentivizes NBCTs to work in low-income classrooms, which may affect the distribution of NBCTs across classrooms.

IV. National Board Assessment Results and Teacher Effectiveness

Student Achievement Along the NBPTS Assessment Distribution

Although policymakers may be interested in the signaling value of the National Board certificate, the credential effects we estimate above may not accurately represent how well the assessment process discriminates between effective and ineffective candidates because the sample of NBPTS candidates is not randomly selected from the population of teachers. Therefore, we also assess the relationship between teacher value-added and the NBPTS assessment results. There are two potential complications with the estimation of the association between teacher value-added and performance on the assessment. First, the National Board assessment relies on evidence from student work and places particular emphasis on how teachers assess their students' progress (Pearlman, 2008). The portfolio design therefore introduces a possibly spurious correlation between measured teacher value-added and student achievement if raters' assessments of teacher practice are influenced by the students selected for inclusion in the NBPTS portfolio. As with the results on certified teachers, we therefore estimate models that exclude classrooms with a teacher who is participating in the National Board assessment process.

A second concern is that teacher performance may vary over time. While most research on the returns to teacher experience document substantial increases in teacher effectiveness during the first few years in the classroom, the returns to experience are

much smaller over the portion of the career in which teachers obtain certification (Papay and Kraft, 2013; Rockoff, 2004). However, recent research also suggests that long-run teacher effects are not perfectly persistent across time (Chetty et al., 2014a; Goldhaber and Hansen, 2013). We may therefore expect that the correlation between NBPTS assessment results and teacher value-added measured in different years understates the true contemporaneous correlation. In order to account for this possibility, we restrict our analysis of assessment results to years near participation in the National Board assessment process. In particular, we use classrooms for which the teacher completes a submission in years $t-2$, $t-1$, $t+1$, or $t+2$.²⁴

We begin by estimating the difference in value-added between teachers who initially pass and fail the National Board assessment. Using data on the classrooms of teachers who apply for certification, we regress achievement on student characteristics and an indicator for passing the National Board assessment:

$$A_{ijt} = \rho A_{ijt-1} + X_{ijt}\beta + NBPTS_j\delta + \epsilon_{ijt} \quad (3)$$

In Eq. (3), $NBPTS_j$ is a measure of teacher performance on the NBPTS assessment. We measure teacher outcomes in several different ways to produce different comparisons of teacher effectiveness.

In our most basic models, $NBPTS_j$ indicates that teacher j passes the National Board assessment on the first attempt. These regressions estimate the average difference in effectiveness between teachers who pass the assessment on the first attempt and other, initially unsuccessful NBPTS applicants. The estimates from these regressions may differ from those estimated with the entire sample of teachers above for two reasons. First, applicants for NBPTS certification, whether successful or unsuccessful, may be more or less effective than the average non-applicant. If NBPTS applicants are more effective than the average non-NBCT, then differences in value-added by certification status may be smaller within the sample of applicants than for the population of teachers as a whole. Second, initially unsuccessful applicants may reapply to the board for certification, so some of the NBCTs we observe in Section III initially failed their assessment.²⁵

²⁴ An additional concern is whether to include teachers who have not submitted assessment results. Some studies have included all teachers with indicators for having submitted an assessment. This may improve efficiency for the student- and classroom-level regressors, but point estimates are generally biased if assessment results are correlated with student and classroom characteristics (Jones, 1996). We therefore limit our sample to teachers with assessment outcomes.

²⁵ In the Washington data, we observe a 60% first-time pass rate and an 83% three-year pass rate. These numbers are higher than those reported nationally (Committee on Evaluation of Teacher Certification by the National Board for Professional Teaching Standards, 2008). However, among a sample of North Carolina teachers, which is another state with a large population of NBCTs, Goldhaber and Hansen (2008) find a first-time passing rate of 54% and an eventual passing rate of about 75%, which are roughly consistent with the patterns we observe. In the analytical samples, the pass rates are even higher: 65-75% for initial applicants and 85%-95% overall.

Therefore, we also include models with indicators for whether the teacher subsequently passes on a retake. These models compare initially successful applicants and those who pass on retakes to those who never obtain certification.

While the NBPTS certification decisions are binary, the underlying assessment process may contain additional information about teacher effectiveness. We therefore estimate models where $NBPTS_j$ is the teacher's assessment score. We standardize the NBPTS scores against the distribution of first-time assessments so that the estimated coefficients measure the difference in student achievement associated with a one standard deviation difference in NBPTS assessment scores. As with the binary passing indicator, teachers may retake portions of the NBPTS assessment and the first score does not correspond to the final certification decision for all teachers. We therefore estimate models that include both the initial score and the maximum score for each candidate. Suppose we have two candidates who both receive the same score and fail their first attempt but receive different scores on their second attempt. If teacher performance on the retake reflects differences in teacher effectiveness, we should observe a relationship between the final score and student achievement even after controlling for the first score. In other words, these regressions test whether the difference between the initial and final candidate scores adds any additional information about teacher effectiveness.

We present the results for differences in effectiveness by assessment outcomes in **Table 5**. In elementary classrooms, teachers who initially pass the NBPTS assessment are 0.06 standard deviations more effective than those who fail in teaching math and 0.05 standard deviations more effective in teaching reading. When we add indicators for subsequently passing the NBPTS assessment, we find that elementary teachers are approximately 0.09 standard deviations more effective than those who never pass. These latter effects are approximately the same size as those estimated by Goldhaber and Anthony (2007) and somewhat smaller than the experimental estimates reported by Cantrell et al. (2008). In terms of annual learning gains, our estimates suggest that the differences in effectiveness by initial performance on the NBPTS assessment correspond to about 4.5 weeks of learning.²⁶ When we additionally consider teachers who pass the NBPTS assessment after initially failing, we only find evidence that teachers who pass on a retake are more effective than those who never pass in reading.

In Panel B, we show results for middle school classrooms. Interestingly, we do not find that middle school teachers who initially pass National Board assessments are more effective than those who fail, although the effect is statistically significant at the 10% level for mathematics teachers. We find a difference of 0.06 standard deviations in math and 0.03 in reading classrooms, although neither of the coefficients is statistically significant. Adding indicators for passing on a subsequent administration does little to change these estimates. However, given the relatively smaller samples of middle school

²⁶ This conversion uses the findings from Bloom et al. (2008) and is discussed in footnote 21.

applicants and the high pass rates of the sample of teachers matched to classrooms, the estimated contrasts are generally imprecisely estimated.

Next, we consider teacher effectiveness by the initial score on the National Board assessment. We replace the indicator for passing the assessment in Eq. (3) with teachers' total assessment scores. Across subjects and school levels, we find that a one standard deviation difference on the National Board assessment score corresponds to an approximately 0.04-0.05 standard deviations difference in student achievement.²⁷ The results for mathematics are smaller than the experimental estimates from Cantrell et al. (2008) but similar to the non-experimental results estimated on a larger sample of teachers, while the reading results are similar to both sets of estimates. When we include teachers' maximum scores on the NBPTS assessment, we find little evidence that subsequent scores add additional explanatory power for predicting student achievement. In mathematics, the coefficient on the maximum score is small and statistically insignificant for both grade levels; in reading, the coefficients are larger but we do not find statistically significant evidence that they add additional information beyond what is contained in the first score.

To further explore the relationship between NBPTS assessment scores and student achievement, we additionally estimate models using quintiles of NBPTS assessment scores instead of a linear specification. We plot the coefficients for the lowest and highest two quintiles by subject and grade level in **Figure 1** (the middle quintile is the omitted group). A few interesting non-linearities are apparent from the figures. First, in no sample are the coefficients on the two lowest quintiles of performance jointly or individually statistically significantly different than the middle quintile of performance. In the elementary school sample, we find that the highest two quintiles of performance have similar average student achievement effects, which is consistent with the diminishing marginal effects found by Cantrell et al. (2008).²⁸ On the other hand, we find evidence in the middle school grades that teachers in the highest performance quintile are producing significantly higher student achievement effects. The highest quintile outperforms the fourth quintile by 0.10 student standard deviations in middle school math classrooms and 0.06 student standard deviations in middle school reading classrooms. Both of these differences are statistically significant at the 0.01 level.

To give some sense of the magnitude of these findings, it may be helpful to consider the additional variation in student achievement explained by the National Board assessment. We therefore estimate teacher and classroom random effects models that include controls for teacher experience on the sample of NBPTS applicants both with and without the final candidate assessment score. Without the final assessment score, we estimate the variance of teacher effectiveness among National Board applicants is 0.022

²⁷ We standardize all NBPTS assessment scores against the distribution of first-time assessment results across all certificates.

²⁸ The differences in average effectiveness are not statistically significant in either subject.

in elementary math, 0.015 in elementary school reading, 0.025 in middle school math, and 0.007 in middle school reading. Adding the final score to the value-added models explains about 4-5% of the variance in teacher effectiveness in mathematics, about 8% of the variance of teacher effectiveness in elementary reading, and about 11% of the variance in middle school reading. For comparison, Rockoff et al. (2011) consider several non-traditional measures of pre-service teacher quality and find that they explain about 10% of the variation in future teacher effectiveness.

We next break out the performance of National Board candidates by certificate type. For these regressions, we estimate teacher effectiveness using the sample of teachers who apply for the given certificate and are teaching in a related classroom. The results of these regressions are in **Tables 6** and **7**. The estimates are less precise than those that aggregate across certificate types, but produce generally consistent results. Teachers who pass the MC/Gen assessment on the first attempt are about 0.06 standard deviations more effective teaching math and 0.03 standard deviations more effective in teaching reading than those who initially fail, although the reading result is only statistically significant at the 0.10 level. In both cases, teachers who pass the assessment on either the first attempt or a retake are more effective than those who never pass. Results are somewhat larger for the EMC/LRLA assessment. Teachers who pass on the first attempt are about 0.16 standard deviations more effective in both math and reading. As with the results with the aggregated certificates, we find evidence that the first score predicts student achievement, but do not find consistent evidence that the maximum score adds any additional information.

We present the estimates for the Early Adolescence certificates using the middle school data in Table 7. In Table 5, nearly 75% of the applicants in the middle school math sample apply for certification in something other than EA/Math. When we limit the sample of teachers to those who apply for EA/Math certification, we find that first-time passers are about 0.08 standard deviations more effective than those who initially fail. When we split the sample of first-time unsuccessful applicants by their ultimate certification status, we do not find any statistically significant differences by certification outcome. This is due to the fact that the point estimates for the group of teachers who pass on a second attempt is actually negative; however, the group of teachers who never earn certification is only 31 and all of the point estimates are imprecisely estimated. For the EA/ELA certificate, we do not find statistically significant differences in teacher effectiveness by the assessment outcomes. As with the EA/Math certificate, however, the group of applicants who never pass is small and coefficients are imprecise. As with the other certificates, when we instead look at overall performance, we do find that continuous measures of performance predict student achievement for both certificates. For the EA/Math assessment, we estimate that a one standard deviation differences in assessment scores predicts about a 0.07 standard deviation increase in student

achievement. For the EA/ELA assessment, the estimated coefficient is similar to those observed in the larger sample of applicants.

Optimal Weights for Value-Added Prediction

The National Board assessment comprises ten separate exercises, and these are judged separately and then aggregated to obtain the final scale score. The assessment score used by NBPTS reflects their professional judgment of the relative importance of various teacher characteristics and skills and may not provide the optimal prediction of teacher quality among all possible combinations of the NBPTS assessment subscores (Cantrell et al., 2008). We therefore attempt to use the assessment information to better predict teacher value-added. An important caveat of the following analysis is that student mastery of the skills reflected by standardized assessments is only one responsibility of teaching. While recent research suggests that value-added reflects important contributions to both short- and long-term student outcomes, other research suggests that teachers may also make important contributions to higher-order analytical and non-cognitive skills that may not be well captured by value-added (Chetty et al., 2014a, 2014b; Jackson, 2012; Papay, 2010).

In order to estimate the optimal weights for value-added prediction, we replace the final NBPTS assessment score in Eq. (3) with the average assessment score for each of the four NBPTS exercise types (student work, instructional analysis, documented accomplishments, and assessment center exercises).^{29,30} We then form the optimal weights for value-added prediction by standardizing the regression coefficients to sum to one. We estimate the standard errors using the delta method.

We display the optimal weights by subject in **Table 8**. In column 2, we display the current weights for each exercise type. The final score weights the student work exercise at 0.16, the two instructional analysis exercises at 0.32 (0.16 each), the documented accomplishments exercise at 0.12, and the six assessment center exercises at 0.40 (0.40/6 each). Our estimated optimal prediction weights are in columns 3 and 4. In column 3, the optimal value-added prediction weights include the MC/Generalist and EA/Mathematics certificates. In column 4, the weights include the MC/Generalist, EA/English Language Arts, and EMC/Literacy, Reading, and Language Arts certificates. The optimal weights differ by subject, but both suggest greater weight should be placed on the documented accomplishments portfolio entries. However, the results differ across subjects for the other exercise types and all the weights are imprecisely estimated.

A more difficult question is whether adoption of the suggested weights is likely to improve the certification decision process. A simple way to check the performance of the

²⁹ We additionally constrain the coefficients on the score variables to be positive, although negativity of the coefficients on exercise type averages is not a concern in the present context.

³⁰ We found our sample sizes to be too small to produce reliable estimates of optimal weights when we treated each of the assessment exercises separately.

reweighted estimator is to compute the additional proportion of the variance in student achievement predicted by the reweighted assessment scores compared to the NBPTS-determined weights. These results suggest that the reweighted assessment scores provide better estimates of the observed teacher value-added for all the assessments. We find that the reweighted assessment scores improve the R^2 in out student achievement regression by about 0.0002 in math and 0.0001 in reading. We found above that the NBPTS assessment scores explained about 5-10% of the unobserved teacher component; these results suggest that the reweighted assessment scores explain nearly an additional 1% of unobserved teacher effectiveness.

However, this approach is likely to produce an optimistic view of the reweighted scores since we assess the fit of the model using the same teachers used to generate the weights. In other words, if we obtained a new sample of teachers with NBPTS assessment scores and applied the weights derived from our sample, we would expect to find a greater prediction error making out-of-sample predictions. We therefore use a cross-validation approach to assess whether our reweighting procedure creates better predictions of teacher value-added than the original weights. We implement the cross-validation procedure by randomly dividing each of the teacher samples into 10 nearly equally sized subsamples. For each subsample, we re-estimate the optimal weights using the students assigned to teachers in the remaining nine samples and then calculate the reweighted assessment score for the selected subsample. We then regress student achievement on the control variables and the reweighted assessment score using all subsamples. While we cannot assess whether our chosen weights would perform better on an entirely new sample of teachers, this resampling approach allows us to assess the *procedure* of choosing optimal weights. While we estimate better in-sample predictions for all assessments, the out-of-sample predictions do not perform as well. For both subjects, the reweighted assessment scores perform worse than the existing weights when making predictions of teacher effectiveness for an unseen population of teachers. While a larger sample of teachers may produce weights better aligned with teacher value-added, we conclude that the NBPTS weighting scheme provides reasonably good estimates of teacher value-added for the current choice of assessment exercises.

V. Policy Implications and Conclusions

In this study, we assess the relationship between teacher value-added and performance on the National Board for Professional Teaching Standards assessments. We find that teachers in Washington with the National Board certificate are between 0.01 – 0.05 standard deviations more effective than non-NBCTS, which is consistent with prior studies of NBCTs in North Carolina and Florida. For elementary teachers and middle school reading teachers, we find differences in effectiveness of about 0.01-0.02 standard deviations. In middle school math, NBCTs are about 0.05 standard deviations more effective than non-NBCTs. The differential result for middle school math classrooms

appears to be driven by the larger gap in average effectiveness between non-NBCTs and NBCTs certified under the EA/Math assessment.

Comparisons to educational benchmarks suggest that these differences may be of educational significance. Results from nationally normed tests suggest that the differences in teacher effectiveness for NBCTs may correspond to approximately 1-2 weeks of additional learning in elementary classrooms and middle school reading classrooms and nearly 1.5 months of additional learning in middle school math classrooms (Bloom et al., 2008). While estimates of the returns to teaching experience vary, the elementary and middle school reading results are approximately equal to 15-35% of the return to the first five years of teaching experience. The middle school mathematics results suggest that the effectiveness of NBCTs relative to non-NBCTs is about 50-75% of the return to the first five years of experience (Atteberry et al., 2013; Harris and Sass, 2011; Wiswall, 2013).

We further find that performance on the National Board assessments predicts student achievement, although this relationship varies across the different certificates offered by NBPTS. A one standard deviation difference in assessment scores appears to correspond to a difference of about 0.04-0.05 standard deviations in student achievement across all levels and subjects we consider, which corresponds to about 3-5 weeks of student learning gains. However, it appears that there may be important nonlinearities in the relationship between the assessment score and student achievement and we find some evidence that teachers in the top 40% of the NBPTS assessment score distribution produce substantially greater learning gains than those in the bottom 60%. Given the sample size of teachers available for this study, re-weighted composite scores designed to best predict value-added do not outperform the existing set of weights. Finally, we find some evidence that the retesting procedures of the NBPTS weaken the assessment's ability to differentiate between more and less effective teachers. For elementary and middle school reading teachers, we find no evidence that NBCTs who initially failed the NBPTS assessment but earned certification on a subsequent sitting are more effective than non-NBCTs. Notably, this result does not hold for middle school math teachers. Among applicants for NBPTS certification, comparisons of teachers who initially fail and subsequently pass to those who never pass are complicated by small sample sizes and produce more ambiguous results.

Over the past 10 years, Washington has revised its compensation policies surrounding National Board teachers and has dramatically increased the number of NBCTs in the state. Our analyses suggest that the teachers licensed in this time period are more effective than the average non-NBCT in the state. While our study does not speak to the policy effectiveness of any particular certification policy, we do find that NBCTs in high-poverty schools, who have received an additional bonus since 2008, are at least as effective relative to their colleagues than teachers in other schools.

A number of states are experimenting with policies aimed at improving the recruitment and retention of effective teachers. Often these involve financial incentives

for particular groups of teachers. Observable measures of teacher effectiveness are therefore an important prerequisite for such policies. The credential offered by the National Board for Professional Teaching Standards serves this role in 24 states as well as in other individual school districts (Exstrom, 2011). While our results provide only a descriptive analysis of the effectiveness of NBCTs, and do not indicate the effectiveness of any particular compensation policy, they do suggest that the teachers targeted by these incentives are likely on average more effective than the population of teachers as a whole. The overall efficacy of policies that incentivize NBCTs for improving student outcomes, however, is much harder to assess and there is little direct evidence on their impact. In particular, such policies rely on the sensitivity of teacher labor supply decisions to financial incentives and the effects of improved teacher recruitment and retention on student outcomes. A number of studies have found that teachers respond to financial incentives in deciding where to work or whether to leave the profession (Clotfelter et al., 2008; Dee and Wyckoff, 2013). Beyond any potential improvements in teacher staffing, reduced turnover may also directly affect student achievement (Ronfeldt et al., 2013). Although there is little empirical evidence of NBCT spillover effects, the effects of reduced turnover may be particularly salient for NBCTs given their high reported participation in leadership activities (Loeb et al., 2006). Nonetheless, there is little direct evidence on whether such incentive policies improve student outcomes. This includes both students' performance on standardized assessments as well as in other important domains. There is some evidence that teacher effects on non-tested outcomes may not be highly correlated with teacher value-added, but there is little evidence on the effects of credentials like the NBPTS on other student outcomes (Jackson, 2012). Further research is needed on the effects of these policies on teacher staffing and their implications for a variety of important student outcomes.

References

- Aaronson, D., Barrow, L., and Sander, W. (2007). Teachers and student achievement in the Chicago Public high schools. *Journal of Labor Economics*, 25(1): 95-135.
- Atteberry, A., Loeb, S., and Wyckoff, J. (2013). Do first impressions matter? Improvement in early career teacher effectiveness. *CALDER Working Paper*, 90: 1-51.
- Bloom, H. S., Hill, C. J., Black, A. R., and Lipsey, M. W. (2008). Performance trajectories and performance gaps as achievement effect-size benchmarks for educational interventions. *Journal of Research on Educational Effectiveness*, 1(4): 289-328.
- Burke, M. A., & Sass, T. R. (2013). Classroom Peer Effects and Student Achievement. *Journal of Labor Economics*, 31(1), 51-82.
- Cantrell, S., Fullerton, J., Kane, T. J., and Staiger, D. O. (2008). National board certification and teacher effectiveness: Evidence from a random assignment experiment. *National Bureau of Economic Research Working Paper Series*, 14608.
- Chetty, R., Friedman, J. N., & Rockoff, J. E. (2014a). Measuring the Impacts of Teachers I: Evaluating Bias in Teacher Value-Added Estimates. *American Economic Review*, 104(9), 2593-2632.
- Chetty, R., Friedman, J. N., & Rockoff, J. E. (2014b). Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood. *American Economic Review*, 104(9), 2633-2679.
- Chingos, M. M. and Peterson, P. E. (2011). It's easier to pick a good teacher than to train one: Familiar and new results on the correlates of teacher effectiveness. *Economics of Education Review*, 30(3): 449-465.
- Clotfelter, C. T., Glennie, E., Ladd, H., & Vigdor, J. (2008). Would higher salaries keep teachers in high-poverty schools? Evidence from a policy intervention in North Carolina. *Journal of Public Economics*, 92(5-6), 1352-1370.
- Clotfelter, C. T., Ladd, H., & Vigdor, J. (2006). Teacher-student matching and the assessment of teacher effectiveness. *The Journal of Human Resources*, 41(4), 778-820.
- Clotfelter, C. T., Ladd, H., and Vigdor, J. (2007). Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. *Economics of Education Review*, 26(6): 673-682.
- Clotfelter, C. T., Ladd, H., and Vigdor, J. (2010). Teacher credentials and student achievement in high school: A cross-subject analysis with student fixed effects. *Journal of Human Resources*, 45(3): 655-681.
- Committee on Evaluation of Teacher Certification by the National Board for Professional Teaching Standards. (2008). *Assessing accomplished teaching: Advanced-level certification programs*. (M. W. Hakel, J. A. Koenig, & S. W. Elliott, Eds.). Washington, D.C.: Board on Testing and Assessment, Center for Education, National Research Council.
- Dee, T., & Wyckoff, J. (2013). *Incentives, selection, and teacher performance: Evidence from IMPACT* (No. 19529). Cambridge, MA: National Bureau of Economic Research.

- Duflo, E., Dupas, P., & Kremer, M. (2011). Peer Effects, Teacher Incentives, and the Impact of Tracking: Evidence from a Randomized Evaluation in Kenya. *American Economic Review*, 101(5), 1739–1774.
- Exstrom, M. (2011). National Board for Professional Teaching Standards certification: what legislators need to know. Technical report, National Conference of State Legislatures, Denver, Colo.
- Goldhaber, D. (2006). National Board Teachers Are More Effective, But Are They in the Classrooms Where They're Needed the Most? *Education Finance and Policy*, 1(3), 372–382.
- Goldhaber, D. and Anthony, E. (2007). Can teacher quality be effectively assessed? National Board certification as a signal of effective teaching. *Review of Economics and Statistics*, 89(1): 134-150.
- Goldhaber, D. and Hansen, M. (2013). Is it just a bad class? Assessing the long-term stability of estimated teacher performance. *Economica*, 80(319): 589–612.
- Goldhaber, D. D., Brewer, D. J., and Anderson, D. J. (1999). A three-way error components analysis of educational productivity. *Education Economics*, 7(3): 199-208.
- Goldhaber, D., Lavery, L., and Theobald, R. (2014). “Uneven Playing Field? Assessing the Teacher Quality Gap Between Advantaged and Disadvantaged Students.” *Educational Researcher*, in press.
- Harris, D. N., & Sass, T. R. (2009). The effects of NBPTS-certified teachers on student achievement. *Journal of Policy Analysis and Management*, 28(1), 55–80.
- Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics*, 95(7-8), 798–812.
- Humphrey, D. C., Koppich, J. E., & Hough, H. J. (2005). Sharing the wealth: National Board Certified teachers and the students who need them most. *Education Policy Analysis Archives*, 13(18).
- Ishii, J., & Rivkin, S. G. (2009). Impediments to the estimation of teacher value-added. *Education Finance and Policy*, 4(4), 520–536.
- Jackson, C. K. (2012). Non-cognitive ability, test scores, and teacher quality: Evidence from 9th grade teachers in North Carolina. *National Bureau of Economic Research Working Paper Series*, 18624.
- Jackson, C. K. (2014). Teacher quality at the high school level: The importance of accounting for tracks. *Journal of Labor Economics*, 32(4), 645–684.
- Jacob, B. A. and Lefgren, L. (2008). Can principals identify effective teachers? Evidence on subjective performance evaluation in education. *Journal of Labor Economics*, 26(1): 101-135.
- Johnson, M., Lipscomb, S., & Gill, B. (2014). Sensitivity of teacher value-added estimates to student and peer control variables. *Journal of Research on Educational Effectiveness*, forthcoming.
- Jones, M. P. (1996). Indicator and Stratification Methods for Missing Explanatory Variables in Multiple Linear Regression. *Journal of the American Statistical Association*, 91(433), 222-230.
- Kane, T. J., Rockoff, J. E., & Staiger, D. O. (2008). What Does Certification Tell Us about Teacher Effectiveness? Evidence from New York City. *Economics of Education Review*, 27(6), 615–631.

- Kane, T. J., Taylor, E. S., Tyler, J. H., and Wooten, A. L. (2011). Identifying effective classroom practices using student achievement data. *Journal of Human Resources*, 46(3): 587-613.
- Koppich, J. E., Humphrey, D. C., & Hough, H. J. (2007). Making use of what teachers know and can do: Policy, practice, and National Board Certification. *Education Policy Analysis Archives*, 15(7), 1-30.
- Lavy, V., Paserman, M. D., & Schlosser, A. (2012). Inside the Black Box of Ability Peer Effects: Evidence from Variation in the Proportion of Low Achievers in the Classroom. *The Economic Journal*, 122(559), 208-237.
- Lefgren, L. (2004). Educational peer effects and the Chicago Public Schools. *Journal of Urban Economics*, 56(2), 169-191.
- Loeb, H., Elfers, A. M., Plecki, M. L., Ford, B., & Knapp, M. S. (2006). *National Board Certified Teachers in Washington State: Impact on professional practice and leadership opportunities*. Seattle, WA: Center for Strengthening the Teaching Profession.
- National Board of Professional Teaching Standards (2010). Profiles in excellence: Washington state. Technical report.
- National Board of Professional Teaching Standards (2012). State profile: Washington. Technical report, Arlington, VA.
- National Board for Professional Teaching Standards. (2014a). *2014 state rankings by new number of National Board certified teachers*. Arlington, VA: National Board for Professional Teaching Standards.
- National Board for Professional Teaching Standards. (2014b). *2014 state rankings by total number of National Board certified teachers*. Arlington, VA: National Board for Professional Teaching Standards.
- Pearlman, M. (2008). The design architecture of NBPTS certification assessments. In Ingvarson, L. and Hattie, J., editors, *Assessing teachers for professional certification: The first decade of the National Board for Professional Teaching Standards*, number 11 in *Advances in Program Evaluation*, pages 55-91. JAI Press, Bingley, UK.
- Protik, A., Walsh, E., Resch, A., Isenberg, E., & Kopa, E. (2013). Does tracking of students bias value-added estimates for teachers? Presented at the Association of Education Finance and Policy Conference, New Orleans, LA.
- Rivkin, S. G., Hanushek, E. A., and Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica*, 73(2): 417-458.
- Rockoff, J. E., Jacob, B. A., Kane, T. J., & Staiger, D. O. (2011). Can you recognize an effective teacher when you recruit one? *Education Finance and Policy*, 6(1), 43-74.
- Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How Teacher Turnover Harms Student Achievement. *American Educational Research Journal*, 50(1), 4-36.
- Rothstein, J. (2009). Student sorting and bias in value-added estimation: Selection on observables and unobservables. *Education Finance and Policy*, 4(4): 537-571.
- Rothstein, J. (2010). Teacher quality in educational production: Tracking, decay, and student achievement. *The Quarterly Journal of Economics*, 125(1): 175-214.
- Sato, M., Wei, R. C., & Darling-Hammond, L. (2008). Improving teachers' assessment practices through professional development: The case of National Board Certification. *American Educational Research Journal*, 45(3), 669-700.

Snyder, T. D. and Dillow, S. A. (2013). Digest of education statistics 2011. Technical Report 2014-015, National Center for Education Statistics, Washington, D.C.

Wiswall, M. (2013). The dynamics of teacher quality. *Journal of Public Economics*, 100, 61–78.

Table 1. Summary Statistics

	Elementary		Middle School Math		Middle School Reading	
	All (1)	NBCT (2)	All (3)	NBCT (4)	All (5)	NBCT (6)
Math post-test	0.007 (0.998)	0.086 (1.024)	0.005 (0.995)	0.221 (1.022)		
Reading post-test	0.008 (0.997)	0.070 (1.004)			0.052 (0.966)	0.161 (0.948)
Math pre-test	0.006 (0.997)	0.054 (1.013)	0.009 (0.992)	0.183 (1.012)	0.037 (0.984)	0.133 (0.992)
Reading pre-test	0.003 (0.999)	0.037 (1.004)	-0.003 (0.998)	0.137 (0.984)	0.057 (0.960)	0.158 (0.947)
Female	0.492 (0.500)	0.492 (0.500)	0.494 (0.500)	0.495 (0.500)	0.501 (0.500)	0.503 (0.500)
American Indian	0.020 (0.139)	0.015 (0.122)	0.015 (0.123)	0.010 (0.101)	0.016 (0.124)	0.011 (0.106)
Asian/Pacific Islander	0.085 (0.279)	0.106 (0.307)	0.087 (0.281)	0.112 (0.316)	0.086 (0.280)	0.099 (0.299)
Black	0.048 (0.213)	0.044 (0.205)	0.043 (0.203)	0.038 (0.192)	0.041 (0.197)	0.037 (0.189)
Hispanic	0.172 (0.377)	0.177 (0.382)	0.172 (0.378)	0.166 (0.372)	0.173 (0.378)	0.174 (0.379)
White	0.631 (0.483)	0.601 (0.490)	0.632 (0.482)	0.624 (0.484)	0.634 (0.482)	0.627 (0.484)
Multiracial	0.043 (0.203)	0.056 (0.231)	0.050 (0.218)	0.049 (0.217)	0.051 (0.220)	0.051 (0.221)
Learning disabled	0.062 (0.240)	0.066 (0.248)	0.054 (0.226)	0.037 (0.189)	0.042 (0.201)	0.031 (0.173)
Gifted	0.050 (0.218)	0.070 (0.254)	0.073 (0.260)	0.092 (0.289)	0.075 (0.263)	0.105 (0.307)
Limited English proficient	0.066 (0.247)	0.075 (0.264)	0.038 (0.192)	0.037 (0.189)	0.031 (0.173)	0.031 (0.173)
Special education	0.125 (0.331)	0.130 (0.336)	0.096 (0.295)	0.071 (0.257)	0.078 (0.269)	0.061 (0.239)
Free/reduced-price lunch	0.447 (0.497)	0.454 (0.498)	0.432 (0.495)	0.402 (0.490)	0.427 (0.495)	0.408 (0.491)
Honors course			0.042 (0.202)	0.045 (0.207)	0.088 (0.283)	0.108 (0.311)
Remedial course			0.012 (0.109)	0.006 (0.077)	0.008 (0.088)	0.007 (0.086)
N	742158	49430	572102	61282	496458	63909

Table 2. Effectiveness of Board Certified Teachers (Elementary School Classrooms)

	Math			Reading		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Any Certificate						
NBCT	0.035*** (0.009)	0.018*** (0.007)	0.017* (0.009)	0.027*** (0.007)	0.016*** (0.006)	0.007 (0.008)
N	742158	742158	329360	742158	742158	329360
Panel B. Individual Certificates						
MC/GEN	0.034*** (0.010)	0.017** (0.008)	0.018* (0.010)	0.026*** (0.008)	0.011* (0.007)	0.002 (0.008)
EMC/LRLA	0.047** (0.019)	0.024* (0.014)	0.043** (0.020)	0.031** (0.014)	0.026** (0.011)	0.026 (0.016)
Other cert	0.019 (0.024)	0.015 (0.018)	-0.028 (0.024)	0.031 (0.019)	0.031** (0.015)	0.010 (0.022)
N	742158	742158	329360	742158	742158	329360
Panel C. Passing Attempt						
NBCT first attempt	0.051*** (0.010)	0.030*** (0.008)	0.028*** (0.010)	0.033*** (0.008)	0.022*** (0.006)	0.011 (0.009)
NBCT retake	-0.013 (0.017)	-0.017 (0.012)	-0.017 (0.015)	0.010 (0.014)	0.000 (0.010)	-0.005 (0.012)
N	742158	742158	329360	742158	742158	329360
Cohort FE	N	Y	Y	N	Y	Y
Apparently Random Sample	N	N	Y	N	N	Y
Number of Teachers:						
NBCT	903	903	580	903	903	580
MC/GEN	592	592	401	592	592	401
EMC/LRLA	183	183	105	183	183	105
Other certificate	128	128	74	128	128	74
NBCT first attempt	661	661	422	661	661	422
NBCT retake	242	242	158	242	242	158

Notes: Models in Panel A regress student achievement on indicator for teacher's National Board certification status, cubic polynomials in prior achievement in math and reading, student sex, race and ethnicity, FRL eligibility, learning disabled status, and participation in special education, English language learning, or gifted programs. Models in Panel B replace the NBCT indicator with indicators for subject-specific certificates. Panel C replaces NBCT indicator with indicators for a teacher who is an NBCT and passed the assessment on the first attempt or passed the assessment on a subsequent attempt. Cohorts indicate school-grade-year cells. Apparently random sample includes schools without clear evidence of sorting determined as described in text. Counts of teachers give the number of unique teachers with each certificate in the analysis sample. Standard errors in parentheses are clustered by the teacher level in all equations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3. Effectiveness of Board Certified Teachers (Middle School Classrooms)

	Math			Reading		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Any Certificate						
NBCT	0.049*** (0.012)	0.052*** (0.009)	0.049*** (0.009)	0.019** (0.008)	0.012** (0.005)	0.012** (0.005)
N	572102	572102	572102	496458	496458	496458
Panel B. Individual Certificates						
EA/Math	0.055*** (0.013)	0.065*** (0.010)	0.061*** (0.010)			
EA/ELA				0.021** (0.009)	0.013** (0.006)	0.014** (0.006)
Other cert	0.011 (0.027)	-0.007 (0.016)	-0.007 (0.016)	0.015 (0.013)	0.010 (0.009)	0.009 (0.009)
N	572102	572102	572102	496458	496458	496458
Panel C. Passing Attempt						
NBCT first attempt	0.063*** (0.013)	0.057*** (0.010)	0.054*** (0.010)	0.027*** (0.009)	0.017*** (0.006)	0.018*** (0.006)
NBCT retake	0.009 (0.024)	0.037*** (0.013)	0.034** (0.013)	-0.005 (0.014)	-0.005 (0.011)	-0.006 (0.011)
N	572102	572102	572102	496458	496458	496458
Number of Teachers:						
NBCT	371	371	371	511	511	511
EA/MATH	226	226	226	11	11	11
EA/ELA	17	17	17	284	284	284
Other cert	153	153	153	227	227	227
NBCT first attempt	257	257	257	365	365	365
NBCT retake	114	114	114	146	146	146

Notes: Models in Panel A regress student achievement on indicator for teacher's National Board certification status, cubic polynomials in prior achievement in math and reading, student sex, race and ethnicity, FRL eligibility, learning disabled status, and participation in special education, English language learning, or gifted programs. Models in Panel B replace the NBCT indicator with indicators for subject-specific certificates. Panel C replaces NBCT indicator with indicators for a teacher who is an NBCT and passed the assessment on the first attempt or passed the assessment on a subsequent attempt. Cohorts indicate school-grade-year cells; tracks additionally stratify cohorts by honors and remedial status. Standard errors in parentheses are clustered by the teacher level in all equations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4. National Board Effects by Student Subgroup

	Math			Reading		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Elementary School Classrooms						
NBCT	0.019** (0.008)		0.016** (0.008)	0.015** (0.007)		0.013* (0.007)
NBCT * Gifted	0.025 (0.019)	0.053** (0.022)	0.026 (0.019)	0.015 (0.016)	0.030 (0.020)	0.015 (0.016)
NBCT * ELL	-0.015 (0.011)	-0.011 (0.011)	-0.019* (0.011)	-0.029** (0.012)	-0.028** (0.013)	-0.031** (0.012)
NBCT * SPED	0.015* (0.009)	0.018** (0.009)	0.015* (0.009)	0.005 (0.010)	0.007 (0.010)	0.005 (0.010)
NBCT * FRL	-0.009 (0.007)	-0.016** (0.006)	-0.014** (0.007)	0.004 (0.007)	-0.001 (0.007)	0.003 (0.007)
NBCT * Challenging Sch.			0.030* (0.016)			0.011 (0.014)
N	742158	742158	742158	742158	742158	742158
Classroom FE	N	Y	N	N	Y	N
Panel B. Middle School Classrooms						
NBCT	0.059*** (0.010)		0.059*** (0.011)	0.015** (0.006)		0.014** (0.007)
NBCT * Gifted	0.008 (0.017)	0.020 (0.019)	0.008 (0.017)	-0.012 (0.015)	0.016 (0.018)	-0.012 (0.015)
NBCT * ELL	-0.005 (0.016)	-0.006 (0.017)	-0.005 (0.016)	-0.002 (0.017)	-0.012 (0.016)	-0.004 (0.017)
NBCT * SPED	-0.040*** (0.013)	-0.048*** (0.013)	-0.040*** (0.013)	-0.010 (0.014)	-0.011 (0.015)	-0.010 (0.014)
NBCT * FRL	-0.010 (0.007)	-0.016*** (0.006)	-0.011* (0.007)	-0.003 (0.006)	-0.008 (0.006)	-0.004 (0.006)
NBCT * Challenging Sch.			0.003 (0.017)			0.009 (0.012)
N	572102	572102	572102	496458	496458	496458
Classroom FE	N	Y	N	N	Y	N

Notes: Results from regression of student achievement on indicator for teacher's National Board certification status and interactions with shown characteristics, cubic polynomials in prior achievement in math and reading, student sex, race and ethnicity, FRL eligibility, learning disabled status, and participation in special education, English language learning, or gifted programs. FRL = subsidized lunch eligibility; SPED = special education services; ELL = English language learner. Standard errors are clustered by the teacher level in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5. NBPTS Assessment Results and Teacher Effectiveness (All Certificates)

	Math				Reading			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Elementary School Classrooms								
Pass (first attempt)	0.062*** (0.019)	0.085*** (0.026)			0.045*** (0.017)	0.093*** (0.025)		
Pass (retake)		0.038 (0.031)				0.078*** (0.029)		
Score (first attempt)			0.039*** (0.010)	0.034 (0.022)			0.043*** (0.009)	0.017 (0.021)
Score (retake)				0.005 (0.021)				0.027 (0.020)
Number of observations	32614	32614	32614	32614	32614	32614	32614	32614
Number of teachers:								
In assessment sample	731	731	731	731	731	731	731	731
Pass on first attempt	507	507	507	507	507	507	507	507
Have a subsequent attempt	179	179	179	179	179	179	179	179
Pass on retake	142	142	142	142	142	142	142	142
Panel B. Middle School Classrooms								
Pass (first attempt)	0.057* (0.030)	0.036 (0.043)			0.033 (0.022)	0.033 (0.036)		
Pass (retake)		-0.040 (0.047)				0.001 (0.042)		
Score (first attempt)			0.047*** (0.015)	0.065** (0.029)			0.038*** (0.012)	0.022 (0.025)
Score (retake)				-0.019 (0.028)				0.017 (0.023)
Number of observations	24933	24933	24933	24933	27052	27052	27052	27052
Number of teachers:								
In assessment sample	244	244	244	244	332	332	332	332
Pass on first attempt	161	161	161	161	247	247	247	247
Have a subsequent attempt	57	57	57	57	72	72	72	72
Pass on retake	45	45	45	45	62	62	62	62

Notes: Regressions of student achievement on indicator for teacher's National Board certification result, cubic polynomials in prior achievement in math and reading, student sex, race and ethnicity, FRL eligibility, learning disabled status, and participation in special education, English language learning, or gifted programs. All models estimated on sample of teachers with NBPTS submissions in two school years prior to and following assessment. Standard errors are clustered at the teacher level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6. NBPTS Assessment Results and Teacher Effectiveness (Early/Middle Childhood Certificates)

	Math				Reading			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. MC/Generalist (Elementary School Classrooms)								
Pass (first attempt)	0.064*** (0.021)	0.072** (0.030)			0.036* (0.020)	0.087*** (0.030)		
Pass (retake)		0.013 (0.034)				0.081** (0.034)		
Score (first attempt)			0.037*** (0.010)	0.050** (0.022)			0.040*** (0.009)	0.006 (0.024)
Score (maximum)				-0.014 (0.020)				0.034 (0.022)
Number of observations	22682	22682	22682	22682	22682	22682	22682	22682
Number of teachers:								
In assessment sample	490	490	490	490	490	490	490	490
Pass on first attempt	329	329	329	329	329	329	329	329
Have a subsequent attempt	133	133	133	133	133	133	133	133
Pass on retake	105	105	105	105	105	105	105	105
Panel B. EMC/Literacy, Reading, and Language Arts (Elementary School Classrooms)								
Pass (first attempt)	0.158*** (0.054)	0.232*** (0.072)			0.155*** (0.040)	0.253*** (0.053)		
Pass (retake)		0.124 (0.096)				0.163** (0.070)		
Score (first attempt)			0.037* (0.020)	0.025 (0.059)			0.056*** (0.021)	0.070 (0.056)
Score (maximum)				0.012 (0.058)				-0.013 (0.057)
Number of observations	7202	7202	7202	7202	7202	7202	7202	7202
Number of teachers:								
In assessment sample	162	162	162	162	162	162	162	162
Pass on first attempt	131	131	131	131	131	131	131	131
Have a subsequent attempt	21	21	21	21	21	21	21	21
Pass on retake	17	17	17	17	17	17	17	17

Notes: Regressions of student achievement on indicator for teacher's National Board certification result, cubic polynomials in prior achievement in math and reading, student sex, race and ethnicity, FRL eligibility, learning disabled status, and participation in special education, English language learning, or gifted programs. All models estimated on sample of teachers with NBPTS submissions in two school years prior to and following assessment. Standard errors are clustered at the teacher level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7. NBPTS Assessment Results and Teacher Effectiveness (Early Adolescence Certificates)

	EA/Math (Middle School Math Classrooms)				EA/ELA (Middle School Reading Classrooms)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pass (first attempt)	0.077** (0.032)	0.051 (0.048)			0.042 (0.027)	0.028 (0.043)		
Pass (retake)		-0.049 (0.052)				-0.018 (0.051)		
Score (first attempt)			0.070*** (0.020)	0.108*** (0.035)			0.041*** (0.014)	0.025 (0.031)
Score (maximum)				-0.039 (0.036)				0.016 (0.027)
Number of observations	21897	21897	21897	21897	20085	20085	20085	20085
Number of teachers:								
In assessment sample	181	181	181	181	212	212	212	212
Pass on first attempt	115	115	115	115	160	160	160	160
Have a subsequent attempt	46	46	46	46	47	47	47	47
Pass on retake	35	35	35	35	39	39	39	39

Notes: Regressions of student achievement on indicator for teacher's National Board certification result, cubic polynomials in prior achievement in math and reading, student sex, race and ethnicity, FRL eligibility, learning disabled status, and participation in special education, English language learning, or gifted programs. All models estimated on sample of teachers with NBPTS submissions in two school years prior to and following assessment. Standard errors are clustered at the teacher level.

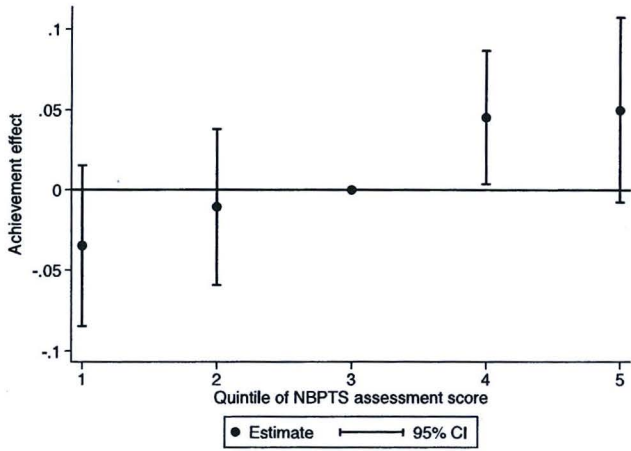
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8. Optimal Weights for Value-added Prediction

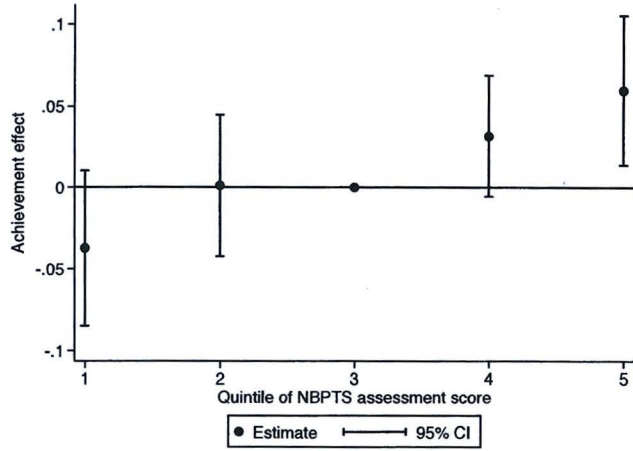
Type	No. Exercises	NBPTS Weight	Math	Reading
Student Work	1	0.16	0.08 (0.11)	0.20 (0.08)
Instructional Analysis	2	0.32	0.34 (0.14)	0.16 (0.10)
Documented Accomplishments	1	0.12	0.28 (0.12)	0.16 (0.07)
Assessment Center	6	0.40	0.30 (0.14)	0.48 (0.11)
Number of teachers			695	902
Number of student observations			46,064	51,970
In-sample change in R^2		0.0017/ 0.0012	0.0019	0.0013
Cross-validation change in R^2			0.0012	0.0011

Notes: Estimated optimal weights for value-added prediction by subject. Weights in column “NBPTS Weight” are current weights used in formulating the composite score. For math, included assessments are MC/Generalist and EA/ELA. For reading, included assessments are MC/Generalist, EA/ELA, and EMC/LRLA. In-sample change in R^2 gives improvement in R^2 of a regression of student achievement on controls from the addition of the weighted or reweighted NBPTS final score. Cross-validation change in R^2 is computed by the 10-fold cross-validation procedure described in the text. Totals may not sum to 1 due to rounding error. Standard errors of weights in parentheses are computed by the delta method and allow for clustering at the teacher level.

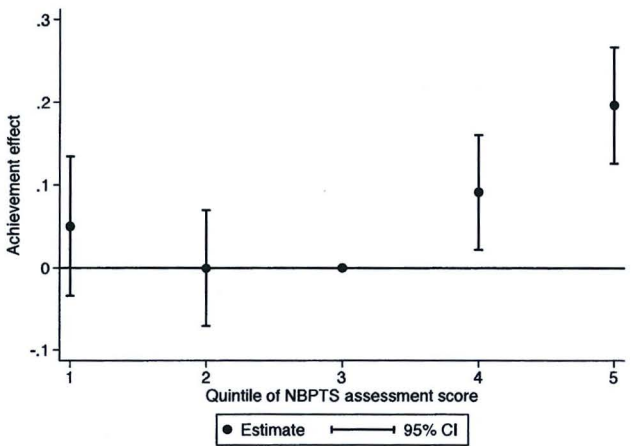
Figure 1. Student Achievement Effects by NBPTS Score Quintile



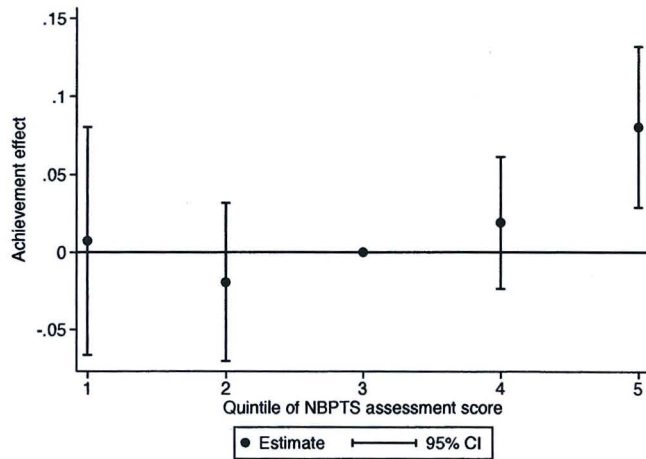
(a) Elementary Math



(b) Elementary Reading



(c) Middle School Math



(d) Middle School Reading

NATIONAL BOARD

for Professional Teaching Standards®

State	Compensation for Board Certification ^{1,2}	Connection to State Licensure	Support for Board Certification Fees ^{3,4}
AK		Toward obtaining and renewing a Master Teacher Certificate (top tier)	
AL	\$5,000 annual stipend	Toward obtaining and/or renewing a Professional Educator Certificate	
AR	\$5,000 annually for NBCTs who certify before 2018. NBCTs who certify after 2018 receive: \$2500 annually if they do not teach in a high-poverty school (for five years); \$5000 annually if they teach in a high-poverty school not located in a high-poverty district (five years); \$10,000 annually if they teach in a high-poverty school in a high-poverty district (10 years)	Toward professional development requirements (renewal)	First-time candidates subsidized initial fee but must repay if certification not achieved. Candidates receive 3 days release
AZ		Toward obtaining and/or renewing a standard (professional) certificate	
CA		Toward obtaining a Clear Single Subject Teaching Credential (top tier)	
CO	\$1,600 annual stipend; additional \$3,200 annually for NBCTs in high need schools	Toward obtaining a Professional Teacher License or Master Teacher Certificate (top tier)	
CT		Toward continuing education requirements (renewal)	
DC			
DE		Toward obtaining and renewing an Advanced License (top tier)	
FL		Toward obtaining and/or renewing a Professional Certification	
GA		Toward obtaining and renewing an Advanced Professional Certificate (top-tier) or obtaining and renewing a Professional Certificate	
HI	\$5,000 annual stipend; additional \$5000 for NBCTs in high-need schools	Toward obtaining an Advanced Certificate (top tier)	Scholarship funding available statewide
IA	\$2,500 annual stipend (term of 10 years)	Toward renewal credits of either a Standard (professional) or Master (top tier) license.	First-time candidates subsidized for up to one-half the fee
ID	\$2000 annually (for 5 years)		
IL		Toward a National Board endorsement on a professional license and toward license renewal	Up to 750 first-time candidates in high-need schools and 250 teachers in other schools can be subsidized the application fee. Renewal candidates may receive a \$1,000 subsidy
IN		Toward professionalizing a license (converts to a 10-year license) or renewing a practitioner (professional) or accomplished (top-tier) license	
KS	Districts are responsible for \$1,000 annual stipend	Toward obtaining and renewing an Accomplished Teaching License (top tier)	First-time candidates subsidized up to \$950. Renewal candidates subsidized \$500
KY	\$2,000 annual stipend	One path to Rank 1 Professional Certificate	
LA		Toward a National Board endorsement	
MA		Toward obtaining/renewing a Professional License	
MD	State will match \$1,000 from districts annually, and will match an additional \$1,000 annually to NBCTs in high need schools	Toward obtaining Advanced Professional Certificate (top tier)	First-time candidates subsidized 2/3 of fee and the district pays the remaining 1/3. Candidates must repay if don't complete process
ME	\$3,000 annual stipend	Toward obtaining a Professional Certificate and toward obtaining and renewing a Master Certificate (top tier)	First-time candidates subsidized the application fee on a first-come first-serve basis
MI		Toward obtaining a Professional or Advanced (top tier) license and toward license renewal	
MN		Toward renewal requirements	
MO		Toward obtaining a Career Continuous Professional Certificate and toward renewal	

MS	\$6,000 annual stipend; additional \$4000 for NBCTs in 13 counties	Toward renewal requirements	First time candidates are reimbursed the assessment fee upon completion of each component
MT	\$2500 annual stipend for NBCTs in high-need schools and \$1500 annual stipend for other NBCTs; both stipends are contingent on a district contribution of \$500.	Toward obtaining a license and toward renewing a Standard or Professional license	
NC	NBCTs placed on salary schedule 12% above base pay	Toward renewing a Standard Professional License 2 (professional)	First time candidates receive a \$1,900 loan to be repaid over three years
ND	\$1,000 annual stipend		First time candidates subsidized half the application fee for up to 7 candidates
NE	\$5,000 annual stipend	NBCTs are eligible for a 10-year Professional Teaching Certificate (top tier)	Candidates reimbursed one-half the fee. The remainder is reimbursed upon certification
NH		Toward obtaining a Master Teacher Certificate (top tier)	
NJ			
NM	Annual 1.5 program unit stipend ~\$5,800	Toward obtaining a Level III license (top tier)	
NV	5% annual salary increase	Toward renewal requirements	
NY		Toward renewing a professional certificate.	First-time candidates subsidized for three components. Upon completion, candidates will be reimbursed the cost of the first component
OH		Toward obtaining a Lead Professional Educator License (top tier)	
OK	NBCTs may earn up to an additional \$1,000/year	Toward obtaining a traditional state teaching credential (professional)	Candidates receive scholarships of \$1,300 and additional \$500 to cover other expenses
OR		Toward obtaining/renewing a professional teaching license or a distinguished teaching license (top tier)	At least 150 teachers will be reimbursed for the costs of each component and for the costs related to participating in a cohort
PA		Toward obtaining a Level II certification (top tier) and toward professional development credits	
RI			
SC	\$5,000 stipend (up to 10 years)	Toward obtaining a professional certificate and toward renewal	
SD	\$2000 annual stipend for at least 5 years	Toward obtaining or renewing a 10-year license and toward renewal	Upon obtaining National Board Certification, the state will reimburse fees paid by the teacher
TN		Toward obtaining/renewing a professional license	
TX			
UT	\$1500 annually for NBCTs in Title I schools; \$750 annually for NBCTs in other schools	Toward obtaining and renewing a Level 3 license (top tier)	
VA	Initial \$5,000 award; subsequent \$2,500 annually		
VT		Toward obtaining and renewing a Level I (initial) or level II (professional) license	
WA	\$5,090 annual stipend. Additional \$5,000 annually to NBCTs in high need schools	Toward obtaining and renewing a professional certificate	First-time candidates receive interest free conditional loan for three components
WI	\$2,500 annual stipend after first year. Additional \$2,500 annually to NBCTs in high need schools	Toward obtaining a Master Educator license (top tier) and toward license renewal	Those who certify may apply for reimbursement of up to \$2,000 expenses
WV	\$3,500 annual stipend; additional \$2,000 to NBCTs in low-performing schools	Toward obtaining a permanent professional license	First-time candidates reimbursed one half the fee at enrollment, and the remainder at completion. Those who achieve are reimbursed up to \$600 for additional expenses
WY	\$4,000 annual stipend	Toward obtaining and renewing a professional license.	Up to \$950 available through the WY National Board Certification Initiative (WNBCI)

State funds for stipends are typically subject to annual appropriations and stipends may be prorated if there is a defined funding pool

Stipend is for the life of the certificate unless otherwise indicated

3 The structure of fee support may change as states transition to the new format of the National Board assessment

4 State funds for fee support are typically subject to annual appropriations and there may be a cap on recipients or subsidies may be prorated if there is a defined funding pool

5 Based on total teachers from U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "State Nonfiscal Public Elementary/Secondary Education Survey", SY 2013-14 v.1a.

This page reflects the most recent information available to the National Board for Professional Teaching Standards at the time of posting. The National Board is not responsible for the accuracy of the information found herein. Please contact your state agency for current information.

Nov 2017

The Impact of National Board Certification on Burnout Levels in Educators

TANYA JUDD PUCELLA

Abstract: Teacher retention has become a major issue facing policy makers as our nation's school-age population continues to grow while the teaching workforce continues to decline because of attrition and an aging workforce. Common reasons cited by teachers for leaving the profession can also be linked to burnout. This study examined burnout levels in a specific subset of teachers—those who achieved certification by the National Board for Professional Teaching Standards (NBPTS). The potential benefits to teachers who pursue NBPTS certification include professional pride, recognition of outstanding teaching practice, new leadership roles and responsibilities, and higher salaries (Shapiro 1995). Some of these potential rewards seem to address a number of the factors that are related to the onset of burnout, and therefore may not only alleviate burnout but also impact retention rates. The study found that National Board Certified Teachers (NBCTs) demonstrated significantly lower levels of burnout in two of its three dimensions.

Keywords: National Board for Professional Teaching Standards, NBPTS certification, teacher burnout, teacher retention

Teacher attrition and retention has become a major issue as our nation's school-age population continues to grow while the teaching workforce does not. More than enough prospective teachers are graduating from teacher education programs; however, only 50 percent of these make it to the classroom, and of these, 46 percent leave within the first five years (National Council on Teacher Quality 2003). In addition, the veteran teaching workforce is declining as baby boomers, who make up more than 50 percent of America's educators,

are reaching retirement age (Carroll and Foster 2008). Schools and districts concentrating their efforts on replacing faculty have fewer resources to spend on improving the quality of instruction. Consequently, even in a declining economy the issue of teacher retention is a critical one for the field of education.

Common reasons cited by teachers for leaving the field include: the lack of teacher participation in decision making, minimal career advancement opportunities, low pay, the declining respect accorded to teachers by society, the attitudes of students and parents, inadequacy of administrative support, and the increasingly violent nature of the school environment (Anderson and Iwanicki 1984; Blase, Dederick, and Strathe 1986; Bryne 1998; Farber 1991; Hock 1988). Many of the reasons cited for leaving the profession are also associated with the onset of burnout, a construct that has been linked to attrition (Byrne 1999; Friedman and Farber 1992; Villa and Calvete 2001). Further, research shows that one of the consequences of burnout is attrition (Farber 1991).

Teacher burnout is an issue facing all schools, but perhaps one of even greater concern to teachers, administrators, and policy makers associated with our middle and high school settings. The Maslach-Leiter theoretical framework identifies workload as a contributing factor to the onset of burnout (Maslach 1999). Workload levels for educators become problematic in a quantitative sense because of factors such as class size, the amount of required paperwork, or the number of students assigned to the teacher (Starnaman and Miller 1992). In fact, a study of more than 1,000 teachers found that secondary teachers were more prone to burnout than their peers in elementary classrooms (Borthwick 1982). Class size and certainly the overall number of students are much higher in secondary classrooms, making burnout and its

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consequences a major concern for leaders in our middle and high schools across the country.

Burnout: Framing the Problem

Farber (1991), a leading researcher in burnout among educators, uses Maslach's social-psychological framework to formulate a conceptual definition of burnout as

A work-related syndrome that stems from an individual's perception of a significant discrepancy between effort (input) and reward (output), this perception being influenced by individual, organizational, and social factors. It occurs most often in those who work face to face with troubled or needy clients and is typically marked by withdrawal from and cynicism toward clients, and various psychological symptoms such as irritability, anxiety, sadness, and lowered self-esteem. (24)

Maslach and Pines (1977) operationalize burnout through three independent dimensions, which are interrelated to varying degrees. These dimensions, while distinct, are related empirically. It is possible for someone to demonstrate signs of burnout in one, two, or all three of these dimensions.

The first dimension of burnout is emotional exhaustion, or the feeling that one has been sapped of energy. Emotional exhaustion has been described as feeling emotionally fatigued or worn out (Maslach 1999).

Depersonalization, the second dimension, deals with an emotional distancing between the teacher and their students, as well as a hardening of emotions toward the students and their own work. Depersonalization has been described as being detached or uncaring, with frequently high levels of irritation with clients (students) and the work itself (Maslach 1999).

The final dimension, lack of personal accomplishment, is a decline in one's feelings of experienced success at work. These teachers see themselves as ineffective in helping students achieve, and are often unmotivated to fulfill their other duties in the school setting (Byrne 1999).

Burnout and the NBPTS Process

The National Board for Professional Teaching Standards (NBPTS) is an organization that developed a certification process to address assertions that the field of education did not have a set of codified knowledge, skills, and abilities that demonstrated mastery, such as one would see in other professions such as law or medicine (Baratz-Snowden, Shapiro, and Streeter 1993). The mission of NBPTS is in part to "establish high and rigorous standards for what accomplished teachers should know and be able to do" (National Board for Professional Teaching Standards 2007). The rigorous standards developed by NBPTS focus on the teacher's knowledge of the subject matter, their level of professional commitment and continued development, their ability to

reflect deeply on their own teaching practice, a demonstrated ability to manage and monitor student learning, and interaction with other educators as members of a larger learning community. Teachers compile a comprehensive portfolio to demonstrate their work as accomplished practitioners and take a rigorous examination.

Many of the benefits of successful completion of the NBPTS process identified by researchers address some of the factors that are related to burnout. Serafini (2002) acknowledges that terms such as "recognition and respect" are often used to explain the outcomes associated with attaining NBPTS certification. Shapiro (1995) suggests several possible advantages to being certified, including new leadership positions and responsibilities, a sense of professional pride and self-esteem, salary increases, recognition of accomplished teaching, reasons for remaining in the profession, and increased mobility between states. Other researchers mention increased public accountability, verifying the hard work of teachers, or peer recognition of excellence in the field as being important results of the process (Areglado 1999; Smagorinsky 1995). Additionally, a 2001 study by NBPTS indicated that the certification process has resulted in an average of 10 different leadership activities after the teachers became certified (National Board for Professional Teaching Standards 2001). The study also found that more than 90 percent of the National Board Certified Teachers (NBCTs) felt that becoming a NBCT enhanced their credibility in the education profession.

Studies by Friedman and Farber (1992) and Villa and Calvete (2001) found a significant negative relationship between burnout and professional self-concept, or how an individual views his or her competence as a professional. Therefore, a process that instills the confidence that one is an accomplished teacher may have the ability to influence perceived levels of burnout. In addition, teachers who have successfully completed the NBPTS process have stated that the process has renewed their professional vigor and provided them with a sense of professional satisfaction, the very type of professional renewal that many mid-career teachers in danger of burning out may need (National Board for Professional Teaching Standards 2007).

Research Methodology

Although no previous studies have directly examined the link between NBPTS certification and burnout, the literature reveals that the benefits associated with certification are similar to those factors that are thought to alleviate burnout. An empirical evaluation of the impact of NBPTS certification on burnout levels revealed a great deal about the possible relationship between certification and burnout and retention.

TABLE 1. Independent Samples *t* Tests

	NBCT Sample			Non-NBCT Sample		
	Mean	SD	<i>N</i>	Mean	SD	<i>N</i>
Emotional exhaustion	19.99**	9.92	248	23.85	11.26	220
Depersonalization	4.41**	.351	205	5.90	.390	190
Personal accomplishment	40.58**	435	243	38.83	475	218

p* < .05.*p* < .10.

Research Design

This study was based on the premise that the potential benefits of NBPTS certification might counteract the onset of burnout. The study was a comparative model in which the researcher looked for statistically significant differences in levels of perceived burnout in all three dimensions between a group of NBCTs and their noncertified peers, as measured by the Maslach Burnout Inventory-Educators Survey (MBI-ES). Several additional questions were added to the MBI-ES in order to identify demographic information and to address the factors that the Maslach-Leiter burnout model identified as being associated with the onset of burnout.

Research Sample

The instrument was distributed to two distinct groups. The first group was the population of NBCTs within the target school district (*n* = 255). The second group was a random sample of non-NBCTs who have never been a part of the NBPTS process (*n* = 221).

Data Analysis

A variety of statistical tools were utilized in the analysis of the data. Three separate *t* tests were conducted in order to compare the scores of the NBCTs to the non-NBCTs across each dimension of the burnout construct as identified by the MBI-ES. A *t* test is a statistical test used to compare the differences between the means, or averages, of two groups in order to see if there is a significant difference between them. The *t* test in this study compared the average burnout scores of the NBCT group to the non-NBCT group to see if there was a statistically significant difference between these means.

To make comparisons more reliable, statistical adjustments were made for individual teacher characteristics such as age, years of experience, subject area taught, and grade level. A second group of variables included workplace factors such as organizational characteristics, task qualities, and social support. These factors are identified in the Maslach-Leiter theoretical framework and were included in order to examine the strength of the in-

fluence of NBPTS certification as opposed to these other aspects of the theoretical model that are thought to be related to the onset of burnout. This helped to determine whether NBPTS certification was a significant predictor of burnout levels, providing a second statistical model to analyze the strength and direction of the relationship between certification and burnout.

Results

The purpose of the *t* tests in this study was to determine if there was a significant difference between the average levels of perceived burnout between NBCTs and non-NBCTs across the three dimensions of the burnout construct. As indicated in table 1, there was a significant difference in burnout levels across all three dimensions between NBCTs and their noncertified peers, with NBCTs demonstrating lower levels of perceived burnout in all three dimensions. Note that in the personal accomplishment dimension the mean, or average, burnout level was higher in the non-NBCT group; the personal accomplishment dimension is reverse ordered on the MBI-ES, meaning that higher values indicate lower burnout levels. Therefore, the NBCT group demonstrated lower levels of burnout in this dimension as well.

The negative relationship between NBPTS certification and burnout seems to be supported by an analysis of the ranges of experienced burnout in each dimension. The preponderance of NBCTs (42%) were in the low range of experienced burnout in the emotional exhaustion dimension (scores of between 0 and 17), while the largest segment of the control group (40%) was found in the high range (scores greater than 30). The personal accomplishment dimension found both the majority of the NBCT (80%) and control group (66%) in the low range of experienced burnout with scores greater than 40, although the control group still showed far more individuals in the moderate (21%) and high (13%) ranges than did the NBCT sample (moderate 12%; high 8%). The majority (84%) of the NBCT group reported

depersonalization levels in the low range of experienced burnout as well (scores of between 0 and 5).

Discussion

The NBCT group might be demonstrating significantly lower levels of experienced burnout in emotional exhaustion for a variety of reasons. For example, emotional exhaustion is typically associated with feelings of frustration. It is possible that these feelings may be alleviated by the benefits of attaining NBPTS certification, such as increased leadership opportunities, higher pay, and recognition by colleagues and the community. These proposed benefits of certification coincide with a number of the common teacher frustrations associated with burnout.

It is also possible that NBCTs may be displaying a greater degree of professional self-concept—or, confidence in their abilities—that assuages feelings of frustration, resulting in lower levels of perceived burnout in the emotional exhaustion dimension. The heightened degree of professional self-concept may be a result of the recognition of accomplishment by their peers and by the community as a whole that occurs when a teacher attains certification despite the rigors of the process.

Personal Accomplishment

NBPTS certification was also found to be a statistically significant predictor of the development of personal accomplishment dimension of burnout. Again, the higher average burnout score reported for the NBCT group actually indicates lower levels of burnout because this dimension was reverse ordered on the survey.

The reported benefits of achieving NBPTS certification may also help us understand the lower levels of burnout in the personal accomplishment dimension. The feeling of professional pride, or professional self-concept, is critically important to anyone in a helping services profession such as education. These individuals often enter their chosen field out of a desire to help and assist others. If they do not feel that they are doing a good job, or that their efforts are not making an impact, feelings of frustration, depression, and burnout may set in. The difficult nature of NBPTS certification seems to indicate that those who attain certification have demonstrated mastery within their chosen field that was recognized by a body of their peers. Such recognition might bolster an educator's confidence in their work in the classroom and enhance his or her professional self-concept, leading to lower levels of perceived burnout. Teachers who have confidence in their abilities are more likely to be retained in the classroom.

Depersonalization

The initial findings showed statistically significant differences between the NBCT and non-NBCT groups in depersonalization. However, the regression analysis

that was conducted to confirm that NBCT certification is related to the levels of burnout did not support the results of the *t* test for depersonalization (see the appendix for a full explanation of the multiple regression analysis). This indicates that while there does seem to be a difference between the average burnout scores in these groups based on the *t* tests, NBPTS certification itself was not a significant predictor of the onset of burnout. The results of this second statistical test seemed to be in opposition to the findings from the *t* test.

One possible explanation is that there are only a small number of questions on the MBI-ES that target depersonalization, which may make it more difficult to accurately identify. Another possibility is that depersonalization involves emotional distancing between the teacher and their students. For many educators this is a difficult thing to admit, even to oneself, as most individuals enter education out of the desire to make a difference in the lives of others. To admit that you feel emotionally distant from your students and that you "don't really care what happens to some students" (MBI question 15) would likely be extremely upsetting to the teacher, and would certainly be looked at as unacceptable to others within the profession. As a result, respondents may have had difficulty responding to the questions regarding depersonalization.

Despite the demonstrated statistical difference between the means of the NBCT and non-NBCT groups on the depersonalization scale of the MBI-ES, the regression analysis demonstrates that the relationship of NBPTS certification to depersonalization is unclear. While NBPTS certification does appear to be a possible factor, when other explanatory variables from the theoretical framework enter the model, its influence appears confounded. Further research is necessary in order to explore the impact of NBPTS certification on the depersonalization dimension of burnout.

Secondary Findings

The survey instrument also provided the researcher with secondary findings that relate to the impact of NBPTS certification on educators (see table 2). A series of questions was included to evaluate how the NBPTS process changed educator perceptions in a few key areas. These questions, combined with the statistical analysis of the burnout instrument, can help provide a clearer depiction of the influence of NBPTS certification on burnout and, therefore, retention. The analysis of these questions is based on reviewing the frequencies of responses in each category.

Farber (1991) noted that the lack of respect accorded to educators by society is one of the leading factors in the development of burnout. One of the questions asked NBCTs was whether they felt that their NBCT status had provided them with additional rewards and recognition. A majority (75.8%) agreed or strongly agreed that they

TABLE 2. NBCT Additional Questions

	Strongly Disagree (%)	Disagree (%)	Undecided (%)	Agree (%)	Strongly Agree (%)
Becoming an NBCT has made a difference in my commitment to my students.	5.8	14.7	2.7	43.4	33.3
Becoming an NBCT has made a difference in my commitment to my school.	7	18.8	11.7	35.2	27
Becoming an NBCT has renewed my interest in teaching.	1.3	15.6	7.8	39.5	32.8
I feel that my status as an NBCT has provided me with additional rewards and recognition.	4.7	11.3	8.2	41	34.8
Recognition of my accomplishments in the classroom through the NBPTS process has improved my outlook on teaching.	5.1	12.5	11.7	44.5	26.2
I am still in the field of education because of my participation in the NBPTS process.	16	27.3	11.7	29.3	15.2

did in fact feel that they had received additional recognition. If Farber is correct, then it would seem that the NBPTS process may in some way alleviate the lack of respect that many teachers often feel, and may therefore reduce burnout levels.

In addition, these questions indicated that the NBPTS process increased the educator's commitment to their school (62.2%) and their students (76.7%). Increased commitment to the school or the students may lead to a reduced chance that the teacher feels emotionally exhausted. This heightened sense of commitment to students and the school also is relevant to the energy expansion model, which suggests that added roles and responsibilities may actually expand the energy of the individual rather than become added stressors (Marks 1977). Marks states that the expansion of energy stems from commitment, which may come from loyalty to significant others involved in the role, such as students or the school community. If this heightened sense of commitment can serve as a way to expand energy for an educator, it may be that this expansion will reduce stressors that may lead to burnout.

Recommendations for Practice

The correlational findings of this study indicate that the NBPTS certification process has a negative relationship with the onset of burnout in at least two dimensions for the NBCTs in this sample. It is difficult to establish clear and direct causal relationships between the NBPTS process and the reduction of burnout; however, the data from this study—along with research cited in the literature—suggest that school leaders might find the fol-

lowing practices positive actions toward enhancing professional development and reducing some of the factors that lead to burnout.

- *Encourage teachers to pursue NBPTS certification.* Assist them in finding mentors within your faculty to help them through the process.
- *Encourage teachers to pursue graduate degrees.* Teachers who pursue additional coursework toward advanced degrees will have the opportunity not only to improve their teaching practice but also to stretch themselves personally and professionally. This may offer a renewal of professional vigor similar to what the NBPTS process provides, and may also be accompanied by increased recognition and salary enhancements that could improve professional self-concept.
- *Develop a culture of reflective practice.* Taking time to reflect regularly, as teachers do during the NBPTS process, allows them to think about their strengths and target areas in need of improvement, boosting their sense of professional accomplishment.
- *Engage in shared decision making with your faculty.* Byrne (1999) noted that the lack of teacher participation in decision making is a significant predictor of burnout. Consulting with teachers about key decisions that impact their classrooms and the school aids in the development of a learning community is one of the core propositions of NBPTS.
- *Utilize the expertise of your veteran teachers by encouraging them to be teacher leaders.* A 2001 study by NBPTS indicated that the certification process resulted in an

average of 10 different leadership activities for NBCTs. Teacher leaders take on a variety of roles, from mentor to department chair, which improve the quality of instruction for all students. A principal who cultivates teacher leadership demonstrates confidence in the ability of the faculty, which improves their sense of professional pride.

- *Invest in networking opportunities for teachers, such as book groups or professional learning communities.* Teachers have little time during their work day to interact with other adults, a fact that often leads to stress and frustration. The NBPTS process encourages teachers to work together as members of learning communities; perhaps opportunities to develop a cohort improved teachers' sense of social support from their peers—a factor noted in the Maslach-Leiter theoretical framework as negatively associated with burnout (Maslach 1999). A structured opportunity to meet with their peers and discuss salient issues gives teachers an opportunity to grow as professionals, improve their teaching practice, and reduce stress—all of which may reduce the likelihood of burnout.

Summary and Conclusions

This study demonstrated a negative relationship between two dimensions of burnout and NBPTS certification. Because NBCTs in this study did in fact exhibit lower levels of burnout, enhancing some of the benefits of the NBPTS process—such as increased pay, new leadership opportunities, and recognition by colleagues and the community—through support of NBPTS certification or through other similar means, such as advanced degrees, may also be effective in alleviating burnout.

One goal of this study was to explore the relationship between NBPTS certification and burnout in order to attempt to provide policy makers with concrete data to use in evaluating their current support of the NBPTS certification program. Increasingly, policy makers and the public at large want to be able to quantify the impact of the dollars they spend on educational reform efforts. In finding a negative relationship between two burnout dimensions and NBPTS certification, there are at least preliminary indications that support of this program may help policy makers and administrators deal with the retention issues that they are currently facing. Additionally, any program that assists in the reduction of teacher turnover allows schools and districts to concentrate precious resources on improving instruction rather than recruiting and training new teachers.

Additional research would be beneficial to fully explore the relationship between the pursuit of professional development experiences, such as NBPTS certification, and burnout. A replication of this study with teachers pursuing advanced degrees or other forms of professional certification might help us understand how

to stem the tide of burnout. A study attempting to understand the psychology of achievement in educators could also help us understand the relationship between an educator's sense of professional self-concept and their perceived levels of burnout.

Overall, this study is exciting news for policy makers, teacher leaders, community members, and other supporters of the NBPTS process because it indicates that the NBPTS process may be able to reduce burnout levels. While the relationships between burnout and NBPTS certification found in this study do not necessarily demonstrate a causal relationship, these findings show that encouraging both professional development experiences and opportunities for reflection such as the NBPTS process provides might address the rising tide of burnout in our schools. If professional development experiences such as NBPTS certification can potentially alleviate burnout, it is possible that it will also increase retention rates in teachers. Alleviating burnout will also improve the quality of education provided to students by reenergizing teachers and keeping them focused on why they entered the profession—teaching children.

REFERENCES

- Anderson, M. B., and E. F. Iwanicki. 1984. Teacher motivation and its relationship to burnout. *Educational Administration Quarterly* 20(2): 94-132.
- Areglado, N. 1999. I became convinced: How a certification program revitalized an educator. *Journal of Staff Development* 20(1): 35-37.
- Baratz-Snowden, J., B. Shapiro, and K. Streeter. 1993. The National Board for Professional Teaching Standards: Making a profession. *Middle School Journal* 25(2): 68-71.
- Blase, J. J., C. Dederick, and M. Strathe. 1986. Leadership behavior of school principals in relation to teacher stress, satisfaction, and performance. *Journal of Humanistic Education and Development* 24(4): 159-69.
- Borthwick, P., J. Thornell, and F. Wilkinson. 1982. Teacher burnout: A study of professional and personal variables. *Proceedings of the Annual Meeting of the American Association for Teacher Education*. Houston, TX: ERIC Document Reproduction Service.
- Bryne, J. J. 1998. Teacher as hunger artist: Burnout: Its causes, effects, and remedies. *Contemporary Education* 69(2): 86-92.
- Byrne, B. M. 1999. The nomological network of teacher burnout: A literature review and empirically validated model. In *Understanding and preventing teacher burnout*, ed. R. Vandenberg and A. M. Huberman, 15-37. Cambridge: Cambridge University Press.
- Carroll, Thomas G., and Elizabeth Foster. 2008. *Learning teams: Creating what's next*. Washington, DC: National Commission on Teaching and America's Future.
- Farber, B. A. 1991. *Crisis in education*. San Francisco: Jossey-Bass.
- Friedman, I. A., and B. A. Farber. 1992. Professional self-concept as a predictor of teacher burnout. *Journal of Educational Research* 86(1): 28-35.
- Hock, R. R. 1988. Professional burnout among public school teachers. *Public Personnel Management* 17(2): 167-89.
- Marks, S. R. 1977. Multiple roles and role strain: Some notes on human energy, time, and commitment. *American Sociological Review* 42(6): 921-36.
- Maslach, C. 1999. Progress in understanding teacher burnout. In *Understanding and preventing teacher burnout*, ed. R. Vandenberg and A. M. Huberman, 211-22. Cambridge: Cambridge University Press.
- Maslach, C., and A. Pines. 1977. The burnout syndrome in the daycare setting. *Child Care Quarterly* 6(2): 110-13.
- National Board for Professional Teaching Standards. 2001. Impact of National Board Certification. *National Board for Professional Teaching*

- Standards. <http://www.nbpts.org/pdf/ResRpt.pdf> (accessed February 25, 2004).
- National Board for Professional Teaching Standards. 2007. *About NBPTS*. http://www.nbpts.org/about_us (accessed November 22, 2007).
- National Council on Teacher Quality. 2003. SREB focus on retention. *Teacher Quality Bulletin* (January 31).
- Serafini, F. 2002. Possibilities and challenges: The National Board for Professional Teaching Standards. *Journal of Teacher Education* 53(4): 316-28.
- Shapiro, B. 1995. A boost for teachers? *Vocational Education Journal* 68: 28-29.
- Smagorinsky, P. 1995. Teacher certification as personal and professional development. *Voices From the Middle* 2(4): 21-26.
- Stamaman, S. M., and K. I. Miller. 1992. A test of a causal model of communication and burnout in the teaching profession. *Communication Education* 41: 40-53.
- Villa, A., and E. Calvete. 2001. Development of the Teacher Self-Concept Evaluation Scale and its relation to burnout. *Studies in Educational Evaluation* 27: 239-55.

Appendix

Multiple Regression Analysis of the Overall Model

In addition to the independent sample *t* tests, a multiple regression analysis was conducted. Multiple regression is a statistical technique that is used to predict the value of a variable based on the behavior of one or more independent variables. For example, a multiple regression model could attempt to predict grades in a course based on variables such as time spent studying and grades in previous courses.

This regression model was completed in order to look at the impact of NBPTS certification as a predictor of burnout levels in each dimension. This regression analysis also included components of the Maslach-Leiter theoretical model as additional independent variables that are considered to be predictors of burnout. If NBPTS certification was found to be a statistically significant variable in these multiple regression analyses, just as elements of the Maslach-Leiter models were, it would help confirm the findings of statistical significance in the independent samples *t* tests by demonstrating that NBPTS certification is indeed a significant predictor of burnout levels.

TABLE 3. Examination of NBPTS Certification as an Independent Variable

	Emotional Exhaustion	Depersonalization	Personal Accomplishment
Beta	-.111	-.069	.092
Significance	.019 ^a	.201	.072 ^b
N	248	205	243

^aDifference is significant at the .05 level.

^bDifference is significant at the .10 level.

Overall, the results of the *t* tests were confirmed by the regression analysis for both emotional exhaustion and personal accomplishment dimensions. As table 3 shows, the NBPTS certification status of a teacher was found to have a statistically significant negative relationship on emotional exhaustion ($p = .019$); in other words, someone who has achieved NBPTS certification is less likely to show signs of burnout in the emotional exhaustion dimension.

NBPTS certification was also a significant predictor of burnout in the personal accomplishment dimension. In this case the beta value reported in table 3 is positive because the personal accomplishment dimension is reverse ordered, with higher scores on the scale indicating lower ranges of perceived burnout. As with emotional exhaustion, this shows that NBPTS certification is negatively associated with the onset of burnout.

The multiple regression analysis of depersonalization was not statistically significant. In other words, NBPTS certification is not a significant predictor of depersonalization. This conflicts with the independent samples *t* tests. The fact that these two statistical tests showed conflicting results demonstrates that more research may be needed to further examine the relationship between a professional development experience such as NBPTS certification and its resulting impact on depersonalization.

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Retaining South Carolina Teachers Through National Board Certification

According to the most recent South Carolina Annual Educator Supply and Demand Report released by CERRA, more teachers are leaving their positions and fewer are entering the profession. A program called National Board Certification (NBC) provides a strategy for keeping accomplished teachers in the classroom, and it is currently available to teachers in this state. Results from national research confirm that the retention rates of National Board Certified Teachers (NBCTs) are often significantly higher than those of teachers who are not National Board certified.

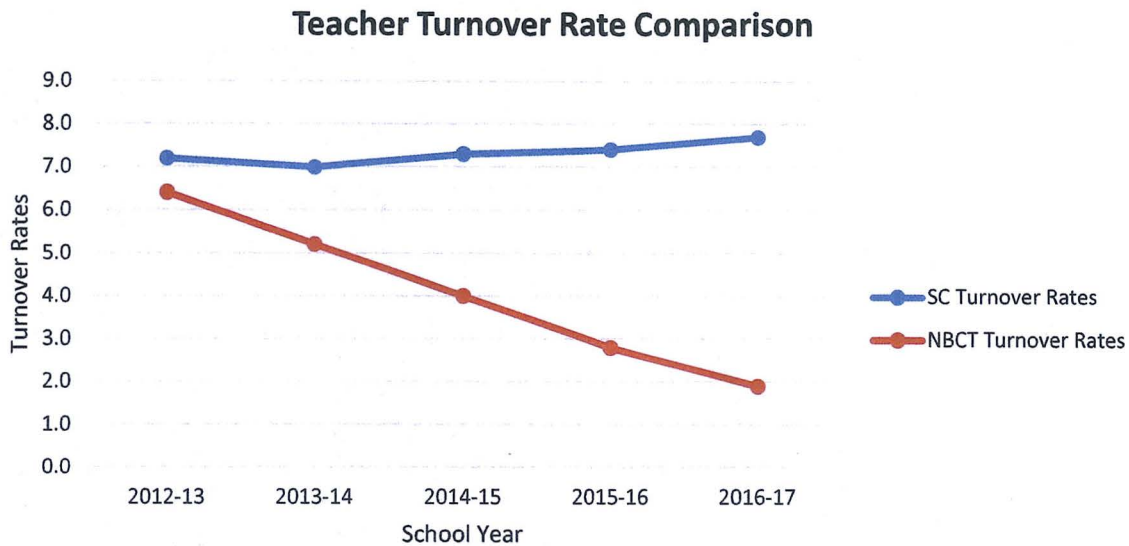
NBC is a voluntary, advanced certification process for teachers that requires candidates to provide content specific, standards-based evidence of accomplished practice. Candidates are assessed across four components, each of which is designed to evaluate a different aspect of a teacher's practice. Component 1 is a computer-based assessment that focuses on both content knowledge and pedagogy. Components 2-4 are portfolio assessments that require candidates to, among other tasks, analyze student work samples, submit videos of classroom instruction, demonstrate their collaboration with families, the community, and colleagues to impact student learning, and provide evidence of assessment knowledge.

Crosswalk documents, created by a group of experienced NBCTs in 2016, illustrate a close alignment between the NBC requirements of accomplished teaching and South Carolina's teacher evaluation system. Consequently, the NBC requirements were found to be more rigorous than the state's proficient level of teacher performance. Candidates who achieve NBC receive a five-year certificate from the National Board for Professional Teaching Standards (NBPTS). Pursuant to SC Proviso, those educators who are employed in a teaching position are eligible to receive a state supplement of \$5,000 per year for the duration of the National Board certificate. The current National Board Proviso requires educators to apply with NBPTS prior to July 1, 2018 in order to be eligible for the state supplement.

While national research exists related to the retention benefits of NBC, South Carolina has not produced any recent studies that focus on this topic. With substantial numbers of teachers leaving their classrooms, CERRA began examining this issue in the fall of 2017. The South Carolina Department of Education (SCDE) provided statewide teacher turnover rates that include teachers who leave the state for any reason. Teachers who move from one SC public school district to another are not considered statewide turnover as long as they remain in a teaching position. These rates do, however, include teachers who move into a non-teaching position (i.e., assistant principal, district coordinator, etc.) in any SC public school district.

The state's turnover rates were compared to turnover rates of South Carolina NBCTs over a five-year period. For each of the five years, CERRA calculated turnover rates for NBCTs by applying the same formula used by the SCDE to determine turnover rates for the entire state. Like the statewide rates, the rates among NBCTs account for those who leave the state for any reason and those who move into a non-teaching position that is no longer eligible for the National Board state supplement. NBCTs who leave a SC public school district to teach in another one are not considered statewide turnover.

The most recent data available from the SCDE are for the 2016-17 school year. Specifically, these data represent the rates of teachers who were teaching in a SC public school district in 2015-16, but not teaching in any SC public school district in 2016-17. Some of these teachers remain employed in a SC public school district, but they are no longer in a teaching position. As shown in the following table, the SC teacher turnover rate for the 2016-17 school year was 7.7%, yet only 1.9% for all NBCTs in the state. A line chart was used to reveal the slight increase in SC teacher turnover rates over five years and the significant decrease in turnover among NBCTs.



In November 2017, a survey was sent to the SC National Board Network (SCNBN) to gain anecdotal evidence related to the impact of NBC on teacher instruction and retention. The SCNBN is a new membership organization comprised of NBCTs. Members were asked if they believed that the NBC process affected their planning, instruction, and/or assessment practices. All teachers who responded to the survey credited the process with enabling them to reflect on their practice and better assess the different needs of their students. Such reflection and differentiated instruction often have a positive impact on student learning and growth and can lead to an improvement in the teacher's overall effectiveness.

Teachers also were asked if the National Board state supplement impacted their decision to remain in the classroom. With the exception of one teacher who certified before the supplement was available, all respondents reported that the supplement influenced their choice to stay in the classroom. Many specifically noted that going into administration was not a feasible option since they would no longer be eligible for the supplement. When questioned about the NBC renewal process, some teachers indicated that they would leave the classroom or at least begin to consider district-level positions with larger salaries if they lost the supplement.

The turnover rate comparisons and anecdotal evidence provided in this paper provide compelling reasons to conclude that National Board Certification is an effective teacher retention tool in South Carolina. Whether it is the process itself that keeps teachers in the classroom or the supplemental funds or both, the results are notable. If more teachers were to experience the NBC process and become certified, more teachers likely will remain in the classroom. South Carolina must improve its teacher retention rates as the state continues to struggle with an ongoing teacher shortage.