

**A Study of the Relationship Between the
National Board Certification Status of Teachers
and Students' Achievement**

Technical Report

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Executive Summary

Introduction

One of the South Carolina State Department of Education's ongoing initiatives is to improve teacher quality by promoting National Board Certification of teachers. The National Board for Professional Teaching Standards (NBPTS) offers experienced teachers the opportunity to obtain National Board Certification. This process requires the teacher to submit a portfolio including samples of students' work, videotaped lessons, samples of assessments, and self-reflection journals. State certification systems for beginning teachers establish minimum requirements for entry-level teachers. The NBPTS has established advanced standards for experienced teachers.

The South Carolina General Assembly has provided considerable monetary support for the State Department of Education's National Board Certification initiative. As a result, the General Assembly asked that a study be conducted to determine if National Board Certification has improved student achievement in South Carolina. The Office of Program Evaluation (OPE), College of Education, University of South Carolina contracted with the State Department of Education and the Center for Educator Recruitment, Retention, and Advancement (CERRA) on May 14, 2004 to conduct the study.

The purpose of this study was to investigate whether students, in grades four through eight, of National Board Certified teachers achieve higher scores on the English language arts (ELA) and mathematics Palmetto Achievement Challenge Test (PACT) than do students whose teachers have not obtained National Board Certification.

Methods and Design

To investigate the relationship between National Board Certification status and PACT scores, researchers in the Office of Program Evaluation consulted with experts in research design and analysis. As a result, researchers decided to study the effect of National Board Certification on students' PACT scores using two approaches. One approach was a matched pairs design.

National Board Certified and Non-National Board certified teachers were matched and students the teachers taught were matched to control for certain background variables. The second approach was the use of Hierarchical Linear Models (HLM). Hierarchical linear models were used to account for the nested structure of the data. In school settings, students within a classroom have a relationship due to common experiences shared in the classroom. HLM models permit researchers to account for this dependence by separating out variation in the independent variable (achievement in this case) due to classroom effects and variation in the independent variable due to student effects. Variables may be added to the models to account for variation in achievement at the student and classrooms levels.

Findings

- The trends in the data were similar for both the matched pairs and HLM analyses.
- The results suggest that National Board Certified teachers are having a positive impact on elementary and middle school students' achievement in the content areas of ELA and mathematics.
- The evidence was strongest for ELA student achievement.

- The evidence for mathematics student achievement was predominantly descriptive with students of National Board Certified teachers on average scoring more than one point higher than did students of Non-National Board Certified teachers.
- The effect was greatest for students on a full pay lunch status.
- Most of the findings associated with students on free or reduced lunch tended to be less than one point difference and very small.
- The scope for the requested study was rather narrow. Although student achievement should be a part of any study of the effects for National Board Certification of teachers, other potential contributions should be considered also. Some of the other contributions might be leadership, student affect, teacher retention, classroom climate, and so forth.
- This study was limited to content area PACT scale scores for one particular year, 2004, using scores for the previous year, 2003, as a control for prior learning. It was not possible to look across multiple years, or longitudinally, for two reasons. First, a statewide-database linking all teachers in the state to their students and the students' test scores was not available prior to 2004. Second, the number of National Board Certified teachers available for study decreases with each prior year added to the study thus resulting in a sample size that would be too small for the purpose of conducting a study and detecting any significant differences.

Recommendations

- The database issues concerning missing teacher and student ID numbers need to be resolved. The missing ID numbers limit the size of the sample researchers have to work

with. They also limit the degree to which researchers have a sample to work with that is representative of all teachers and students in the state of South Carolina.

- Additional study needs to be conducted on the effects of National Board Certification for high school students as well as elementary schools and middle school students in all content areas subject to National Board Certification. Studies need to be broader in scope than just student achievement as one snapshot in time. Possible variables of interest might include, but not limited to, the effects longitudinally on student achievement, student affect, teacher affect and retention, and school climate.

Introduction

One of the South Carolina State Department of Education's ongoing initiatives is to improve teacher quality by promoting National Board Certification of teachers. The National Board for Professional Teaching Standards (NBPTS) offers experienced teachers the opportunity to obtain National Board Certification. This process requires the teacher to submit a portfolio including samples of students' work, videotaped lessons, samples of assessments, and self-reflection journals. State certification systems for beginning teachers establish minimum requirements for entry-level teachers. The NBPTS has established advanced standards for experienced teachers.

Teachers applying for National Board Certification are required to have at least three years of teaching experience and to currently be teaching at least six students in a school setting.

Applicants are required to demonstrate their knowledge of subject matter, pedagogy, cognition, and intelligence. The applicants also have to demonstrate how knowledge is made available to all students with awareness of, and respect for, individual differences. In addition, the applicants are expected to demonstrate how they use self-reflection to learn from prior teaching experiences to improve the quality of their instruction. Applicants are also required to demonstrate that they have worked collaboratively with other teaching professionals in developing curriculum.

In addition to the prestige of obtaining National Board Certification, the State of South Carolina offers the following incentives to teachers certified by the National Board for Professional Teaching Standards and teaching in South Carolina schools:

1. Equivalent of 12 credit hours certification renewal credit.
2. Additional pay annually for the life of the certificate.

3. Forgiveness of loans for the application fee.

The South Carolina General Assembly has provided considerable monetary support for the State Department of Education's National Board Certification initiative. As a result, the General Assembly asked that a study be conducted to determine if National Board Certification has improved student achievement in South Carolina. The Office of Program Evaluation (OPE) in the College of Education at the University of South Carolina contracted with the State Department of Education and the Center for Educator Recruitment, Retention, and Advancement (CERRA) on May 14, 2004 to conduct the study. Student performance in grades four through eight on the English language arts (ELA) and mathematics Palmetto Achievement Challenge Test (PACT) were used as measures of student achievement in the study. At the time the study was formulated and contracted, there was no single achievement test that was administered to all students in the high school grades.

Purpose of the Study

The purpose of this study was to investigate whether students, in grades four through eight, of National Board Certified teachers achieve higher scores on the English language arts (ELA) and mathematics Palmetto Achievement Challenge Test (PACT) than do students whose teachers have not obtained National Board Certification.

Methodology

Study Variables

A literature review on characteristics associated with schools and teachers that have an effect on student achievement was conducted (e.g. Darling-Hammond, 2000; Okpala, 2002; Stone & Lane

2003; Wayne & Youngs 2003). School level variables that most often were reported in the literature as having an effect on student achievement were socio-economic status (SES) and student/teacher ratio. Teacher level variables most often reported in the literature as having an association with student achievement were years of teaching experience and level of college degree achieved.

Data Collection

The first step in the data collection process was to create a database of school characteristics for each school in the state of South Carolina that enrolled students in grades three through eight. The school characteristics were identified and downloaded from the South Carolina State Department of Education's Web site <http://www.myscschools.com> for the academic year 2004. School characteristics included the school's poverty index (based on free/reduced lunch and Medicaid eligibility), school enrollment, percentage of teachers with advanced degrees, and student-teacher ratio.

Databases for South Carolina National Board Certified teachers, both active and unsuccessful applicants for National Board Certification, and Non-Board Certified teachers were provided by CERRA and the Division of Teacher Quality in the South Carolina Department of Education. The databases received were for active as well as unsuccessful applicants and successful National Board Certified teachers for the NBPTS certification areas of EC/GEN, MC/GEN, EA/GEN, EA/ELA, EA/MATHEMATICS, AYA/ELA, and AYA/MATH. A database for Non-Board Certified teachers was received from the Division of Teacher Quality in South Carolina Department of Education. Information provided for the teachers included teacher ID number, full name for teachers, school and district ID number, school and district name, area of

certification, and years of experience for the teachers. The school and district data provided were the school and district the teacher had taught in during the 2003 – 2004 academic year. The Office of Technology in the South Carolina Department of Education provided two databases of class rosters for the 2003 – 2004 academic year. One database was for ELA teachers and their students. The second database was for mathematics teachers and their students. Each roster database contained the school and district names, teacher ID numbers, full name for teachers, student ID numbers, full name for students, 2003 PACT performance level and scale scores for the students and 2004 PACT performance level and scale scores for the students. The Office of Research in the South Carolina Department of Education provided 2004 PACT databases.

It was recognized that applicants for National Board Certification and National Board Certified teachers are expected to work collaboratively with other teaching professionals in developing curriculum. It was felt that a Non-Board Certified teacher in a school with a National Board Certified teacher may benefit from the collaboration efforts of the National Board Certified teacher. Therefore, techniques used by the National Board Certified teacher may also be used by his or her colleagues who are not National Board Certified. This might result in Non-Board Certified teachers in these schools not being equivalent to Non-Board Certified teachers in schools that do not have an applicant or National Board Certified teacher in terms of the effect of National Board Certification status on student achievement. It was therefore decided to include in the study only Non-National Board Certified teachers from schools that did not have National Board Certified teachers or an applicant for National Board Certification.

Non-Board Certified teachers in schools that also employed National Board Certified teachers and applicants for National Board Certification were removed from the database. The files for Board Certified and Non-Board Certified teachers were then coded as Board Certified and Non-Board Certified and merged creating one overall database for teachers. This database contained the seven digit district and school ID number, district name, school name, teacher ID number, teacher last name, first name, middle initial, teacher years of teaching experience, and the National Board Certification status of the teacher. The school characteristics database was merged with the database for teachers. This added the school poverty index, student teacher ratio, school enrollment, and percentage of teachers with advanced degrees to the teacher database.

The teacher database containing the teacher and school level variables was then merged with the 2003 – 2004 ELA and mathematics roster databases. The merge did not result in most of the National Board Certified teachers merging with the roster databases. Review of the original roster databases revealed that about 25 percent of the teachers in the roster databases were missing teacher ID numbers. The review also revealed that there were entire classes of students with missing student ID numbers. The missing student ID numbers likely contributed to further reducing the number of teachers available for the study.

Separate 2003 – 2004 ELA and mathematics PACT database for each of the grade four, five, six, seven, and eight levels were then created. Review of the data revealed PACT scale scores that were likely for students tested off grade level or data entry errors. These cases were removed

from the databases. Each roster database was then merged with the 2004 PACT databases by grade level to obtain the students ethnicity, gender, and lunch status.

During a meeting that included the OPE researchers, the Deputy Superintendent of Education, Division of Educator Quality and Leadership, and Office of Technology staff members it was determined that middle school students identified in the roster databases as being taught ELA or mathematics by a particular teacher should have been taught by that teacher. It was also determined that the same may not be true for elementary school teachers and students. A decision was made that fourth, fifth, and sixth grade elementary school teachers would need to verify whether or not they taught the students listed in the class roster databases.

Rosters for fourth through sixth grade students identified as having been taught ELA or mathematics by a particular teacher were developed for 902 teachers. The rosters, along with a letter from State Superintendent of Education and instructions for the teachers on how they may verify the rosters, were sent to the teachers at their school address. District superintendents and school principals were notified prior to the mailing via an e-mail sent by the Office of Public Information in the State Department of Education.

Follow-up e-mails and phone calls were used to contact teachers who had not replied two weeks after the rosters had been mailed. A second follow-up was conducted by phone for teachers who had not responded to the first round of follow-up. It was determined that 103 teachers had moved and could not be contacted. Of the 799 teachers who could be contacted, 628 did respond. The resulting final response rate was 78.6 percent for teachers who could be contacted.

Study Design

Pilot analyses were conducted using ELA and mathematics PACT scale scores. Table 1 and Table 2 show that findings for the pilot analyses indicated there were significant differences in mathematics and ELA PACT scale scores for 2003 and 2004 regardless of grade level favoring scores for students of National Board Certified Teachers as compared to students of Non-Board Certified teachers. These analyses did not control for variables that may account for differences in achievement such as prior student achievement, socio-economic status (SES), school level characteristics, or teacher characteristics other than Board Certification status. The question became, were the differences due to National Board Certified Teachers or other teacher, school level, or student characteristics?

To investigate the relationship between National Board Certification status and PACT scores, researchers in the Office of Program Evaluation consulted with experts in research design and analysis. As a result, researchers decided to study the effect of National Board Certification on students' PACT scores using two approaches. One approach was a matched pairs design. National Board Certified and Non-National Board certified teachers were matched and students the teachers taught were matched to control for certain background variables. The second approach was the use of Hierarchical Linear Models (HLM). Hierarchical linear models were used to account for the nested structure of the data. In school settings, students within a classroom have a relationship due to common experiences shared in the classroom. HLM models permit researchers to account for this dependence by separating out variation in the independent variable (achievement in this case) due to classroom effects and variation in the independent

variable due to student effects. Variables may be added to the models to account for variation in achievement at the student and classrooms levels.

Table 1

ELA Pilot Analyses

Grade	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
4	2003	1804	311.42	13.25	3357	306.96	13.17	4.46	11.594	.000
	2004	1804	409.36	12.66	3357	403.45	13.05	5.91	15.676	.000
5	2003	1534	405.88	12.53	2962	402.46	12.72	3.42	8.612	.000
	2004	1534	505.45	12.56	2962	501.44	12.38	4.01	10.265	.000
6	2003	2144	504.14	12.71	5878	498.99	13.43	5.15	15.411	.000
	2004	2144	606.30	15.28	5878	600.47	15.97	5.83	14.625	.000
7	2003	2783	605.45	15.67	7491	601.30	15.09	4.15	12.262	.000
	2004	2783	706.77	13.43	7491	702.46	13.10	4.31	14.758	.000
8	2003	3064	706.54	12.62	5977	702.37	15.59	4.17	14.892	.000
	2004	3064	808.59	12.21	5977	803.88	12.03	4.71	17.548	.000

Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean

difference, t = t statistic, p = probability the difference was a chance occurrence

For both the matched pairs and HLM approaches, National Board Certified teachers and Non-National Board Certified teachers were matched. A National Board Certified teacher was paired

(i.e., matched) with a Non-National Board Certified teacher with a similar school poverty index, student/teacher ratio, and teacher years of experience.

Table 2

Mathematics Pilot Analyses

Grade	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
4	2003	1816	313.82	12.74	3294	309.76	12.96	4.06	10.777	.000
	2004	1816	415.24	14.36	3294	409.41	14.40	5.83	13.875	.000
5	2003	1171	414.01	13.92	3091	410.07	14.26	3.94	8.101	.000
	2004	1171	513.96	15.24	3091	509.04	14.85	4.92	9.592	.000
6	2003	783	512.59	14.31	6232	506.44	13.54	6.15	11.907	.000
	2004	783	616.58	15.160	6232	609.65	15.30	6.93	11.963	.000
7	2003	2135	612.92	15.99	7671	608.84	15.63	4.08	10.614	.000
	2004	2135	712.79	15.12	7671	707.13	14.83	5.66	13.882	.000
8	2003	1869	712.75	15.92	4596	705.68	14.58	7.07	17.200	.000
	2004	1869	810.90	14.38	4596	804.02	12.69	6.88	18.994	.000

Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean

difference, t = t statistic, p = probability the difference was a chance occurrence

Table 3 and Table 4 contain the number of teachers available for matching and the number of teachers matched by grade level and content area.

Table 3

Number of ELA Teachers Available for Matching and Matched

Grade	Board Certified		Non-Board Certified	
	All Teachers	Matched Teachers	All Teachers	Matched Teachers
4	82	50	163	50
5	62	39	195	39
6	34	24	152	24
7	47	34	157	34
8	55	40	178	40
Total	280	203	845	203

Table 4

Number of Mathematics Teachers Available for Matching and Matched

Grade	Board Certified		Non-Board Certified	
	All Teachers	Matched Teachers	All Teachers	Matched Teachers
4	80	49	164	49
5	53	37	137	37
6	18	14	135	14
7	32	23	151	23
8	34	21	98	21
Total	217	144	685	144

Matched Pairs Design

National Board Certified teachers were matched with Non-National Board Certified teachers on the poverty index for the school they taught in, the student-teacher ratio for the school, and the teachers' years of teaching experience.

Students for each matched pair of teachers were then matched exactly on their content area PACT 2003 scale score and lunch status (Full Pay or Subsidized). Thus, Board Certified teachers and Non-Board Certified teachers with similar characteristics had students' with the same level of prior achievement and lunch status.

Matching National Board Certified teachers with Non-National Board Certified teachers on the poverty index for the school they taught in was difficult for teachers in schools with the lowest levels of Poverty Index. The Poverty Index for South Carolina schools is based on the number of students on subsidized lunch and the number eligible for Medicaid. Table 5 and Table 6 contain the average Poverty Index and percentage of students taught on subsidized lunch for ELA and mathematics National Board Certified and Non-National Board Certified teachers prior to matching.

Table 5 and Table 6 indicate National Board Certified teachers for both English language arts and mathematics tend to have more years of experience than do Non-National Board Certified teachers. However, reasonable matches for teachers were found for most teachers at all grade levels in both content areas.

Table 5

ELA Teacher, School, and Student Characteristics Prior to Matching Teachers

Grade	Board Certified			Non-Board Certified		
	Average Years Experience	Average Poverty Index	% Students Subsidized Lunch	Average Years Experience	Average Poverty Index	% Students Subsidized Lunch
4	15.2	59.6	39.7	8.3	72.9	61.8
5	15.1	57.3	43.5	9.1	71.7	62.0
6	17.6	50.5	38.7	9.0	68.8	59.3
7	16.9	53.4	39.6	8.3	65.0	55.4
8	15.4	53.6	35.0	8.8	63.9	52.0

Teachers were matched if the Poverty Index for the school they taught in were within two points of one another. The second and third matching criteria were a similar student –teacher ratio for the schools and similar teaching years of experience. For example, a teacher in a school with a student – teacher ratio of 12 was not matched to a teacher in a school with a student – teacher ratio of 20. A teacher with 22 years of experience was not matched with a teacher with eight years of experience. Teachers with less than four years experience were not utilized in matching.

Table 6

Mathematics Teacher, School, and Student Characteristics Prior to Matching Teachers

Grade	Board Certified			Non-Board Certified		
	Average Years Experience	Average Poverty Index	% Students Subsidized Lunch	Average Years Experience	Average Poverty Index	% Students Subsidized Lunch
4	15.8	52.2	40.7	8.9	73.0	63.5
5	15.3	58.6	43.9	9.7	72.1	60.3
6	16.5	54.0	42.8	7.8	67.1	60.8
7	16.8	50.6	42.7	7.7	67.1	57.5
8	15.9	45.6	32.3	8.9	63.9	57.8

Table 7 and Table 8 display the effects for matching of National Board Certified and Non-Board Certified teachers. The difference in the average school Poverty Index for both ELA and mathematics National Board Certified and Non-Board Certified teachers was 0.5 points or less for all grade levels. The differences in years of teaching experience and the percentage of students on subsidized lunch for both ELA and mathematics National Board Certified and Non-Board Certified teachers were smaller for all grade levels after teachers were matched.

Table 7

ELA Teacher, School, and Student Characteristics After Matching Teachers

Grade	Board Certified			Non-Board Certified		
	Average Years Experience	Average Poverty Index	% Students Subsidized Lunch	Average Years Experience	Average Poverty Index	% Students Subsidized Lunch
4	14.5	59.5	50.0	10.3	60.0	47.6
5	13.7	63.9	47.5	12.6	63.7	53.5
6	16.5	56.0	44.3	14.1	56.0	46.8
7	16.7	60.2	48.5	13.6	60.4	52.9
8	15.4	60.3	44.6	12.9	60.5	48.6

Table 8

Mathematics Teacher, School, and Student Characteristics After Matching Teachers

Grade	Board Certified			Non-Board Certified		
	Average Years Experience	Average Poverty Index	% Students Subsidized Lunch	Average Years Experience	Average Poverty Index	% Students Subsidized Lunch
4	14.4	59.5	47.8	11.4	59.9	51.8
5	14.8	64.8	50.5	11.4	64.7	50.5
6	17.8	51.7	40.2	10.5	51.4	46.3
7	15.5	57.4	49.6	13.1	57.3	49.5
8	17.2	55.2	38.9	10.4	55.3	40.2

HLM Design

Teacher background variables considered were the years of experience of the teachers and the National Board Certification (NBC) status of the teachers. Within each pair of schools, National Board Certified teachers were matched with Non-Board Certified teachers based on their years of teaching experience. At the student level, students' prior achievement and poverty status were taken into account in the models. The previous year's PACT scale score and whether the student received subsidized lunch were used as covariates in the HLM models. A two-level model with students at level 1 and classroom/teachers at level 2 was selected for this analysis. The number of teachers available at each school was relatively small and did not permit inclusion of school level factors. However, the two sets of schools (those with at least one National Board Certified teacher and those with no National Board Certified teachers) may be considered to be similar since they were matched by Poverty Index. Also, the sets of National Board Certified and non-National Board Certified teachers may be considered to be similar since they were matched on their years of experience.

Various models were developed for each grade level and for each subject area (ELA and math). In all models, the outcome variable of interest was the 2004 PACT scale score. First, an unconditional model with no predictors was fit to the data. This model provides the partitioning of variance into that attributable to classroom differences and that attributable to student differences. The estimated variance components and partitioning of variance between and within classes are displayed in Table 9 for the ELA models and in Table 10 for the math models. Inspecting the variation between classrooms and within classrooms from the unconditional models in Tables 9 and 10, the proportion of variation within classrooms (i.e. students) was

always higher than the proportion of variation between classrooms. The within variation ranged from 64.2% to 80.6% with grades 4, 5, and 6 having higher percentages of variation within students in the class and grades 7 and 8 having lower percentages. The between variation ranged from 19.4% to 35.8% with grades 4, 5, and 6 having lower percentages of variation within students in the class and grades 7 and 8 having higher percentages. This indicates relatively more variation between classes and relatively less variation within classes for the upper grades compared with lower grades.

Table 9

Variance Components from the Unconditional ELA Models

	Between Classes	Within Classes	Prop Between	Prop Within
Grade 4	33.078	126.11	0.208	0.792
Grade 5	34.427	116.24	0.218	0.782
Grade 6	56.607	197.96	0.222	0.778
Grade 7	53.124	124.42	0.299	0.701
Grade 8	44.882	115.55	0.280	0.720

Next, models with only the NBC status of the teacher as a predictor of achievement were fit to the data. Together with the unconditional models, variance estimates from these models permit calculation of the proportion of variance in classroom means that is accounted for by the NBC status of the teacher. Only between 0.7% and 10.9% of the variation in the classroom mean PACT scale score was accounted for by NBC status of the teacher. These low values suggest that other factors not present in the model account for variability among classroom means.

Table 10

Variance Components from the Unconditional Math Models

	Between Classes	Within Classes	Prop Between	Prop Within
Grade 4	40.141	167.10	0.194	0.806
Grade 5	66.897	171.93	0.280	0.720
Grade 6	84.062	169.13	0.332	0.668
Grade 7	72.994	177.06	0.292	0.708
Grade 8	79.648	142.72	0.358	0.642

To account for student characteristics, models with student level predictors of previous year's PACT scale score (centered around the mean for all students) and subsidized lunch status were fit to the data. The proportion of explained variability in student scores were computed after fitting this model and the covariates were inspected for significance. Finally, both student level covariates and the NBC status of the teacher were included in the final model. Again, the proportion of explained variability in student scores were computed after fitting this model and the covariates were inspected for significance. The primary explanatory variable of interest is the teacher's NBC status.

The proportion of student (within classroom) variance explained by the models was computed from the estimates of the variance components from the models with student and/or classroom predictors and the unconditional model. Estimates of student variance from the various models and proportion of variance accounted for by the predictors in the models for ELA and mathematics are displayed in Table 11 and Table 12. The percentage of variation explained in

the various models depends on grade level and subject. Relatively more variation in student differences in 2004 PACT scale scores is explained by the models for higher grades compared to lower grades. Relatively more variation in student scores is accounted for in the math models compared to the ELA models. Also, little (if any) improvement in the percentage of explained variation in student scores is achieved by adding the NBC status of the teacher. This suggests that NBC status does not account for substantial variation in student achievement scores. There may be other classroom or teacher level variables that explain differences among student scores that were not accounted for in the model.

Table 11

Variance Estimates and Proportion of Explained Variance for ELA Models with Predictors

Models with student level predictors			Model with student level predictors and NBC	
Grade	Estimate of student variance	Prop of within variance explained	Estimate of student variance	Prop of within variance explained
4	51.743	0.590	51.774	0.589
5	53.728	0.538	53.722	0.538
6	83.223	0.580	83.226	0.580
7	53.435	0.571	53.427	0.571
8	45.501	0.606	45.491	0.606

Table 12

Variance Estimates and Proportion of Explained Variance for Math Models with Predictors

Models with student level predictors			Model with student level predictors and NBC	
Grade	Estimate of student variance	Prop of within variance explained	Estimate of student variance	Prop of within variance explained
4	74.611	0.553	74.618	0.553
5	76.017	0.558	76.020	0.558
6	74.811	0.558	74.765	0.558
7	66.039	0.627	66.024	0.627
8	47.198	0.669	47.192	0.669

*Results**Matched Pairs*

This section presents the descriptive statistics and matched pairs t-test results by content area and grade level. The 2003 PACT descriptive statistics display the effect of matching students exactly on their 2003 PACT scale scores and lunch status. The result is an identical distribution of 2003 scale scores for students of both Board Certified and Non-Board Certified teachers. The test for effect on student achievement is on the 2004 PACT scale scores.

Descriptively, there were small positive differences for students of National Board Certified teachers in both content areas and most grade levels. One exception was small descriptive differences favoring grade 6 ELA students of Non-Board Certified teachers. The differences for grades 4, 5, 7, and 8 ELA and grade 6 mathematics PACT scale scores were significant in favor of National Board Certified teachers' students. Confidence intervals are provided the largest

effect for each content area and grade level to give a range for the National Board Certified teacher effect on the PACT scale score.

English Language Arts

The data in Table 13 indicate that fourth grade ELA students of National Board Certified teachers with a full pay lunch status scored 2.12 points higher on average than students of Non-National Board Certified teachers for PACT 2004 English language arts. This finding was significant, $t(110) = 2.440, p < .05$. With 95% confidence, the average score of a student of a National Board Certified teacher on full pay lunch is expected to be at least 0.44 points and at most 4.20 points higher than a student of a Non-National Board Certified teacher full pay lunch. The 1.37 point difference for students of National Board Certified teachers on subsidized lunch was not significant.

The data in Table 14 indicate that fifth grade ELA students of National Board Certified teachers with a full pay lunch status scored 1.67 points higher on average than students of Non-National Board Certified teachers for PACT 2004 English language arts. This finding was significant, $t(97) = 2.053, p < .05$. With 95% confidence, the average score of a student, on full pay lunch, of a National Board Certified teacher is expected to be at least 0.06 points and at most 3.29 points higher than a student, on full pay lunch, of a Non-National Board Certified teacher. The 0.93 point difference for students of National Board Certified teachers on subsidized lunch was not significant.

Table 13

Descriptive Statistics and t-tests for Paired Samples 4th Grade ELA Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	205	409.20	11.24	205	407.32	11.61	1.88	2.601	.010
	PACT 2003	205	310.80	10.35	205	310.80	10.35			
Full Pay	PACT 2004	111	414.20	9.21	111	411.88	10.13	2.12	2.440	.016
	PACT 2003	111	315.86	8.93	111	315.86	8.93			
Subsidized	PACT 2004	94	403.31	10.58	94	401.94	10.96	1.37	1.230	.222
	PACT 2003	94	304.82	8.60	94	304.82	8.60			

*Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, *t* = *t* statistic, *p* = probability the difference was a chance occurrence*

The data in Table 15 indicate that sixth grade ELA students of National Board Certified teachers with a full pay lunch status scored 0.62 points lower on average than students of Non-National Board Certified teachers for PACT 2004 English language arts. This finding was not significant. With 95% confidence, the average score of a student, on full pay lunch, of a National Board Certified teacher is expected to be no more than 2.31 points lower than a Non-National Board Certified teacher and may be up to 1.07 points higher than a student of a Non-National Board

Table 14

Descriptive Statistics and t-tests for Paired Samples 5th Grade ELA Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	187	503.83	11.67	187	502.51	9.76	1.32	1.790	.075
	PACT 2003	187	405.04	10.10	187	405.04	10.10			
Full Pay	PACT 2004	98	508.49	10.08	98	506.82	8.36	1.67	2.053	.043
	PACT 2003	98	409.84	9.30	98	409.84	9.30			
Subsidized	PACT 2004	89	498.70	11.18	89	497.76	8.99	0.93	0.735	.464
	PACT 2003	89	399.75	8.14	89	399.75	8.14			

*Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, *t* = *t* statistic, *p* = probability the difference was a chance occurrence*

Certified teacher. The 0.40 point difference for students of Non-National Board Certified teachers on subsidized lunch was not significant.

The data in Table 16 indicate that seventh grade ELA students of National Board Certified teachers with a full pay lunch status scored 3.02 points higher on average than students of Non-National Board Certified teachers for PACT 2004 English language arts. This finding was

significant, $t(229) = 4.112$, $p < .001$. With 95% confidence, the average score of a student, on full pay lunch, of a National Board Certified teacher is expected to be at least 1.57 points and at most 4.46 points higher than a student, on full pay lunch, of a Non-National Board Certified teacher. The 0.23 point difference for students of National Board Certified teachers on subsidized lunch was not significant.

Table 15

Descriptive Statistics and t-tests for Paired Samples 6th Grade ELA Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	424	605.78	14.21	424	606.31	14.16	-.53	-.799	.425
	PACT 2003	424	504.50	9.77	424	504.50	9.77			
Full Pay	PACT 2004	247	610.07	12.71	247	610.69	13.56	-.62	-.723	.470
	PACT 2003	247	507.84	8.76	247	507.84	8.76			
Subsidized	PACT 2004	177	599.80	14.06	177	600.19	12.67	-.40	-.384	.701
	PACT 2003	177	499.84	9.19	177	499.84	9.19			

*Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, *t* = *t* statistic, *p* = probability the difference was a chance occurrence*

Table 16

Descriptive Statistics and t-tests for Paired Samples 7th Grade ELA Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	449	705.71	11.59	449	704.05	10.80	1.66	3.282	.001
	PACT 2003	449	603.97	11.71	449	603.97	11.71			
Full Pay	PACT 2004	230	710.57	11.07	230	707.55	10.86	3.02	4.112	.000
	PACT 2003	230	608.77	10.83	230	608.77	10.83			
Subsidized	PACT 2004	219	700.60	9.81	219	700.37	9.44	0.23	0.336	.737
	PACT 2003	219	598.93	10.43	219	598.93	10.43			

*Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, *t* = *t* statistic, *p* = probability the difference was a chance occurrence*

The data in Table 17 indicate that eighth grade ELA students of National Board Certified teachers with a subsidized lunch status scored 2.08 points higher on average than students of Non-National Board Certified teachers for PACT 2004 English language arts. This finding was significant, $t(321) = 3.915, p < .001$. With 95% confidence, the average score of a student, on subsidized lunch, of a National Board Certified teacher is expected to be at least 1.03 points and at most 3.12 points higher than a student, on subsidized lunch, of a Non-National Board Certified

teacher. The 0.67 point difference for students of National Board Certified teachers on full pay lunch was not significant.

Table 17

Descriptive Statistics and t-tests for Paired Samples 8th Grade ELA Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	t	p
All	PACT 2004	704	806.58	11.18	704	805.27	11.17	1.32	3.505	.000
	PACT 2003	704	704.10	10.43	704	704.10	10.43			
Full Pay	PACT 2004	382	810.20	10.50	382	809.53	10.38	0.67	1.280	.201
	PACT 2003	382	708.13	9.57	382	708.13	9.57			
Subsidized	PACT 2004	322	802.28	10.42	322	800.20	9.93	2.08	3.915	.000
	PACT 2003	322	699.32	9.34	322	699.32	9.34			

Note: Diff =Board Certified minus Non-Board Certified PACT scale score mean difference, t = t statistic, p = probability the difference was a chance occurrence

Mathematics

The data in Table 18 indicate that fourth grade mathematics students of National Board Certified teachers with a full pay lunch status scored 1.50 points higher on average than students of Non-

National Board Certified teachers for PACT 2004 mathematics. This finding was not significant. With 95% confidence, the average score of a student, on full pay lunch, of a National Board Certified teacher is expected to be no more than 0.52 points lower than a Non-National Board Certified teacher and may be up to 3.52 points higher than a student of a Non-National Board Certified teacher. Students of National Board Certified teachers on subsidized lunch scored 0.11 points lower on average than students of Non-National Board Certified teachers. This finding was not significant.

The data in Table 19 indicate that fifth grade mathematics students of National Board Certified teachers with a subsidized lunch status scored 1.18 points higher on average than students of Non-National Board Certified teachers for PACT 2004 mathematics. This finding was not significant. With 95% confidence, the average score of a student, on subsidized lunch, of a National Board Certified teacher is expected to be no more than 1.27 points lower than a Non-National Board Certified teacher and may be up to 3.64 points higher than a student of a Non-National Board Certified teacher. Students of National Board Certified teachers on full pay lunch scored 0.01 points lower on average than students of Non-National Board Certified teachers. This finding was not significant.

Table 18

Descriptive Statistics and t-tests for Paired Samples 4th Grade Math Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	333	414.88	13.30	333	414.16	13.66	0.72	0.925	.356
	PACT 2003	333	313.54	10.83	333	313.54	10.83			
Full Pay	PACT 2004	172	420.36	12.62	172	418.86	11.24	1.50	1.462	.146
	PACT 2003	172	318.53	9.20	172	318.53	9.20			
Subsidized	PACT 2004	161	409.02	11.42	161	409.13	14.25	-.11	-.089	.929
	PACT 2003	161	308.21	9.88	161	308.21	9.88			

*Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, *t* = *t* statistic, *p* = probability the difference was a chance occurrence*

Table 19

Descriptive Statistics and t-tests for Paired Samples 5th Grade Math Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	241	511.90	14.16	241	511.29	15.08	0.61	0.684	.494
	PACT 2003	241	412.38	11.78	241	412.38	11.78			
Full Pay	PACT 2004	116	518.26	14.01	116	518.27	13.54	-.01	-.007	.995
	PACT 2003	116	418.11	10.56	116	418.11	10.56			
Subsidized	PACT 2004	125	506.01	11.55	125	504.82	13.52	1.18	0.954	.342
	PACT 2003	125	407.06	10.29	125	407.06	10.29			

*Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, *t* = *t* statistic, *p* = probability the difference was a chance occurrence*

The data in Table 20 indicate that sixth grade mathematics students of National Board Certified teachers with a full pay lunch status scored 2.76 points higher on average than students of Non-National Board Certified teachers for PACT 2004 mathematics. This finding was significant, $t(145) = 2.939, p < .01$. With 95% confidence, the average score of a student, on full pay lunch, of a National Board Certified teacher is expected to be at least 0.90 points and at most 4.62 points higher than a student, on full pay lunch, of a Non-National Board Certified teacher. The

0.26 point difference for students of National Board Certified teachers on subsidized lunch was not significant.

Table 20

Descriptive Statistics and t-tests for Paired Samples 6th Grade Math Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	273	616.58	15.40	273	614.99	15.05	1.60	2.232	.026
	PACT 2003	273	511.77	13.94	273	511.77	13.94			
Full Pay	PACT 2004	146	624.49	11.98	146	621.73	11.97	2.76	2.939	.004
	PACT 2003	146	518.53	11.72	146	518.53	11.72			
Subsidized	PACT 2004	127	607.50	13.83	127	607.24	14.51	0.26	0.239	.812
	PACT 2003	127	503.99	12.14	127	503.99	12.14			

Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, t = t statistic, p = probability the difference was a chance occurrence

The data in Table 21 indicate that seventh grade mathematics students of National Board Certified teachers with a full pay lunch status scored 1.22 points higher on average than students of Non-National Board Certified teachers for PACT 2004 mathematics. This finding was not

significant. With 95% confidence, the average score of a student, on full pay lunch, of a National Board Certified teacher is expected to be no more than 0.28 points lower than a Non-National Board Certified teacher and may be up to 2.73 points higher than a student of a Non-National Board Certified teacher. Students of National Board Certified teachers on subsidized lunch scored 0.60 points lower on average than students of Non-National Board Certified teachers. This finding was not significant.

Table 21

Descriptive Statistics and t-tests for Paired Samples 7th Grade Math Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	481	710.81	14.64	481	710.51	13.56	0.31	0.522	.602
	PACT 2003	481	611.67	14.53	481	611.67	14.53			
Full Pay	PACT 2004	239	716.51	14.15	239	715.28	12.97	1.22	1.599	.111
	PACT 2003	239	617.82	12.86	239	617.82	12.86			
Subsidized	PACT 2004	242	705.19	12.85	242	705.79	12.49	-.60	-.679	.498
	PACT 2003	242	605.60	13.52	242	605.60	13.52			

*Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, *t* = *t* statistic, *p* = probability the difference was a chance occurrence*

The data in Table 22 indicate that eighth grade mathematics students of National Board Certified teachers with a full pay lunch status scored 1.27 points higher on average than students of Non-National Board Certified teachers for PACT 2004 mathematics. This finding was not significant.

Table 22

Descriptive Statistics and t-tests for Paired Samples 8th Grade Math Matched Students

Lunch Status	Year	Board Certified			Non-Board Certified			t-Test		
		n	Mean	SD	n	Mean	SD	Diff	<i>t</i>	<i>p</i>
All	PACT 2004	340	808.26	12.87	340	807.54	12.84	0.72	1.384	.167
	PACT 2003	340	710.33	13.47	340	710.33	13.47			
Full Pay	PACT 2004	198	812.91	12.45	198	811.65	12.94	1.27	1.958	.052
	PACT 2003	198	715.26	13.01	198	715.26	13.01			
Subsidized	PACT 2004	142	801.77	10.44	142	801.82	10.29	-.05	-.058	.954
	PACT 2003	142	703.46	10.86	142	703.46	10.86			

*Note: Diff = Board Certified minus Non-Board Certified PACT scale score mean difference, *t* = *t* statistic, *p* = probability the difference was a chance occurrence*

With 95% confidence, the average score of a student, on full pay lunch, of a National Board Certified teacher is expected to be no more than 0.01 points lower than a Non-National Board

Certified teacher and may be up to 2.54 points higher than a student of a Non-National Board Certified teacher. Students of National Board Certified teachers on subsidized lunch scored 0.05 points lower on average than students of Non-National Board Certified teachers. This finding was not significant.

HLM

Fixed Effects Results

Statistics from the final models with student level predictors of previous year's PACT score (centered) and subsidized lunch status and the classroom/teacher level predictor of NBC status are displayed in the following tables. Tables 23-27 display information on the ELA models and Tables 28-32 display information on the math models. The following interpretations of results focus on the NBC teacher effect in each model. For all but two cases, the estimate of the NBC teacher effect was positive. The positive effect was statistically significant in two cases, ELA grade 4 and ELA grade 8. Confidence intervals are provided to give a range of the NBC teacher effect on the PACT scale score. For the ELA analyses, the NBC teacher effect was largest for grade 4 with an upper bound of 2.47 points. Grades 5 and 7 also had upper bounds of almost 2 points indicating that students of NBC teachers may score up to 2 points higher on the ELA PACT exam on average. For the math analyses, none of the results were statistically significant. However, the upper bounds on the confidence intervals were all over 2 points indicating that students of NBC teachers may score over 2 points higher on the math PACT exam on average. In fact, the upper limit for the grade 8 analysis was 3.80 points. Only one case, ELA grade 6, produced a negative estimate NBC teacher effect. However, this result was not statistically significant and the confidence interval indicates that the effect could be positive.

ELA HLM Results

ELA Grade 4 results are presented in Table 23. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 1.31 points higher than students of non-NBC teachers on the 2004 ELA PACT exam. This difference was statistically significant. In fact, with 95% confidence, the average score of a student of a NBC teacher is expected to be at least 0.15 points and at most 2.47 points higher than a student of a non-NBC teacher.

Table 23

Final Model for ELA Grade 4

	Estimate	Std Error	p-value
Intercept	410.18	0.445	<0.0001
Prev year PACT (centered)	0.708	0.019	<0.0001
Subsidized lunch	-2.540	0.363	<0.0001
NBC teacher	1.311	0.594	0.0296

ELA Grade 5 results are presented in Table 24. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 0.39 points higher than students of a non-NBC teacher on the 2004 ELA PACT exam. This difference was not statistically significant. With 95% confidence, the average score of a student of a NBC teacher is expected to be no more than 0.89 points lower than a non-NBC teacher, but may be as much as 1.66 points higher than a student of a non-NBC teacher.

Table 24

Final Model for ELA Grade 5

	Estimate	Std Error	p-value
Intercept	505.01	0.477	<0.0001
Prev year PACT (centered)	0.712	0.025	<0.0001
Subsidized lunch	-1.126	0.399	0.0048
NBC teacher	0.385	0.652	0.5561

ELA Grade 6 results are presented in Table 25. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 0.56 points lower than students of a non-NBC teacher on the 2004 ELA PACT exam. This difference was not statistically significant. With 95% confidence, the average score of a student of a NBC teacher is expected to be no more than 1.93 points lower than a non-NBC teacher and may be up to 0.80 points higher than a student of a non-NBC teacher.

Table 25

Final Model for ELA Grade 6

	Estimate	Std Error	p-value
Intercept	606.44	0.523	<0.0001
Prev year PACT (centered)	0.898	0.022	<0.0001
Subsidized lunch	-2.403	0.391	<0.0001
NBC teacher	-0.562	0.696	0.4235

ELA Grade 7 results are presented in Table 26. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 0.83 points higher than students of a non-NBC teacher on the 2004 ELA PACT exam. This difference was not statistically significant. With 95% confidence, the average score of a student of a NBC teacher is expected to be no more than 0.34 points lower than a non-NBC teacher, but may be as much as 1.99 points higher than a student of a non-NBC teacher.

Table 26

Final Model for ELA Grade 7

	Estimate	Std Error	p-value
Intercept	704.73	0.498	<0.0001
Prev year PACT (centered)	0.620	0.014	<0.0001
Subsidized lunch	-1.921	0.310	<0.0001
NBC teacher	0.826	0.594	0.1691

ELA Grade 8 results are presented in Table 27. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 0.91 points higher than students of a non-NBC teacher on the 2004 ELA PACT exam. This difference was statistically significant. In fact, with 95% confidence, the average score of a student of a NBC teacher is expected to be at least 0.01 points and at most 1.80 points higher than a student of a non-NBC teacher.

Table 27

Final Model for ELA Grade 8

	Estimate	Std Error	p-value
Intercept	807.10	0.361	<0.0001
Prev year PACT (centered)	0.733	0.014	<0.0001
Subsidized lunch	-1.934	0.265	<0.0001
NBC teacher	0.908	0.457	0.0505

Mathematics HLM Results

Math Grade 4 results are presented in Table 28. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 0.67 points higher than students of a non-NBC teacher on the 2004 math PACT exam. This difference was not statistically significant. With 95% confidence, the average score of a student of a NBC teacher is expected to be no more than 0.75 points lower than a non-NBC teacher, but may be as much as 2.08 points higher than a student of a non-NBC teacher.

Math Grade 5 results are presented in Table 29. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 0.27 points lower than students of a non-NBC teacher on the 2004 math PACT exam. This difference was not statistically significant. With 95% confidence, the average score of a student of a NBC teacher is expected to be no more than 1.53 points lower than a non-NBC teacher and may be up to 2.07 points higher than a student of a non-NBC teacher.

Table 28

Final Model for Math Grade 4

	Estimate	Std Error	p-value
Intercept	415.95	0.577	<0.0001
Prev year PACT (centered)	0.805	0.021	<0.0001
Subsidized lunch	-2.234	0.417	<0.0001
NBC teacher	0.666	0.724	0.3601

Table 29

Final Model for Math Grade 5

	Estimate	Std Error	p-value
Intercept	513.51	0.715	<0.0001
Prev year PACT (centered)	0.771	0.021	<0.0001
Subsidized lunch	-2.967	0.517	<0.0001
NBC teacher	0.271	0.917	0.7686

Math Grade 6 results are presented in Table 30. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 0.59 points higher than students of a non-NBC teacher on the 2004 math PACT exam. This difference was not statistically significant. With 95% confidence, the average score of a

student of a NBC teacher is expected to be no more than 1.38 points lower than a non-NBC teacher, but may be as much as 2.56 points higher than a student of a non-NBC teacher.

Table 30

Final Model for Math Grade 6

	Estimate	Std Error	p-value
Intercept	618.78	0.805	<0.0001
Prev year PACT (centered)	0.777	0.025	<0.0001
Subsidized lunch	-2.379	0.524	<0.0001
NBC teacher	0.590	1.006	0.5626

Math Grade 7 results are presented in Table 31. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 0.44 points higher than students of a non-NBC teacher on the 2004 math PACT exam. This difference was not statistically significant. With 95% confidence, the average score of a student of a NBC teacher is expected to be no more than 1.17 points lower than a non-NBC teacher and may be as much as 2.05 points higher than a student of a non-NBC teacher.

Math Grade 8 results are presented in Table 32. After accounting for prior achievement and subsidized lunch status at the student level, students of a NBC teacher are expected to score an average of 1.79 points higher than students of a non-NBC teacher on the 2004 math PACT exam. This difference was not statistically significant. With 95% confidence, the average score of a

Table 31

Final Model for Math Grade 7

	Estimate	Std Error	p-value
Intercept	710.46	0.5832	<0.0001
Prev year PACT (centered)	0.7233	0.0175	<0.0001
Subsidized lunch	-1.3822	0.3886	0.0004
NBC teacher	0.4388	0.8211	0.5957

student of a NBC teacher is expected to be no more than 0.22 points lower than a non-NBC teacher, but may be as much as 3.80 points higher than a student of a non-NBC teacher.

Table 32

Final Model for Math Grade 8

	Estimate	Std Error	p-value
Intercept	808.32	0.7868	<0.0001
Prev year PACT (centered)	0.7031	0.0161	<0.0001
Subsidized lunch	-1.2487	0.3819	0.0011
NBC teacher	1.7903	1.0269	0.0889

Discussion

The trends in the data were similar for both the matched pairs and HLM analyses. The results suggest that National Board Certified teachers are having a positive impact on elementary and middle school students' achievement in the content areas of ELA and mathematics. The evidence was strongest for ELA student achievement. The evidence for mathematics student achievement was predominantly descriptive with students of National Board Certified teachers on average scoring higher than did students of Non-National Board Certified teachers. The effect was greatest for students on a full pay lunch status. Most of the descriptive findings associated with students on subsidized lunch tended to be less than one point difference and very small.

Sample size issues were a problem for the researchers throughout the study. About 50 percent of the National Board Certified teachers in the certification areas of interest for the study were successfully merged with the ELA and mathematics student roster databases. For those that did not merge, either their ID numbers were missing from the roster databases or they may not have been classroom teachers in an ELA or mathematics classroom. About 10 percent of the National Board Certified teachers that did merge were lost as a result of the roster verification process. Either the teachers did not respond verifying their student rosters or they had left the school they were in during the 2003 – 2004 academic year and could not be contacted.

The scope for the requested study was rather narrow. Although student achievement should be a part of any study of the effects for National Board Certification of teachers, other potential contributions should be considered also. Some the other contributions might be leadership, student affect, teacher retention, classroom climate, and so forth.

This study was limited to content area PACT scale scores for one particular year, 2004, using scores for the previous year, 2003, as a control for prior learning. It was not possible to look across multiple years, or longitudinally, for two reasons. First, a statewide-database linking all teachers in the state to their students and the students' test scores was not available prior to 2004. Second, the number of National Board Certified teachers available for study decreases with each prior year added to the study thus resulting in a sample size that would be too small for the purpose of conducting a study and detecting any significant differences.

Recommendations

1. The database issues concerning missing teacher and student ID numbers need to be resolved. The missing ID numbers limit the size of the sample researchers have to work with. They also limit the degree to which researchers have a sample to work with that is representative of all teachers and students in the state of South Carolina.
2. Additional study needs to be conducted on the effects of National Board Certification for high school students as well as elementary schools and middle school students in all content areas subject to National Board Certification. Studies need to be broader in scope than just student achievement as one snapshot in time. Possible variables of interest might include, but not limited to, the effects longitudinally on student achievement, student affect, teacher affect and retention, and school climate.