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Comfort O. Okpala

North Carolina A & T State University, cookpala@ncat.edu

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Abstract

The relationship between selected teacher variables and high school student achievement was analyzed. Using the Pearson Correlation analysis, this paper tries to: 1) determine the relationship between teachers' teaching experience and high school student achievement, 2) determine the relationship between teacher turnover rate and high school student achievement, 3) determine the relationship between teachers with advanced degree and high school student achievement, and 4) determine the relationship between teachers with National Board certification and high school student achievement. Results from the analysis showed that teachers' teaching experiences and teachers with National Board certification were significant in explaining changes in high school student achievement in English 1, and SAT total score.

Keywords

Education, Teachers, Experience, Teacher turnover, High school students, Achievements, National Board certification

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An Examination of the Impact of Selected Teacher Variables on Student Achievement

Dr. Comfort O. Okpala

Associate Professor

School of Education

North Carolina A & T State University

Greensboro, NC. 27411

(336) 285-4365

cookpala@ncat.edu

Abstract: The relationship between selected teacher variables and high school student achievement was analyzed. Using the Pearson Correlation analysis, this paper tries to: 1) determine the relationship between teachers' teaching experience and high school student achievement, 2) determine the relationship between teacher turnover rate and high school student achievement, 3) determine the relationship between teachers with advanced degree and high school student achievement, and 4) determine the relationship between teachers with National Board certification and high school student achievement. Results from the analysis showed that teachers' teaching experiences and teachers with National Board certification were significant in explaining changes in high school student achievement in English 1, and SAT total score.

In an era of economic recession and accountability in the use of educational resources, it is important to conduct a study that can provide information on the relationship that may exist between selected teacher variables and high school achievement scores of students. Peevely, Hedges, and Nye (2005) stated that the issue of allocating resources to effectively improve the achievement of students is one of the major problems facing educational researchers and policymakers. Researchers have also identified the need to focus on the internal allocation of resources among buildings within school districts, or other micro-levels of analysis (Monk, 1996; Monk & Underwood, 1988, Odden, 2003). Kirps, Yudof, Geel, and Levin (1982) emphasized that the greatest variations in student achievement were found within schools. The purpose of this study was to determine the impact of selected teacher characteristics on high school achievement of students in a low-wealth school district in southeastern United States for 2006-2007. This study, with its emphasis on intra-district analysis, provided a more critical view of the relationship between selected teacher variables and high school achievement of students. Also, the significance of this study could help in expanding the current knowledge base regarding the relationship between national board certified teachers and student achievement.

The key questions that guided the structure of this study were as follows:

1. Is there a significant relationship between teachers' teaching experience and high school student achievement?
2. Is there a significant relationship between teacher turnover rate and high school student achievement?
3. Is there a relationship between teachers with advanced degree and high school student achievement?
4. Is there a relationship between teachers with National Board certification and high school student achievement?

Theoretical Framework

In this study, the researcher utilized a synthesis of constructs from education production function research. The concept of the production function is a powerful pedagogical tool that appears applicable in a wide range of areas that includes educational performance studies (Hanushek, 1987; Krueger, 1999; Lazear, 2001; Odden & Clune, 1995). Greenwald, Hedges, and Laine (1996) emphasized that over the past decades, education production function has become the dominant paradigm used to analyze the impact of education resources on student achievement. Basically, these type of studies attempts to develop a model of the relationship between educational inputs and outcomes. Inputs were defined to include school characteristics, teacher characteristics, facilities, and student characteristics. Outcomes were defined as achievement measured by standardized tests, future educational patterns, and adult learning (Greenwald, et al. 1996). Applying the production function in this study, the variables that were examined are those that literature indicated should impact student achievement. A simplified production equation model can be expressed as follows:

$$Q = f(T, P).$$

Where **Q** represents educational outcome variable (dependent variables), which can be used to measure the student's end-of-course tests scores in English 1, and Algebra 1. Student's average SAT score (math and reading only) was also used in the analysis. **T** represents teacher characteristics which is an input (independent) variable. Four teacher characteristics were used in this study – teachers' teaching experience, teacher turnover rate, percentage of teachers with advanced degrees, and the percentage of National Board certified teachers in the school. Teachers are an integral part of schools, and schools and school districts have some control over the characteristics of teachers they hire. Many studies have concluded that teachers' years of education affect students' achievement (Kupermintz, 2003; Klingele & Warrick, 1990). Researchers have concluded that teachers teaching experiences lead to greater teaching proficiency (Wilson, Floden, & Ferrini-Mundy, 2001). Koppich, Humphrey and Hough (2007) noted in their mixed-method research that attaining national board certification reinforces individual and professional efficacy. Saunders, Ashton and Wright (2005) concluded that the relationship between teachers with national board certification and students' achievement is mixed. Then, **P** represents educational processes which is not part of this study.

Method

Sample

The sample for this study was composed of public high school students and teachers in a low performing school district in southeastern North Carolina during 2006-2007 school year. There were 18 public high schools in this school district of study, but only 17 schools were selected for the study. One high school was an alternative school with incomplete data. While almost all the production function studies used achievement test scores as a proxy (Ferguson, 1991; Hanushek, 1987; Hartman, 1994, Monk, 1992), others used an average test scores from all school grades tested. This study examined high school student achievement in English 1 and Algebra 1 based on their composite scores on the End-of-Course tests, and SAT total score.

Procedures

Data for this study was obtained from several sources within the North Carolina Department of Public Instruction after a permission to conduct the study was granted by the Institutional Research Board (IRB) and the school district in the study. State-level and district-level data collected annually by the North Carolina State Department of Public Instruction and the School District Improvement Plan on students' end-of-course scores, school expenditures, and school demographics available online were used. Information on school and teacher characteristics was obtained from the North Carolina School Building Improvement Report for each school. The SAT total score data was obtained from the school district's statistical profile available online. According to Unger (1999), top quality high schools are those whose students consistently perform at or above grade levels as determined by objectively administered standardized achievement tests. North Carolina is among states that use statewide assessment (end-of-course test) to measure the achievement of students in public high schools. In its drive for higher standards, the State Department of Public Instruction developed its own end-of-course and end-of-grade tests for students in grades 3-12. The end-of-grade tests are given to elementary and middle school students, while the end-of-course tests are given to high school students. School districts in the state are required to have a record of achievement scores of students scoring at different levels. There are four levels that a student can achieve. Level I students did not achieve at the basic level; Level II students met the basic level; Level III students achieved at a proficient level; and Level IV students achieved at an advanced level. In this study, the percentage of students who achieved at Levels III and IV, which represent the percentage of students who mastered the subjects according to North Carolina state policy (North Carolina Department of Public Instruction, 1995/96) were used.

Analysis

Monk (1992) stated that studies that deal with the relationship between educational inputs and outputs should use complex empirical models that have greater potential for policy implication. Fortune and O'Neil (1994) concluded that the multiple

dimensions of schooling suggest that a simplified measure of either input or output is inadequate to fully describe the production relationship that may exist among schools or students. The statistical procedures used in this study to answer the research questions were those that captured the spread or dispersion of the variables used in the study. A measure of central tendency (the mean) and a measure of dispersion (standard deviation) were used to analyze the unique characteristics of the variables in the study. Pearson's Correlation was used to measure and compare the overall strengths of the relationship between the variables used in the study and to answer the four research questions in the study.

Results

Table 1 shows the summary of descriptive statistics – the minimum, maximum, mean and standard deviation of the data for each of the variables used in the study. The descriptive statistics results showed that the percentage of teachers in the county High Schools with advanced degree ranged from a minimum of 14.0 percent to a maximum of 35.0 percent, with a mean of 21.08 and a standard deviation of 5.85.

Table 1. *Summary of Descriptive Statistics of Selected Variables for 2006-07 School Year (n=17)*

Variables	Min.	Maxi.	Mean	Std. Dev.
<u>Dependent</u>				
End-of-Course Grade English 1	58.00	95.00	74.67	11.23
End-of-Course Grade Algebra 1	32.00	77.00	51.17	14.02
Average SAT (Math & Reading)	815.00	1073.00	936.58	69.17
<u>Independent</u>				
Teachers with Advanced Degree	14.00	35.00	21.08	5.65
National Board Certified Teachers	0.00	27.00	6.50	7.61
Teaching Experience Between 0 -4 years	19.00	37.00	29.08	5.21
Teaching Experience Between 5 - 9 years	18.00	35.00	27.33	5.59
Teaching Experience Between 10+ years	36.00	50.00	43.67	4.64
Teacher Turnover Rate	15.00	43.00	27.42	7.72

The percentage of teachers with National Board certification ranged from a minimum of zero to a maximum of 27.0 percent. This finding indicates that some schools in the county have no National Board certified teachers. Further examination of the raw data showed that exactly three schools do not have National Board certified teachers, while four schools have only one National Board certified teacher. On teacher turnover rate for schools in the county, the descriptive statistics showed a minimum of 15.0 to a maximum of 43.0 percent of teachers. With a mean of 27.42 percent and a standard deviation of 7.72 percent, teacher turnover rate seems to be an issue in this county. Teaching experience was divided into three – teachers with less than 5 years, those with 5 – 9 years, and those with more than 9 years. For teaching experience in the county, the analysis showed a minimum of 19 percent to a maximum of 37 percent have less than 5 years of teaching experience. For teachers with 5-9 years of teaching experience the descriptive analysis ranged from 18.0 to 35.0, while those with more than 10 years of teaching experience ranged from a minimum of 36.0 to a maximum of 50.0. The standard deviation for teachers with less than 5 years, 5-9 years and more than 9 years teaching experiences were 5.21 years, 5.59 years and 4.34 years respectively. Teachers with more than 9 years teaching experience has a slightly lower standard deviation than others. The percentage of students that mastered Algebra 1 ranged from 32.0 to 77.0, in English 1, it ranged from 58.0 to 95.0. The SAT for Mathematics and Reading scores ranged from a minimum of 815.0 to a maximum of 1073.0, with a mean score of 936.58, and a standard deviation of 69.17.

The results of the Pearson correlation analysis are shown in Table 2. The percentage of teachers with National Board certification had a positive correlation with student achievement in English 1 and their average SAT total score at a .05 significance level. Teachers with 5 – 9 years of teaching experience was positively correlated with student achievement in English 1 at a .05 percent significance level, while teachers with teaching experience between 0-4 years had a negative correlation with student achievement in English 1 at a .05 percent significance level. Teacher turnover had an insignificant negative correlation with student achievement in English 1, Algebra 1, and average SAT total score. The percentage of teachers with advanced degree had no significant relationship with student achievement.

Table 2. Correlation between Selected Teacher Variables and High School Student Achievement for 2006-07 School Year

Variables	English 1		Algebra 1		SAT Total Sc.	
	Correlation Coefficient	Prob.	Correlation Coefficient	Prob.	Correlation Coefficient	Prob.
Teachers with Advanced Degree	0.547	0.10	0.222	0.49	0.470	0.12
National Board Certified Teachers	0.599	0.04*	0.360	0.25	0.649	0.02*
Teaching Experience Between 0 -4 years	-0.684	0.01*	-0.541	0.10	-0.485	0.11
Teaching Experience Between 5 - 9 years	0.582	0.04	0.008	0.98	0.077	0.81
Teaching Experience Of 10+ years	0.073	0.82	0.571	0.10	0.433	0.15
Teacher Turnover Rate	-0.253	0.43	0.424	0.17	-0.045	0.89

* Significant level of .05 percent: ** Significant level of .01 percent.

Discussion

It is important to focus on the several key points from the results of the analysis in this study. First, teachers with teaching experience between 5 – 9 years were positively correlated with high school student achievement in English 1, but not in Algebra 1 and SAT total score. But teachers with 0 – 4 years of teaching experience were negatively correlated with high school student achievement in English 1. Many studies have examined the impact of teachers' teaching experience on student achievement, but the results have been inconclusive (Darling-Hammond, 2000; Goldhaber & Brewer, 2000; Reynolds, 1995, Hanushek, 1994). Nye, Konstantopoulos, and Hedges (2004) concluded from their randomized experimental study that teacher's experience is related to student achievement.

Second, the results showed no significant relationship between teacher turnover rate and high school student achievement. Third, there were no significant relationship between teachers with advanced degrees and high school student achievement. This finding collaborates with the results from other studies (Hanushek, 1994; Nye et al.,

2004). The last finding from this study was that teachers who were National Board certified were positively correlated with high school student achievement in English 1, and SAT total score. Cavalluzzo (2005) concluded from his study of Miami-Dade Public Schools that National Board certification is an effective measure of teacher quality. Vandervoort, Amrein-Beardsley, and Berliner (2004) found that students in the classes taught by National Board certified teachers outperformed their counterparts taught by non-National Board certified teachers in Arizona. This is an important conclusion since the state of North Carolina has invested enormously on National Board certification.

Conclusion

This research was devoted to developing an understanding in the relationship between selected teacher variables and high school student achievement. The results show that there is a significant relationship between teachers with teaching experience between 5 – 9 years and high school student achievement as measured by the end-of-course test in English 1, but insignificant in Algebra 1 and SAT total score. There's no significant relationship between teacher turnover and high school student achievement. The results also show that there is no significant relationship between teachers with advanced degrees and high school student achievement. Finally, a significant relationship was found between teachers with National Board certification and high school student achievement and measured by end-of-course test in English 1 and SAT total score.

Although correlational coefficient were frequently used in educational studies such as this, it is important to note that correlation does not necessarily imply causation. Causation can be better analyzed by performing a stronger statistical analysis – Ordinary Least Square (OLS) regression analysis. It is therefore recommended that further studies using OLS regression analysis be conducted. Nevertheless, it is hoped that educational researcher, practitioners, and policy makers will gain insight from the relationships revealed in this study because teachers are an integral part of schools and school districts have some control over the characteristics of teachers they hire, promote and develop. This study was based on one school district in North Carolina, so it is difficult to generalize the findings to other school districts. However, due to the strong relationship revealed between teacher variables and student achievement, it is likely that the findings from this study may be of some benefits to other similar school districts. It is also recommended that mixed-method research approach be undertaken for an in-depth analysis of the relationship between teacher variables and student achievement.

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About the Author

Dr. Comfort Okpala is an Associate Professor in the Department of Human Development and Services, School of Education at North Carolina A & T State University in Greensboro, North Carolina. She has a variety of educational publications in key educational journals like the *Journal of Early Childhood*, *Journal of Education Finance*, *Journal of Educational Researcher*, *Urban Education*, *Journal of Applied Business*, and *Journal of Negro Education*. She has presented her research work in local, state, national and international conferences like American Education Finance Association (AEFA), American Evaluation Association (AEA), American Education Research Association (AERA), and others.