A Correlation Study of PK12 Teacher Experience, Education Level, Turnover, and

Student Achievement

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by

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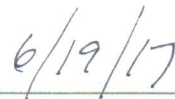A Correlation Study of PK12 Teacher Experience, Education Level, Turnover, and

Student Achievement

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Abstract

The purpose of this quantitative correlational study was to determine whether relationships exist between U.S. public school fourth-grade teacher experience, education level, turnover, and student achievement. This study was guided by a theoretical framework developed from Education Production Theory (EPT), which specifies that educational outcomes are a result of various variables active in the education process (Hanushek, 2008). The target population was the 209,000 fourth-grade students in all 50 states who took the National Assessment of Educational Progress (NAEP) mathematics assessment during the 2011-2012 school year (NAEP, 2011). De-identified archival data of fourth-grade NAEP average scale scores, and teacher experience, education level, and years at current school as reported on the Schools and Staffing Survey (SASS) during the 2011-2012 school year were analyzed using SPSS software and findings indicated that teacher experience was a significant predictor of student achievement ($p = .029$). The implications of the findings were that (a) teacher experience should be considered a significant predictor of fourth-grade NAEP mathematics assessment scores, (b) teacher education level and turnover were not predictors of student achievement scores, and (c) that other factors such as remuneration, age, strategies, and methods may contribute to positive and negative assessment scores as supported by past research. Recommendations for future practice included: (a) PK12 educational leaders to focus on hiring and retaining experienced teachers to ensure student achievement and (b) PK12 educational leaders to hold trainings and professional development where more experienced teachers mentor less experienced teachers. Recommendations for future research included: (a) to replicate this quantitative correlational study within school

districts in all 50 states with similar demographic populations, (b) to conduct a quantitative regression study to determine whether teacher remuneration, age, strategies, styles, and methods predict student NAEP mathematics assessment scores, and (c) to conduct a quantitative quasi-experimental study in a pretest-posttest design to examine differences between levels of teacher experience, education, and turnover on student NAEP mathematics achievement scores.

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Chapter 1: Introduction

Today's educational leaders face many challenges when it comes to hiring and retaining high-quality teachers (Akello, 2015; Bonney, Amoah, Micah, Ahiamenyo, & Lemaire, 2015; Chu, Loyalka, Chu, Qu, Shi, & Li, 2015). More specifically, these leaders must identify what constitutes a high-quality teacher and what characteristics have the most significant effect on student achievement. Numerous studies have examined teacher characteristics to include years of experience, education level, instructional styles, credentials, and attitudes (Akello, 2015; Boonen, Van Damme, & Onghena, 2014; McCormick & O'Connor, 2015). The teacher characteristics that can affect student achievement are very broad; however, several characteristics continue to be studied and identified as having both positive and negative effects on student achievement. These characteristics include teacher experience, education level, and the number of years a teacher has worked at a given school (Akello, 2015; Chu et al., 2015).

Teacher experience has been identified as having an effect on student achievement; however, studies have identified that a teacher's number of years of experience can have both positive and negative effects (Phillips, 2010; Rice, 2010). Teachers with low years of experience have been identified as being less effective than teachers with five years of experience. Similarly, the effectiveness of teachers with high years of experience have been identified as being equally effective as teachers with less years of experience (Rice, 2010; Musau & Abere, 2015). Teacher education levels (i.e., bachelor's degree, master's degree, above master's degree) have also been found to have an effect on student achievement. As with experience, this teacher characteristic has been found to have positive, negative, or no effect on student achievement (Cakır &

Bichelmeyer, 2016). Turnover of teachers exists for many reasons, as some may leave the profession for personal reasons and others may leave because of school characteristics (Lochmiller, Sugimoto, & Muller, 2016). Despite the reason for leaving, teacher turnover has been identified as having a negative effect on student achievement (Ronfeldt, Loeb, & Wyckoff, 2013). With a growing requirement to increase student achievement, while dealing with budget cuts, educational leaders within these schools must identify which characteristic or characteristics most significantly affect student achievement. Identifying the significance of each can greatly assist educational leaders as they hire and retain the most effective teachers for student success.

Meroni, Vera-Toscano, and Costa (2015) conducted a quantitative study that identified that low-quality teachers cannot produce high achieving students and that only high-quality teachers are capable of producing high student achievement. Meroni et al. (2015) utilized the Survey of Adult Skills (PIACC) to identify teachers' skills and the Programme for International Students Assessment (PISA) to determine student performance. The authors examined the variation between the quality of teachers and student performance and concluded that teacher quality does affect student achievement (Meroni et al., 2015). Bonney, Amoah, Micah, Ahiamenyo, and Lemaire (2015) attempted to further understand the relationship between teacher quality and student achievement. However, in contrast to the Meroni, Vear-Toscano, and Costa (2015) study, this study concluded that teacher qualifications, pedagogical skills, and experience are important to student achievement; however, no significant relationship exists between teacher quality and student achievement (Bonney et al., 2015).

As differences continue to be identified between teacher quality and student achievement, additional studies have been conducted to further examine individual teacher characteristics rather than general teacher quality. A study conducted by Akello (2015), sought to gain a better understanding of teacher experience, education level, and remuneration and student achievement. This study examined 11 principals and 289 teachers to identify the effects that each characteristic had on student achievement (Akello, 2015). This study concluded that teacher experience and education level had no significant effect on student achievement. In contrast, a 2011 study found that teachers holding a master's degree produced higher achieving students than teachers who did not (Hairrell et al., 2011). Additionally, Harris and Sass (2010), identified that teacher experience does have a positive effect on student achievement. Again, differences in findings between teacher characteristics and student achievement continue to be identified. These inconsistencies in findings create questions for educational leadership and policy makers as they try to identify the critical components necessary to ensure student achievement (Chu et al., 2015; Harris & Sass, 2010).

In addition to the studies examining teacher experience and education level, researchers have also examined the effects of teacher turnover on students. A study conducted by Ronfeldt, Loeb, and Wychoff (2012), examined the effects of teacher turnover rates on student achievement in English Language Arts and mathematics. This study observed New York student achievement and teacher turnover during an eight-year period (Ronfeldt et al., 2012). This study found that students in grade levels with higher teacher turnover scored lower than students in grade levels without high teacher turnover. While teacher turnover has been identified as having a negative effect on student

achievement, studies have not examined teacher experience, education level, turnover and student achievement to identify which characteristic is more significant to student achievement. This is a necessary next step as educational leaders attempt to hire and retain high-quality teachers for student achievement.

Teacher experience, education level, and turnover have been identified as having an effect on student achievement (Cakır & Bichelmeyer, 2016; Meroni, Vera-Toscano, & Costa, 2015). Several studies have individually examined the relationship between each characteristic and student achievement; however, these studies have been geographically limited and continue to produce conflicting results (Akello, 2015; Ronfeldt, Loeb, & Wyckoff, 2013). Additionally, research has been unable to identify which of these teacher characteristics most significantly affects student achievement (Akello, 2015; Cakır & Bichelmeyer, 2016; Musau & Abere, 2015). Teachers play a critical role in student achievement, and educational leaders must understand which characteristics have the most significant effect on student achievement in order to hire and retain high-quality teachers within their schools (Harris & Sass, 2010).

Statement of the Problem

The general problem was that PK12 teacher experience, education level, and turnover can have both positive and negative effects on student achievement (Akello, 2015; Boonen, Van Damme, & Onghena, 2014; McCormick & O'Connor, 2015). Researchers have identified that teacher experience reaches a maximum effectiveness around five years, so teachers with more than five years of experience have been identified as being no more effective in the classroom than teachers with five years of experience. (Akello, 2015; Boonen, Van Damme, & Onghena, 2014). Additionally,

teacher education level has been reported to have little or no impact on student achievement, especially in schools where teachers possess advanced degrees (Chu et al., 2015; Musau & Abere, 2015). Researchers have also found that teacher turnover may have both positive and negative effects on student achievement (Ronfeldt, Loeb, & Wyckoff, 2013). Negative effects have been identified as creating a loss of institutional knowledge among staff members, which is critical for teachers as they work to support student learning as teacher turnover allows schools to remove ineffective teachers from classrooms and replace them with high-quality effective teachers (Ronfeldt et al., 2013). The specific problem was that critical teacher characteristics must be considered in the hiring and retention of high-quality teachers for PK12 student achievement (Akello, 2015; Chu et al., 2015). Conflicting findings continue to be identified with teacher experience, education level, and turnover having both positive and negative effects on student achievement (Akello, 2015; Chu et al., 2015; Ronfeldt et al., 2013). A lack of identification of the effect of teacher characteristics on student achievement leaves educational leaders uncertain on best methods to hire and retain high-quality teachers for student success (Akello, 2015; Cakır & Bichelmeyer, 2016; Meroni, Vera-Toscano, & Costa, 2015).

Purpose of the Study

The purpose of this quantitative correlational study was to examine whether relationships exist between U.S. public school fourth-grade teacher experience, education level, turnover, and student achievement. A correlation design was appropriate for this study as it allowed non-manipulated variables to be examined, and predictions to be made regarding outcomes based on the selected variables (Creswell, 2015; Field, 2013). The

study criterion variable was fourth-grade student achievement scores earned on the National Assessment of Educational Progress (NAEP) mathematics assessment for all 50 states (NAEP, 2011), and three predictor variables: fourth-grade teacher (a) experience, (b) education level, and (c) years at current school. The target population for this study were the archival records of all fourth-grade public school students from all 50 states who took the NAEP mathematics assessment during the 2011-2012 academic school year (NCES, 2014), and the sampling frame was the roster of fourth-grade student assessment scores. A purposeful sampling method was used to select publicly-available archival quantitative data for each variable from the National Center for Education Statistics (NCES) website for data collection. Data analysis involved multiple linear regression using Statistical Package for the Social Sciences (SPSS) software and categorical variables were dummy coded (Field, 2013; Salkind, 2011). The results of this study may provide a better understanding of the effects of teacher characteristics for educational leaders as they work to hire and retain high-quality teachers for student success.

Theoretical Framework

The theoretical framework for this quantitative correlational study was Education Productivity Theory (EPT), which emerged from Cobb and Douglas' (1928) productivity theory and the ideas related to productivity in the field of economics (Pullen, 2009), where maximum output was achieved while using minimal inputs (Duyer, 2006). From productivity theory, Walberg (1984) developed EPT by identifying nine "productivity factors" correlated with educational achievement. These factors included prior achievement or ability, development, motivation, the amount of time students are engaged in learning, instructional quality and experience, the home environment, the

classroom social group, peers outside of school, and the amount of time out-of-school watching television (Benbow, Arjmand, & Walberg, 1991; Walberg, 1984).

Cobb and Douglas' (1928) productivity theory identified that the quantity and strength of inputs would increase output. Additionally, the authors found that raising an input with a high ratio to other factors would be less productive (Cobb & Douglas 1928). Using Cobb and Douglas' (1928) formula in education and identifying the relationships between educational inputs and outputs would then conclude that any input with a zero value would yield a zero output value. Additionally, if any inputs contain a fixed value, then increasing the amount of this input would lead to a diminished output (Walberg & Tsai, 1983). The Cobb and Douglas (1928) productivity theory argued that minimal inputs can produce maximum output through productivity. The objective of educational productivity is to achieve maximum output using minimal input to advance the quality and quantity of educational factors that influence student achievement (Duyar, 2006), and a lack of identification of the effect of educational inputs (teacher experience, education level, and years at current school) on educational outputs (student achievement) leaves educational leaders uncertain on best methods to hire and retain high-quality teachers for student success (Akello, 2015; Cakır & Bichelmeyer, 2016; Meroni, Vera-Toscano, & Costa, 2015).

Hanushek (1979), a well-respected Stanford University economist, also showed interest in EPT as a result of the Coleman Report (1966) where school inputs and outputs were measured to identify areas that effect student achievement. The Coleman report (1966) identified that families and friends had a higher effect on student achievement than various school inputs, which prompted an investigation by Hanushek into the

relationships between educational inputs and student achievement (Hanushek, 2008). This investigation found that the report findings had misinterpretations, thereby encouraging Hanushek to conduct further studies and produce numerous writings on public policy and the economics of education (Hanushek, 1979, 2008). Hanushek (2008) later argued that educational inputs (e.g., characteristics of schools, teachers, and curricula) were directly controlled by policymakers, whereas the learning capacity of the students and family and friend inputs were not as controlled. Furthermore, Hanushek (2008), added that while student achievement was often measured at a discrete point in time, the educational process was progressive, thereby allowing past educational inputs (e.g., characteristics of schools, teachers, and curricula) to affect the student's current academic achievement. Hanushek (2008) was able to identify that differences in educational inputs (e.g., characteristics of schools, teachers, and curricula) do affect student achievement, which is stated in EPT.

The objective of EPT was to improve the quantity and quality of academic inputs provided to students to increase academic output (Subotnik & Walberg, 2006); however, the Coleman Report (1966) findings created a shift in thinking among policymakers with findings that family and friends had a more significant effect on student achievement than schools and teachers. Hanushek (2008) argued that additional research must be conducted to clearly identify the inputs that effect student achievement. According to Hanushek (2008), research suggested inefficiency in the provision of schooling, finding indications that schools do matter and that academic inputs can affect student output, and noted past research was unable to clearly identify a clear and systematic relationship between academic inputs and student achievement. Furthermore, the American public,

policymakers, and educators continue attempts to identify academic inputs that effectively and efficiently increase student output or academic achievement (Hanushek, 1979, 2008, 2016).

As the study's theoretical framework, EPT served as an appropriate framework to examine the effects of educational inputs on student achievement (Akello, 2015; Hanushek, 1979, 2008, 2016). EPT provided the necessary framework to examine the relationship between U.S. public school fourth-grade teacher experience, education level, and years at current school and student achievement on fourth-grade NAEP mathematics assessments. Therefore, EPT was an ideal framework for this study as teacher experience and education level are two of the nine education "productivity factors" identified within the theory that are related to student achievement and can be used to explore PK12 teacher experience, education level, and turnover (Benbow et al., 1991; Hanushek, 1979, 2008, 2016).

Research Question

For educational leaders to hire and retain high-quality teachers for student success, the significance of relationships between teachers' experience, education level, and turnover must be examined and clarified as necessary based on past research (Akello, 2015; Cakır & Bichelmeyer, 2016). The research question that guided this study sought to identify whether relationships exist between teachers' experience, education level, and turnover and student achievement on fourth-grade NAEP mathematics assessments. The following research question guided this study:

RQ1. Are U.S. fourth-grade public school teacher experience, education level, and turnover predictors of public school fourth-grade student achievement on NAEP mathematics assessments?

Hypothesis

H1$_0$. Fourth-grade teacher experience, education level, and turnover are not predictors of public school fourth-grade student achievement on NAEP mathematics assessments.

H1$_a$. Fourth-grade teacher experience, education level, and turnover are significant predictors of public school fourth-grade student achievement on NAEP mathematics assessments.

Nature of the Study

A quantitative correlational study was used to determine whether relationships exist between U.S. public school fourth-grade teacher experience, education level, turnover, and student achievement. A correlational design was used for this study as it allowed non-manipulated variables to be examined, and predictions to be made regarding the predictor variables effects on the criterion variable (Creswell, 2015; Field, 2013). A correlative design was justified for this study because it allowed for an analysis of the relationships that exist between the predictor variables (experience, education level, and years at current school) and the criterion variable (student achievement scores) (Krathwohl, 2009). A correlation design was used in this study because non-manipulated variables were collected from the Schools and Staffing Survey (SASS) and the fourth-grade NAEP mathematics assessment (Creswell, 2015; Field, 2013).

The study variables included one criterion variable, student achievement scores earned on the fourth-grade NAEP mathematics assessment for the 2011-2012 academic school year (NAEP, 2011), and three predictor variables: (a) teacher experience, (b) education level, and (c) years at current school as defined by the NCES definitions and measured by the Schools and Staffing Survey (SASS) for all K12 public school teachers during the 2011-2012 academic school year (NCES, 2014). The criterion and predictor variables in this study were not manipulated and were examined to identify any relationships that exist based on multiple regression data analysis (Creswell, 2015; Field, 2013).

Northcentral University Institutional Review Board (IRB) approval was sought prior to any archival data being collected for this study. The research design for this study involved archival data only with no human subjects, so an exempt IRB approval was attained and no informed consent was required. Data for this quantitative correlational study involved the use of previously collected archival data only, so no instrument was used in this study to collect new data. Therefore, no instrument validity, reliability, or specific permissions were required. Publicly available archival teacher data were accessed using the results of the SASS located on the NCES website for the 2011-2012 academic school year (see Appendix A). Publicly available archival student data were accessed using the results of the fourth-grade NAEP mathematics assessments located on the NCES website for the 2011-2012 academic school year (NCES, 2011).

The target population for this study were the archival records of all fourth-grade public school students from all 50 states who took the NAEP mathematics assessment during the 2011-2012 academic school year (NCES, 2014). A total of 209,000 fourth-

grade students took the NAEP mathematics assessment during the 2011-2012 academic school year, and the sampling frame consisted of NAEP scores that were based on representative samples using average scale scores reported for all 50 states (NCES, 2014). The archival data were collected from the NCES website and consisted of average scale scores earned on the fourth-grade NAEP mathematics assessment for all 50 states during the 2011-2012 academic school year (NCES, 2014).

Data collection for this study included gathering archival data for the 2011-2012 academic school year from the NCES website after NCU IRB approval was attained. Data located on this website was publicly available in Microsoft Excel format, and files were downloaded and saved as such (see Appendix A). Data analysis included multiple regression analysis using Statistical Package for the Social Sciences (SPSS) software to analyze the significance of relationships between the three predictor variables (teacher experience, education level, and years at current school) and the one criterion variable (student achievement scores) as measured by the fourth-grade NAEP mathematics assessment (Creswell, 2015; Field, 2013). Nominal variables (teacher experience, education level, and years at current school) were dummy coded for parametric regression analysis (Field, 2013; Salkind, 2011). Data assumptions for regression were assessed prior to hypothesis testing and included linearity, independence of errors, normality, and homoscedasticity. The results of this study may provide a better understanding of the effects of teacher experience, education level, years at current school, and student achievement for educational leaders as they work to hire and retain high-quality teachers for student success.

Significance of the Study

Past research has repeatedly produced conflicting findings regarding teacher experience, education level, turnover, and student achievement (Akello, 2015; Chu et al., 2015; Ronfeldt et al., 2013). Researchers have identified that teacher experience reaches a maximum effectiveness around five years, concluding that significantly experienced teachers are no more effective in the classroom than teachers with five years. (Akello, 2015; Boonen, Van Damme, & Onghena, 2014). Additionally, studies have identified teacher education level as having minimal or no impact on student achievement (Chu et al., 2015), and other studies have found that teacher turnover may have negative effects on student achievement (Ronfeldt, Loeb, & Wyckoff, 2013). In contrast, similar studies have produced conflicting findings where teacher experience, education level, and turnover had positive effects on student achievement (Akello, 2015; Chu et al., 2015; Ronfeldt et al., 2013). The results of this study may aid educational leaders in identifying the critical teacher characteristics that must be considered in the hiring and retention of high-quality teachers for PK12 student achievement (Akello, 2015; Cakır & Bichelmeyer, 2016; Chu et al., 2015; Meroni, Vera-Toscano, & Costa, 2015).

A recent study conducted by Akello (2015) examined the relationship between teacher qualifications, experience, remuneration, and age and student achievement. This study observed 11 public schools in Kenya, and found no significant relationship between teacher qualification, experience and student achievement (Akello, 2015); additionally, Akello (2015) identified a significant relationship between teacher remuneration, age and student achievement. In contrast, studies by Hanushek (2008) found that educational inputs do effect student achievement, creating questions regarding which inputs

significantly affect student achievement. This study aimed to further identify the inputs that have a significant effect on student achievement by performing a similar study to the Akello (2015) study through examination of teacher qualifications and experience in a larger geographic area. Additionally, this study examined a third teacher characteristic to identify if this educational input had a significant effect on student achievement, as past researchers have continued to identify conflicting findings regarding the relationship between teacher experience, education level, and turnover on student achievement (Akello, 2015; Boonen, Van Damme, & Onghena, 2014; Hanushek, 2008; McCormick & O'Connor, 2015). The findings of this study may contribute to a better understanding of the effects and significance of teacher experience, education level, and years at current school on student achievement, which may aid educational leaders as they work to hire and retain high-quality teachers for student success.

Definition of Key Terms

  National Assessment of Educational Progress (NAEP). America's largest national representative and continuous assessment of what students know and can do in mathematics, reading, science, writing, the arts, civics, economics, geography, U.S. history, and Technology and Engineering Literacy (NCES, 2016a). This is a paper-and-pencil assessment; however, the NAEP will begin administering a digital version of the mathematics, reading, and writing portions in 2017. Additional subject areas will be added in 2018 and 2019.

  National Assessment of Educational Progress (NAEP) Mathematics Assessment. This assessment measures students' knowledge, skills, and abilities in mathematics and problem-solving. Question design and scoring are based on the

theoretical basis as provided by the NAEP frameworks and under the guidance of the National Assessment Governing Board (NCES, 2016b).

      National Center for Education Statistics (NCES). The primary U.S. federal organization responsible for collecting and analyzing educational data for the U.S. and other nations (NCES, 2016c). The NCES is a part of the U.S. Department of Education and the Institute of Education Sciences and is mandated by Congress to collect, publish, collate, analyze, and report on American and international education activities.

      Schools and Staffing Survey (SASS). A survey conducted by the U.S. Department of Education to gather data on public and private schools in the U.S. (NCES, 2016d). Data were collected from principals and teachers and were designed to provide descriptive data on elementary and secondary education. Teacher demand, teacher and principal characteristics, school conditions, and school climate problems were just a few of the items surveyed. This survey was redesigned and named the National Teacher and Principal Survey (NTPS) after the 2010-2011 academic school year and was conducted for the first time during the 2015-2016 academic school year.

      Standardized assessment. A test that has undergone extensive development, including writing and rewriting test items, numerous administrations, found to be both reliable and valid, and normed with a large group of test takers (Salkind, 2013). Consistent directions, administration procedures, and clear scoring criteria are also extensively developed as part of standardized assessments. These assessments are typically administered in a group setting and serve as a measure of students' aptitude or achievement based on a norm-referenced device (Popham 2013; Salkind, 2013).

Summary

Research continues to identify conflicting findings with teacher experience, education level, and turnover having both positive and negative effects on student achievement (Akello, 2015; Chu et al., 2015; Ronfeldt et al., 2013). Hanusheck (2008), identified a relationship between high-quality teachers and student achievement; however, the significance of each teacher characteristic continues to be unclear. This study was guided by a framework developed around EPT (Hanushek, 2008), which specifies that educational outcomes are a result of various variables active in the education process. This theory has identified that teacher characteristics do have an effect on student performance, which guided this study as teacher experience, education level, and turnover were examined to identify which characteristic or characteristics most significantly affect student achievement (Hanushek, 2008). This quantitative correlational study investigated the relationships between U.S. public school fourth-grade teacher experience, education level, turnover, and student achievement. A purposeful sampling method was used to select publicly-available archival quantitative data for fourth-grade NAEP mathematics assessment scores for all 50 states. Multiple linear regression analysis using SPSS software was used to identify the extent of the relationships between each predictive value of the predictor variable and the criterion variable (Field, 2013; Salkind, 2011).

Chapter 2: Literature Review

The purpose of this quantitative correlational study was to determine whether relationships exist between U.S. public school fourth-grade teacher experience, education level, turnover, and student achievement. Researchers have produced conflicting findings where teacher experience, education level, and turnover have had both positive and negative effects on student achievement (Akello, 2015; Chu et al., 2015; Ronfeldt et al., 2013). The specific problem of focus was that critical teacher characteristics must be considered in the hiring and retention of high quality teachers for PK12 student achievement; however, past researchers continue to reach conflicting conclusions regarding the significance of each characteristic on student achievement (Akello, 2015; Chu et al., 2015). This chapter includes a review of current and historical research data relevant to high quality teacher characteristics and student achievement. This chapter is organized by research themes including: effects of high-quality teachers on student achievement; classroom experience, credentials, and student achievement; and teacher turnover and the effects on student achievement.

The primary databases used to collect current peer-reviewed scholarly articles for this literature review included ProQuest, EBSCOhost, ERIC, Sage Education, Science Direct, and Google Scholar. The primary keywords used for searches included: high-quality teachers and student achievement, low-quality teachers and student achievement, teacher experience and student achievement, teacher education level and student achievement, teacher turnover and student achievement, teacher years at current school and student achievement, and teacher characteristics and student achievement.

Theoretical Framework

Education Productivity Theory (EPT) was the theoretical framework for this quantitative correlation study, and EPT emerged from Cobb and Douglas' (1928) productivity theory originally founded in the field of economics (Pullen, 2009) where maximum output was achieved with minimal inputs (Duyer, 2006). Walberg (1984) first developed EPT through identification of nine "productivity factors" related to education achievement, and the goal of EPT is to achieve maximum educational output using minimal educational inputs to advance the quality and quantity of educational factors that influence student achievement (Duyar, 2006).

Khan and Kiefer (2007) conducted a quantitative study to explore EPT using test scores to identify the impact of student ability and wealth, daily attendance, teacher experience, school type, school fees, and distance on student achievement in rural Pakistan. The study used mathematics and comprehension tests to measure student performance to identify significant differences in government, private, and non-government organization (NGO) schools. The authors found that teacher experience had a positive and significant effect on student achievement; however, no relationship between teacher credentials and student performance was identified. The findings of this study produced uncertain results regarding the identified variables of education production functions and student achievement (Khan & Kiefer, 2007).

Additionally, Oshio, Sano, and Suetomi (2010) attempted to identify the relationships between EPT and student achievement of Japanese junior high and senior high school students (Oshio, Sano, & Suetomi, 2010). The authors concluded that the quality of education, and the adopted educational strategies used in the classroom, had no

statistically significant effect on student achievement (Oshio, Sano, & Suetomi, 2010).

Furthermore, Akello (2015) examined EPT and the relationships between education

production functions and student achievement by conducting a descriptive survey study

of the *ex-post facto* type to identify the impact of teacher characteristics on student

achievement in Kenya. Akello (2015) concluded that salary and teacher age had a

significant effect on student academic achievement, and that student achievement

increased when teacher remuneration increased. No significant relationships were found

between teacher qualifications, experience, and student achievement. Akello (2015) also

noted conflicting findings to the current EPT where educational inputs (teacher

experience and education level) should have produced maximum educational output

(student achievement). The findings of Akello (2015) and Khan and Kiefer (2007) raised

additional questions regarding EPT, and the relationships between teacher characteristics

and student achievement; therefore, additional research must be performed to further

clarify EPT and the relationships that exist between educational production functions

(teacher experience, education level, and years at current school) on educational output

(student achievement) (Akello, 2015; Khan & Kiefer, 2007; Oshio, Sano, & Suetomi,

2010).

Effects of High-quality Teachers on Student Achievement

Harris and Sass (2010) conducted a correlational study of an extensive panel of

Florida public school administrative records to examine the relationships between teacher

training, teacher quality and student achievement. Harris and Sass (2010) found that

experience had a significant positive effect in the early years of a teacher's career,

marginal effects after 10 years, and a teacher with 15-24 years of experience was

comparable to a first-year teacher. Additionally, Harris and Sass (2010) concluded that most subject/grade level teachers with advanced degrees were no more productive in the classroom than those without an advanced degree, and that classroom experience early in a teacher's career was the only teacher characteristic that had a positive effect on student achievement (Harris & Sass, 2010).

Hairrell et al. (2011) performed a quantitative experimental study to examine the effects of teacher quality on students' comprehension and vocabulary performance. Teacher experience and perceived knowledge were not significant, and students with teachers holding a master's degree outperformed students with teachers who did not; thereby concluding that high quality teachers with a master's degree do have a positive effect on student achievement (Hairrell et al., 2011). Likewise, Metzler and Woessman (2012) examined the causal effect of teacher subject knowledge on student achievement and found that an increase in teacher math scores produced an increase in student math assessment scores. Teacher subject knowledge also had a positive effect on reading; however, this effect did not reach a statistical significance level (Metzler and Woessman, 2012).

Bonney et al. (2015) conducted a descriptive survey design study to examine the relationship between teacher quality and student academic performance in the Western Region of Ghana. In contrast to Metzler and Wessman (2012), Bonney et al. (2015) concluded that there was no relationship between teacher quality and student achievement in the Sekondi Takoradi Metropolitan Assembly (STMA) Junior High Schools, and also concluded that no significant relationship existed between teacher qualifications and experience and student achievement. The relationship between teacher

pedagogical skills and subject knowledge and student achievement was low with no relationship found between teacher quality and student achievement.

Further examining the effects of teacher quality on student achievement, Meroni, Vera-Toscano, and Costa (2014) used a multilevel model to examine the relationship between teachers' skills and student achievement scores earned on the Programme for International Students Assessment (PISA). Meroni et al. (2014) identified a strong positive correlation between teachers' skills or quality and student performance, and found that high quality teachers did produce higher achieving students. Similar results were found by Zakharov, Tsheko, and Carnoy (2016) using a causal comparative approach to identify if "better" teachers improved student achievement in Kenya, South Africa, and Swaziland. The authors found that girls performed better with female teachers, increased teacher subject knowledge may lead to higher student performance, a reduction in teacher absences contributed to higher student achievement, extra lessons in reading and math seemed to improve student achievement, and student placement based on ability can help students perform better. Additionally, the authors concluded that teacher experience negatively impacted student achievement in South Africa because of the Apartheid condition used to train older teachers, and more years of experience led to a positive or neutral effect on student achievement in Kenya and Swaziland. Zakharov et al. (2016) concluded that teacher subject knowledge had a positive but small effect on student achievement, and teacher quality and educational interventions may increase student performance.

Wiswall (2013) conducted a quantitative study to examine the effects of teacher quality on fifth-grade student achievement in reading and mathematics. Restricted use

was used to match student and teacher administrative data for nearly all students and teachers in North Carolina public schools. Data analyses were used to examine the relationship between the distribution of high-quality teachers, teacher sorting, and teacher turnover. Teachers with less attachment were found to have higher returns during their first few years, which may be a result of a steeper learning curve. Additionally, teacher quality was found to remain almost unchanged as teacher experience increased. Wiswall (2013) determined that more experienced teachers were not more effective, higher quality new hired teachers may have substantial gains throughout the course of their careers, and concluded that higher returns in reading and mathematics can be achieved by students who have teachers with more teaching experience and higher teacher quality.

Likewise, Forman and Markson (2015) conducted a quantitative study to examine the effects of high-quality teachers on student achievement. Student data were collected using student performance on the New York State standardized assessment in English Language Arts (ELA) and Mathematics, and teacher effectiveness was collected using the teacher performance evaluation system and teachers' Annual Personnel Performance Reviews. A Pearson Product-Moment correlational analysis was used to determine any relationships between variables, and the authors found that students receiving free or reduced lunches had a statistically significant relationship with students achieving grade level on the state exam. As the number of students receiving free or reduced lunches increased, the number of students meeting grade level standards on both the ELA and math tests decreased. Similar to the findings of Wiswall (2013), Forman and Markson (2015) found that teachers who are rated as "highly effective" had a significant and positive relationship with students meeting grade level standards on both the ELA and

math assessments. Teachers with an "ineffective" rating had a statistically significant and negative relationship to student achievement scores on ELA and math assessments. The authors concluded that high quality and "highly effective" teachers do have a significant and positive effect on student achievement (Forman & Markson, 2015).

Z. Ozel and S. Ozel (2013) conducted a quantitative study to further examine the relationships between mathematics teacher quality and student achievement. Student data were collected using mathematics achievement assessments, and teacher data were collected from the Trends in International Mathematics and Science Study (TIMSS). Data analysis for this study included calculations of percentages, nonparametric correlations analysis, two-level hierarchical linear modeling, and multilevel analyses. Z. Ozel and S. Ozel (2013) found that low-SES students were less likely to have access to experienced teachers. Additionally, Goldhaber, Lavery, and Theobald (2015) conducted a quantitative study to examine the teacher quality gap between advantaged and disadvantaged students. Data for this study were collected from four administrative databases in Washington State's Office of Superintendent of Public Instruction (OSPI), the Comprehensive Education Data and Research System (CEDARS), the Student Testing Database, the Washington State S-275 personnel report, and the Washington State Credentials database. Goldhaber et al. (2015) used the OSPI data to develop a data set linking third through tenth-grade students standardized assessment scores in reading and math and their teachers. Value-added models were used to examine the relationship between teacher variables and student variables.

Z. Ozel and S. Ozel (2013) and Goldhaber et al. (2015) found disparities between low and high socio-economic status (SES) families and access to high quality

mathematics teachers. The distribution of mathematics teachers with three or more years of experience was statistically and significantly different between low and high-SES families. Additionally, a larger number of low-SES students had teachers who lacked mathematics education as compared to high-SES students. Goldhaber et al. (2015) also identified that an inequitable distribution of low-quality teachers occurs more across districts and schools rather than within schools. Z. Ozel and S. Ozel (2013) also found that low-SES students were statistically and significantly less likely to have access to experienced teachers, and teachers of low-SES students also felt less prepared to teach the materials. The authors concluded that teachers' experience, degree, and subject knowledge were positively related to student achievement; however, teacher quality indicators in the study did not explain the achievement gap between low and high-SES students (Z. Ozel & S. Ozel; 2013). Additionally, Goldhaber et al. (2015) concluded that the unequal distribution of teachers was primarily a result of disadvantaged students attending schools with lower teacher quality; however, this conclusion can vary depending on the definition of low-quality teachers and disadvantaged students.

Likewise, Zhang and Campbell (2013) conducted a quantitative study to further examine the impact of teacher quality and access to qualified teachers. Multilevel statistical modeling was used to identify the effect of teacher education, experience, and certification on student achievement in science. Teachers who possessed a degree in science, and teachers with a high number of years teaching science, were found to have a positive influence on student achievement. Teacher years of experience, education level, and the pursuit of an advanced degree were also found to have a minor influence on student achievement, and the authors also concluded that the achievement gap between

poor and wealthy students was not significantly different from the average international

gap (Zhang & Campbell, 2013). Similar to the findings of Z. Ozel and S. Ozel (2013)

and Goldhaber et al. (2015), Zhang and Campbell (2013) found that teacher experience,

education, and certification had an influence on student achievement in schools with low

socio-economic status; however, no influence was found when the socio-economic status

was controlled.

Further examining teacher quality, Tatar, Tuysuz, Tosun, and Ilhan (2016)

conducted a quantitative study to investigate the factors that affect student achievement in

science. Data was collected using a Questionnaire of Factors Affecting Student's Science

Achievement (QFASSA). The questionnaire examined student, teacher, material/activity,

learning environment, and curriculum. Descriptive analysis was used to examine the

data, and result percentages were calculated for each dimension identified on the

questionnaire.

Tatar et al. (2016) found that the majority of teachers thought that students'

science achievement was affected by the teacher, then by the student, followed by the

material/activity, curriculum, and finally the learning environment. Additionally,

teaching topics in a way that aroused students was found to be the primary perceived

teacher dimension. Completing the subject again was identified as the leading factor in

the student dimension category, and the frequency of making experimentation was the

priority in regards to materials and activity. The curriculum and learning environment

dimensions produced priority factors of intensity of the science curriculum and friendship

environment in the science classroom respectively. Tatar et al. (2016) concluded that

teachers must teach the topic in a way that arouses the student; thereby, determining that teacher quality is a predictor to student achievement in science.

Taut et al. (2016) conducted a quantitative study to examine the relationship between a standards-based teacher evaluation program and student achievement. Census achievement data based on assessment scores using the same group of students were used in this study, and teacher data were collected using the Chilean teacher evaluation system. Two-level regression analysis was used in this study to determine teacher effectiveness, and advanced statistical analyses were used to identify relationships between teacher evaluation ratings and student achievement scores. Taut et al. (2016) determined that the teacher evaluation system identified factors that influenced student achievement. Likewise, Manzeske et al. (2016) conducted a quantitative study to identify if teacher performance pay had an influence on student achievement. Teacher data were collected using archival records that included teacher-level data regarding classroom practices, performance ratings, and bonus amounts. Statewide student achievement scores were collected using publicly available data. Data were analyzed using descriptive and inferential analyses.

Taut et al. (2016) found that the portfolio instrument portion of a teacher evaluation system was more strongly correlated with value-added teacher effects than the other three sections of the evaluation system based on student performance. Supervisor, peer, and self-assessment questionnaires showed little evidence of a relationship between this part of the evaluation and student performance. Additionally, the video-taped portion of the portfolio was found to be more significant than the written portion. Manzeske et al. (2016) found that under a teacher performance evaluation system, nearly every teacher

received a performance bonus for each year that they were available. Additionally, larger bonuses were paid to teachers with higher performance ratings, and bonuses based on classroom practices were more evenly paid to eligible teachers than were bonuses based on value-added teacher performance ratings. Taut et al. (2016) concluded that the evaluation system highlights the value-added factors that directly influence student performance, and that quality teachers with high evaluation scores had higher student performance. However, Manzeske et al. (2016) determined that teacher performance pay under an evaluation system was found to have no statistically significant effect on student achievement. Manzeske et al. (2016) concluded that this lack of increase in student achievement may be a result of nearly all teachers receiving a bonus, a lack of knowledge regarding the marginal difference between each bonus, or that teachers found the bonus amount to be insufficient for extra efforts in the classroom.

Knoell and Crow (2013) conducted a mixed methods study to examine the influence of teacher quality on students in poverty and affluent schools. Data were collected using qualitative semi-structured interviews, which were then transformed into quantitative data for analysis. Data were analyzed using compare and contrast methods, and included examination of initial responses and follow-up explanations. Knowell and Crow (2013) found that teachers in both poverty and affluent schools did have an influence on student learning. Likewise, McLean and Connor (2015) further examined the relationship between teacher quality and student achievement by conducting a quantitative study to determine the effects that depressive symptoms in third-grade teachers have on classroom quality and student math performance. Participating teachers completed the Center for Epidemiologic Studies Depression Scale that was adapted for

this study, and classroom quality was assessed using a classroom-learning environment rubric. Student data were collected using the Woodcock-Johnson III Tests of Achievement and the Gates-MacGinitie literacy tests. Principal components analysis was used to identify separate factor student performance scores for both math and literacy. McLean and Connor (2015) conducted zero-order correlations to identify any relationships that exist between teacher depression and classroom quality, and determined that student learning was influenced by teachers.

Knowell and Crow (2013) found that students in both poverty and affluent schools thought that teacher encouragement for good behavior was important, and that teachers did have an influence on their learning. Students in the poverty schools had a significantly lower number of "yes" answers when compared to students in affluent schools when asked whether teacher influence was substantial. Additionally, a lower number of students in the poverty schools reported that teachers' influenced their choices and behaviors outside of school. McLean and Connor (2015) also determined that teachers influenced student learning, concluding that as teachers' depression increased, the classroom quality decreased. Furthermore, teacher depression in the fall was linked to student performance math scores in the spring. Knoell and Crow (2013) and McLean and Connor (2015) concluded that the quality of teachers, and the established relationships with students, did have an influence on student learning, behaviors and choices. Additionally, Knoell and Crow (2013) found similar findings to that of that Zhang and Campbell (2013) identifying that teacher experience and education had no effect on the influence level of teachers on student achievement.

Further examining the relationship between teacher quality and student achievement, Barrett and Toma (2013) conducted a quantitative study to identify the relationship between teacher quality and assigned class size. Data were collected using individual student-teacher level observations, administrative databases, and the Comprehensive Tests of Basic Skills in math and reading. The purpose of this study was to examine how class sizes increased given teacher quality, so "choice sets" were used to identify the number of teachers available to an administrator and the number of students that the teacher was assigned. A teacher fixed model and descriptive statistics were used for data analysis.

Barrett and Toma (2013) found that teachers' years of experience, and the number of years of education a teacher had, were positively related to class size. Additionally, high quality teachers with past high levels of effectiveness were found to be assigned a higher number of students. The authors found that teachers with previous high scoring students in mathematics and reading had a larger number of students assigned to them the following year. A statistically significant relationship between racial composition and class size was also found, and lower school expenditures per student had a negative relationship on student achievement. Barrett and Toma (2013) concluded that schools with more teachers per grade level had fewer students, and that principals did strategically place a larger number of students in classrooms with high quality teachers than in classrooms with less effective teachers.

Classroom Experience, Credentials, and Student Achievement

Kalogrides, Loeb, and Beteille (2013) conducted a study to examine teacher characteristics and student classroom assignment. Data for this study were collected

using administrative files on all staff members and students, the math and reading Florida

Comprehensive Assessment Test, and a teacher survey. Descriptive statistics were used

for data analysis. The authors found female and minority teachers had lower achieving

students in their classes, and male white teachers had higher achieving students.

Kalogrides et al. (2013) found that student achievement had a positive relationship with

teachers remaining at their current school, and teachers who were members of school

leadership, professional development leaders, or department heads were assigned higher

achieving students. Additionally, the relationship between teacher experience and

student achievement was found to be higher in schools with more experienced teachers,

and more effective senior teachers were often assigned struggling students rather than

higher achieving students. Kalogrides et al. (2013) concluded that a positive relationship

does exist between teacher experience and student achievement, and that more

experienced teachers were assigned lower performing students.

Kalogrides et al. (2013) found that teacher experience was positively related to

student achievement, that teachers with two to seven years of experience had statistically

significant prior student achievement, and teachers with 10 to 20 years of experience had

average prior student achievement. Likewise, Enwelim (2016) conducted a quantitative

study to identify the effects of teacher characteristics on student achievement in social

studies. Teacher characteristic data were collected using a descriptive survey

questionnaire, and student achievement scores were used in this study. Data were

analyzed using Kendall Tau rank correlation co-efficient to identify the extent of the

relationship between selected teacher characteristics and student achievement.

Kalogrides et al. (2013) and Enwelim (2016) determined that a significant relationship does exist between teachers' academic qualifications and experience and student achievement. Additionally, a significant relationship was found between teaching behaviors, experience and student achievement. Enwelim (2016) concluded that teacher qualification was the most significant factor influencing student achievement scores, and that unqualified teachers had a negative effect on student achievement. Furthermore, Enwelim (2016) concluded that teaching strategies, styles, methods, and teacher experience positively influenced student achievement in social studies.

Wiseman and Al-bakr (2013) conducted a quantitative study to examine the relationships between teacher certification and student achievement. Teacher quality data and student achievement scores in math and reading were collected from the Trends in International Mathematics and Science Study (TIMSS). Data were analyzed using bivariate correlations, multivariate correlations, and multilevel models. The authors found that student achievement scores in math and science were positively and significantly related to teacher certification. Furthering the notions regarding teacher characteristics and student achievement, Chu et al. (2015) conducted a quantitative study to examine the impact of teacher credentials on student achievement in China. Data were collected using student achievement scores in mathematics and Chinese, and surveys were used to identify information about teacher credentials. A cross-subject student fixed model was used for data analysis.

Wiseman and Al-bakr (2013) found that the strongest predictor of student achievement in science was the expenditure percentage spent on each student, and the second strongest predictor of student achievement was teacher certification. In contrast,

Chu et al. (2015) found that teachers with higher ranks increased student learning, and individual certifications or education did not lead to higher student achievement. Additionally, Wiseman and Al-bakr (2013) determined that teacher examination was not significantly associated to student achievement; however, additional data analysis using teacher and student data from another region contradicted these findings. Based on this data, Wiseman and Al-bakr (2013) had similar findings to that of Chu et al. (2015) which found that teacher certification had a negative and not significant effect on student achievement. The difference in these findings led Wiseman and Al-bakr (2013) to conclude that there is no direct or consistent relationship between teacher certification and student achievement, and that simply passing a teacher certification exam does not guarantee the effectiveness of a teacher. Additionally, Chu et al. (2015) concluded that teachers' rank has a significant positive effect on the average student's achievement, and that teaching awards and attending college had no significant impact on student achievement.

Continuing the examination of teacher certification and student achievement, Petty, Good, and Handler (2016) conducted a qualitative study to examine the perceived impact of National Board Certification (NBC) on student achievement. Data collection for this study used a protocol based on Dillman's Total Design Method, and included a 42 question anonymous survey. Coding and a thematic analysis were used for each open-ended question. The primary themes that emerged were positive impact on student achievement, improved teaching, and more effective evaluations and assessments. Petty et al. (2016) found that the most frequent response on the survey was improved teaching. Additionally, teachers' mentioned that the NBC's reflection process had a positive

influence on their current instructional practices. In contrast to the findings of Wiseman and Al-bakr (2013) and Chu et al. (2015), the authors found that teachers' felt that the NBC process on student learning had a positive impact on student achievement within their classrooms, and influenced the effective use of evaluations and assessment strategies in the classroom. Petty et al. (2016) concluded that certification did positively affect student achievement.

Likewise, Cakir and Bichelmeyer (2016) also examined teacher characteristics on student achievement using students in a blended learning environment with standards-based curriculum. The authors tried to better understand the effects of teacher experience, degree, and teaching field and student achievement. Data for this study were collected using an instructor survey and student scores achieved on the final course examination. A general linear model was used for data analysis, and each instructor was matched to his or her students. Similar to the findings of Kalogrides et al. (2013), Cakir and Bichelmeyer (2016) found that teachers with four to six years of teaching experience had higher achieving students, and teachers with 10 years or more of experience had the lowest student achievement. However, in contrast to the Kalogrides et al. (2013) findings, Cakir and Bichelmeyer (2016) found that teachers with 10-15 years of professional experience and teachers who taught three times per course had students with the highest achievement scores. Additionally, like the findings of Wiseman and Al-bakr (2013) and Chu et al. (2015), Cakir and Bichelmeyer (2016) concluded that educational credentials and advanced degrees had no effect on student achievement. Furthermore, the teaching focus of instructors and the studied professional characteristics of teachers did not have a significant effect on student achievement. The authors found no linear

relationship between teacher characteristics and student achievement (Cakir &

Bichelmeyer, 2016).

Boonen, Van Damme, and Onghena (2014) performed a quantitative study to

examine teacher attitudes, beliefs, and instructional practices. Data for this study were

collected as part of the SiBO Project. Data were collected using a teacher questionnaire,

and were analyzed using a multilevel regressions analysis. The authors found that

classroom composition had a significant effect on student achievement, and a measure of

classroom heterogeneity found that students in more heterogeneous classes performed

better in reading, language, and spelling. Teacher background qualifications were not

found to be significantly associated with reading and spelling achievement, but were

found to be significant in math. The teacher attitudes and beliefs model found that job

satisfaction was the only variable significantly associated with math achievement. The

other variables had no significance to math, reading, or spelling. Boonen et al. (2014)

found that teachers' background had a significant effect on student achievement in math,

but not in reading, and instructional practices were found not to be the most significant

variable regarding student math achievement.

Likewise, Klug, Bruder, and Schmitz (2014) conducted a quantitative study to

examine teachers' years of experience and their ability to diagnose students' learning

behavior.   The authors found that teacher motivation was the best predictor of pre-action

and post-action diagnostic competence, which meant teachers with a higher level of

motivation were better than unmotivated teachers at diagnosing students' learning

behaviors. Similarly, Feng and Li (2016) conducted a quantitative study using a student

fixed-effects model to estimate the effects of more experienced head teachers and peers

on student achievement in China. Regression analyses were used to examine the effects of teacher gender, credentials, and experience on student achievement. Klug et al. (2014) concluded that teachers with more experience and motivation are better at diagnosing students' learning behaviors than are students in education programs and teachers early in their careers; and Feng and Li (2016) had similar findings concluding that while students are significantly and positively influenced by the mean achievements of their peers, this negative peer effect could be overridden in courses with a more experienced head teacher instead of a regular teacher.

Further examining the relationship between teacher experience and student achievement, Subedi, Reese, and Powell (2015) conducted a quantitative study to determine if Grade Point Average (GPA), truancy, teacher education level, and years of experience are predictors of teacher effectiveness. Student and teacher level data were collected from the School District of Palm Beach County (SDPBC) database, and a two-level hierarchical linear model was used for analysis. The authors found a significant relationship between motivation and student learning, which means that student achievement can be increased by teachers who constantly care for students through activities, goal setting, and genuine motivation. Additionally, parent-teacher communication was identified as playing an important role in student achievement, and schools can boost effectiveness by extending English Language Learner services after school. Subedi et al. (2015) concluded that truancy had a significant negative effect on ACT and SAT preparation. Similar to the findings of Klug et al. (2014) and Feng and Li (2016), Subedi et al. (2015) concluded that teacher experience had a positive and significant effect on student learning. Additionally, teachers with advanced degrees were

also successful at increasing student GPA and reducing truancy. The authors determined

that teacher effectiveness does play a role in increasing GPA and decreasing absences

(Subedi et al., 2015).

Musau and Abere (2015) conducted a quantitative study to examine the effects of

teacher qualification on student achievement in science, mathematics, and technology.

Data were collected using questionnaires that contained both closed and open-ended

questions. Data were analyzed using frequencies, percentages, and mean scores.

Correlation and regression analyses were used, and ANOVA was used to identify the

variance found in student achievement. The authors found that students in classrooms

with teachers holding a post-graduate degree scored significantly higher than students

taught by untrained graduates, and students taught by trained graduates performed much

better than students who were taught by untrained graduates. Likewise, Meissel, Parr,

and Timperley (2016) further examined teacher education and student achievement by

performing a quantitative study to identify relationships between teacher professional

development and student achievement. This study used a two-year Literacy Professional

Development project to examine the effects of professional development on reading and

writing in New Zealand. Student achievement data were tracked using an asTTle version

4 program, and included student item response theory assessments to monitor progress.

Observations were also used to collect data, and multi-level linear regression analysis

was used to track the progress and student achievement within each school. Meissel et al.

(2016) found that substantial progress was made in schools after the professional

development project was implemented based on pre-study baseline data.

Meissel et al. (2016) concluded that teacher professional development did have a positive effect on student achievement in reading and writing. Furthermore, student performance continued to rise even after the first year of program implementation. Additionally, student performance progress continued to grow considerably in subsequent years after the initial implementation of the professional development program. These findings are in contrast to the findings of Musau and Abere (2015) who found that a very weak negative correlation existed between teacher qualification, experience and student achievement. Furthermore, teachers with training in subjects that they taught produced higher achieving students, concluding that teacher training influenced student achievement more than teacher qualification and experience.

In a similar study, Fung et al. (2016) conducted a quantitative study to examine the relationships between teacher background, subject knowledge, pedagogic efficacy, and student achievement in mathematics. Data for this study were collected using a one-time survey to identify students' mathematics achievement scores and gather information regarding teacher characteristics. Additionally, student data were collected from a government-designed mathematics assessment. Data were analyzed using a stepwise regression and Classification and Regression Tree (CART). Stepwise regression was used to identify which independent variables affected the dependent variable, and CART was used to further explain the effects of teachers' background on student performance.

Fung et al. (2016) also used confirmatory factor and initial descriptive analysis and found that only subject knowledge was positively related to performance competence. Additionally, no significant relationships were found between teachers' subject knowledge, performance competence and student performance. Similar to the

findings of Klug et al. (2014) and Feng and Li (2016), Fung et al. (2016) found that teachers' years of experience was positively correlated to higher student performance; however, the data also found that younger teachers had a more positive affect on student achievement. The authors concluded that teachers' background and subject knowledge, performance competence, and pedagogic efficacy were not strongly related; however, teachers' with a high level of pedagogic efficacy were found to have higher achieving students, and teacher experience only had a low-to-moderate effect on student achievement (Fung et al., (2016).

Further examining the effect of teacher characteristics on student achievement, Sirait (2016) conducted a quantitative study to examine the relationship between teacher evaluation scores and student performance. Data were collected using junior and senior high school national exam averages. Teacher evaluation score data were collected through teacher competency tests, which evaluate the teacher in both professional and pedagogic competency. Data were analyzed using regression analysis.

Sirait (2016) found that teacher evaluation scores were statistically and significantly related to student achievement in mathematics, Chemistry, Biology, and English language. The author further examined the data to identify additional factors that are related to student achievement. Teacher experience and family time spent on education were only found to be significant for Biology and English, and government spending was only significantly related to student achievement in mathematics. Additionally, access to electricity was found to be significantly related to student achievement in all subject areas, and unemployment and poverty had no significant correlation to student achievement in any subject. Sirait (2016) concluded that teacher

evaluation scores were statistically, positively, and significantly related to student achievement; however, there are a number of outside factors that can influence student achievement as well.

Teacher Turnover and the Effects on Student Achievement

Ronfeldt, Loeb, and Wyckoff (2012) conducted a correlational study to investigate the harmful effects of teacher turnover in New York City. After data examination, the authors found that approximately one out of every 10 fourth and fifth-grade teachers left or came to a specific grade level each year. To gain a more precise estimate regarding the effects of teacher turnover, Ronfeldt et al. (2012) examined school-by-grade-by-year level, rather than school or school-by-year level. Regression analyses were used, and Ronfeldt et al. (2012) concluded that student achievement in both English Language Arts (ELA) and math was worse in schools during years when teacher turnover rates were higher, and less in years when teacher turnover rates were lower. A school-by-year fixed effects model was used to examine the effects of teacher turnover and student achievement, and the authors found consistent negative and statistically significant effects, concluding that teacher turnover does harm student achievement. Likewise, Donitsa-Schmidt and Zuzovsky (2016) conducted a quantitative study to examine the quantitative and qualitative effect of teacher turnover and teacher shortage in Israel. Data were collected using an online questionnaire that was sent to all primary and secondary principals. The authors found that principals' viewed teacher shortage as severely affecting student achievement.

Through both quantitative and qualitative methods, Ronfeldt et al. (2012) and Donitsa-Schmidt and Zuzovsky (2016) determined that teacher turnover had a negative

effect on student achievement. Furthermore, Ronfeldt et al. (2012) concluded that student achievement was effected by teacher turnover because teacher quality and effectiveness changed as teachers left and less effective teachers were hired to replace them. Additionally, Donitsa-Schmidt and Zuzovsky (2016) concluded that the lack of quantity and quality of teachers placed a massive strain on schools, current teachers, and students. The authors found that less effective and unqualified teachers were often used to replace leaving teachers, which ultimately affected student performance (Donitsa-Schmidt & Zuzovsky 2016; Ronfeldt et al., 2012).

Kraft (2013) conducted a quantitative study to examine teacher quality and turnover on student achievement. Data were collected using a dataset of all K-12 teachers employed in the Charlotte-Mecklenburg schools. Data analysis was conducted to estimate the effects by isolating the average grade-level achievement and the number of teachers that were laid off from the same school in the previous year. Kraft (2013) found that teachers who were laid off had equal seniority and experience, but were rated as "less effective" by principals. Similarly, Papay, Kraft, Bloom, Buckley, and Liebowitz (2013) conducted a quantitative study to examine the effects of late teacher hiring, as a result of teacher turnover, on student achievement. A comprehensive administrative dataset was used for this study, and the sample included two different sets of teachers. Student achievement was examined using students' previous year's test scores in both reading and mathematics. A discrete time survival analysis was used to estimate the "risk" of being a new hire. Papay et al. (2013) found that late hire teachers were typically male African-Americans, tended to work in various types of school, were lower-performing than teachers hired at the beginning, and tended to cluster in certain schools.

Both Kraft (2013) and Papay et al. (2013) found that teachers hired after the start of the school year were less effective in the classroom. Additionally, the authors concluded that teachers hired after the beginning of the school year, and teachers who did not hold appropriate licenses, were the first to be laid off (Kraft, 2013); and students in classrooms with late-hired teachers did not perform as well as students in classrooms with summer hired teachers (Papy et al., 2013). Kraft (2013) determined that the turnover of "highly effective" teachers, as rated by principals, had a negative effect on student achievement; however, Papay et al. (2013) found that this negative effect only happens in the first year and was not statistically significant. Kraft (2013) and Papay (2013) concluded that teacher turnover had a negative effect on student achievement; however, this effect can be mitigated if lower-performing teachers are laid off first and if teachers are hired over the summer rather than after the school year begins.

Similarly, Ost and Schiman (2015) conducted a quantitative study to examine the effects of grade specific experience and grade reassignments on teacher turnover. Data were collected from the North Carolina Education Research Data Center and was used to identify both voluntary and involuntary separations from schools. Descriptive statistics analysis was used to identify teachers with the highest turnover based on teaching experience and grade-specific experience. The authors found that teachers with less experience were more likely to have higher turnover rates, and teachers with higher achieving students were less likely to change grade levels. Data analysis found that teachers with no years of grade-specific teaching experience had nominally higher turnover rates than novice teachers. Additionally, teachers with one year of grade-specific experience were less likely to leave or move grade levels, and teachers with

additional years of grade-specific experience continued to have a statistically less probability of turnover. The authors also found that teachers who were switched between grade levels were significantly more likely to leave as compared to other teachers. Ost and Schiman (2015) concluded that a strong relationship existed between grade level reassignments and teacher turnover, and schools with teachers that have greater grade-specific experience were less likely to have high teacher turnover.

As Ost and Schiman (2015) identified, teachers who were involuntary moved between grade levels were more likely to leave the school. Similarly, McInerney, Ganotice, King, Marsh, and Morin (2015) conducted a quantitative study to further examine the relationship between teachers' commitment to their profession and school and their turnover intentions. An adapted version of The Affective, Continuance, and Normative Organization and Occupation Commitment Scales was used to identify teachers' commitment to their profession and organization. Additionally, teachers were also given an Intention to Quit self-report questionnaire. Hierarchical multiple regressions analyses were used to examine the relationships between affective, normative, and continuance commitment to profession and organization, and to examine these relationships to turnover intentions. McInerney et al. (2015) found that affective commitment to the organization was the strongest negative predictor of teacher turnover, followed by normative commitment to the organization. Additionally, affective commitment to teaching was also a negative predictor of turnover intentions, and continuance commitment to both teaching and the organization were not predictors of turnover intentions. The authors concluded that teachers' who demonstrated both

commitment to their organization and commitment to teaching were less likely to have turnover intentions (McInerney et al., 2015).

Blazar (2015) used a quantitative study to examine the relationship between teachers remaining in the same grade level and teacher turnover. Data for this study were collected from administrative records from a large urban school district in California. Teacher information was collected from human resources, and student test scores were matched using course files. Regression analysis was used to examine teachers in their second year of teaching and beyond. Current-year test scores and years of experience were also added to the analysis to examine the teachers' ability to increase student achievement over time. Blazar (2015) found that elementary teachers have high rates of switching grade levels. Likewise, Hanushek, Rivkin, and Schiman (2016) performed a quantitative study to examine the relationship between teachers moving to a different school in the same district, teachers moving to a school in a different district, and teachers exiting Texas public schools and the quality of classroom instruction. Data for this study were collected from the Texas Education Agency, which permitted student data to be linked to classroom teachers. Student achievement data were collected using scores earned on the Texas Assessment of Academic Skills (TAAS). Regression analysis and a baseline were used to identify the difference in effectiveness between teachers leaving and teachers staying.

Hanushek et al. (2016) found that teachers leaving one school to teach at another were less effective than the teachers who stayed, and teachers who exited the Texas public schools were significantly less effective than teachers who stayed. Blazar (2015) found that turnover by teachers switching between grade levels was high during their

second and fourth year of teaching, teachers in lower-achieving schools switched grade levels at a much higher rate than teachers in higher-achieving schools, and teachers working in low-minority schools switched less often than teachers in high-minority schools. Additionally, Hanushek et al. (2015) found that teacher turnover also generated a loss of general and grade-specific experience, which are areas that are essential to offset potential losses from teachers leaving the schools. The authors concluded that teacher turnover between grade levels and schools both in and out of districts had significant negative effects on student achievement (Blazar, 2015; Hanushek et al., 2015). Additionally, Hanushek (2015) found that higher-achieving schools showed little negative effect from teacher turnover, but this was not the case in lower-achieving schools who typically lost their more effective teachers to turnover.

Winters, Dixon, and Greene (2011) conducted a quantitative study to examine the impact of teacher characteristics on student math and reading proficiency and attrition. Teacher data were collected from the Florida Department of Education, and student math and reading achievement scores were collected using the Florida Comprehensive Assessment Test (FCAT). Course credit information regarding courses that teachers have completed was collected and categorized based on a direct representation of direct educational training. Descriptive statistics were analyzed, and Winters et al. (2011) concluded that teacher attrition rates were higher with teachers where their students had higher entering proficiency levels in math and reading. The percentage of teachers with prior black or Hispanic students, and teachers with advanced degrees or specific certifications, also had higher attrition rates. The authors also found that teachers who have completed a higher number of math and reading courses outside of college were

more likely to stay in the classroom, and through further analysis found no relationship between teachers' with advanced degrees and more years of experience and student proficiency in math. More specifically, Winters et al. (2011) found that teachers certified to teach English as a second language, and teachers with seven or more years of experience, had a negative influence on student achievement.

Likewise, DeAngelis (2012) conducted a quantitative study to examine teacher turnover and the characteristics of teachers who chose to return to teaching. Data were collected from Teacher Service Record files, the Teacher Certification Information System, teachers' ACT scores provided by ACT, Inc., the National Center for Education Statistics' Common Core of Data, and the Illinois School Report Card. The focus of this study was on full-time novice teachers who had no prior teaching experience. DeAngelis (2012) used discrete-time hazard models to examine the probability of leavers returning to teaching, cluster-adjusted standard errors to identify serial correlations within individuals, traditional multinomial logistic models to examine the school or district that teachers would return to, and descriptive statistics to compare returning teacher characteristics to student characteristics.

DeAngelis (2012) found that the probability of a teacher returning was highest following the teachers' first year out of classroom and that this probability quickly declined after that. Gender did not play a role in the probability of teachers' returning, as the probability for returning females was only slightly higher than males. Personal characteristics were significantly associated to a teacher's return, and did vary by gender. African-Americans and Latinos of both genders, females older than 30, and males over 40 showed the greatest odds of returning to the classroom. The author found that

teachers with two to five years of experience were less likely to return to the classroom as compared to teachers with only one year of experience. Additionally, provisional certification teachers were less likely to return to the profession when compared to teachers with a standard certification, and teachers with high ACT scores were significantly less likely to return than teachers with mid-range ACT scores. Teacher salary was the only job-based characteristic associated with returning teachers. DeAngelis (2012) concluded that teachers' race, age, years of experience, degree level, certification, and subject taught were all associated with the probability of teachers returning to the classroom. Furthermore, high ACT composite scores by women were associated with teachers leaving the profession, and higher teaching salaries were associated with higher probabilities of teachers returning.

Jones (2013) conducted a quantitative study to examine the relationship between teacher pay performance incentives and teacher performance, attrition rate, and effectiveness. Data for this project were collected using the restricted use version of the Schools and Staffing Survey (SASS). Data were analyzed using Ordinary Least Squares (OLS) regression analysis. Jones (2013) found that the number of hours worked by female teachers under a performance pay system dropped significantly, and the number of hours worked by male teachers declined a little but this decline was not significant. Further examining the relationship between teacher remuneration and student performance, Hendricks (2013) conducted a quantitative study to identify relationships between teacher pay and teacher turnover. Data were collected from an administrative data set from the Texas Education Agency (TEA), and included teacher data covering experience, degree, full-time equivalence, base pay, district membership, and subject

taught. The author found that turnover rates were higher in teachers with less experience, and this rate declined until 18 years of experience when rates began to increase again. Regression analysis was used to identify that teacher turnover rates decreased in districts where pay was increased for one experience group relative to another. This contradicts the findings of Jones (2013), who found that teachers with four or more years of experience had a negative response to performance pay, which resulted in less hours being worked each week.

Jones (2013) determined that performance pay had a positive effect on teacher cooperation; however, female teachers and more experienced teachers were less likely to participate in these cooperative activities. Additionally, Hendricks (2013) found that teachers under a performance pay system increased their pursuit of professional development opportunities, and were significantly more likely to take on additional jobs outside of their teaching responsibilities. Furthermore, Jones (2013) determined that teachers under a performance pay system were more likely to leave the school, and teachers who graduated from selective universities responded better to a performance pay system than did teachers from other universities. Jones (2013) concluded that teachers felt less enthusiastic for the profession under a performance pay system, which further added to the negative effect of the system on teacher effectiveness and the relationship to student achievement. Hendricks (2013) found that increasing pay based on experience and subject would not reduce teacher turnover rates, and that teacher pay increases for less experienced teachers would be more cost effective in reducing turnover. In contrast to Jones (2013), Hendricks (2013) found that teacher experience improved significantly within the first four years of teaching and then leveled off after that, so increasing teacher

base pay, and reducing teacher turnover, would likely lead to an improvement in student performance.

Steele, Pepper, Springer, and Lockwood (2015) conducted a quantitative study to examine the distribution and mobility of effective teachers in a large urban school district. Student achievement data were collected using state standardized assessment scores, and teacher characteristics were collected using administrative data. Teacher value-added estimates for each teacher were generated using a multivariate ANCOVA method. School-level characteristics were also examined as part of the analysis and included percentages of students who were black or Hispanic, English Language Learners, and students who received special education accommodations. Minority quartiles were used to examine teacher sorting and mobility, and the distribution of teachers based on identified characteristics and their relationship to minority schools was examined. A multilevel logistic regression model was used to estimate the probability of a teacher leaving their current school at the end of the school year. Additionally, multilevel random effects logistic regression models were used to identify the probability of a teacher moving to a different school within the district verse leaving the grade level in the district. Steele et al. (2015) found that the number of novice teachers with three years or less of experience was largest in high minority schools, and teachers with advanced degrees were less likely to be employed in this school setting.

Likewise, Ozoglu (2015) conducted a mixed methods study using both quantitative and qualitative data to examine mobility-related teacher turnover and distribution inequality of experienced teachers and student performance. Quantitative data were collected from a centralized employment system, and qualitative data were

collected using a semi-structured in-depth interview of school principals. Descriptive and correlations analyses were used to examine the quantitative data. Ozoglu (2015) identified a strong negative correlation between teacher turnover and student achievement. Areas with higher teacher turnover had lower student achievement scores on both high school and university entrance exams.

Steele et al. (2015) and Ozoglu (2015) concluded that teacher turnover had a negative effect on student achievement. Furthermore, Ozoglu (2015) determined that vacancies, as a result of teacher turnover, were not quickly filled leaving students assigned to a teacher without subject knowledge and experience. Additionally, Steele et al. (2015) found that advanced degrees were identified as being non-significant in terms of student achievement. Steel et al. (2015) and Ozoglu (2015) concluded that there was a significant difference in teacher qualifications among low and high minority schools, with higher qualified teachers working in the lowest minority schools. Furthermore, teacher turnover created instability in the school, which created a breakdown in trust and relationships among students, teachers, and families (Ozoglu, 2015). The authors determined that teacher turnover had both direct and indirect negative effects on student achievement (Ozoglu 2015; Steele et al., 2015).

Further examining the effects of teacher turnover on student achievement, Arnold (2015) conducted a quantitative study to identify the relationships between teacher turnover and test results. Data for this study were collected from three school sources and included the school's examinations monitor, the student evaluation system, and the school's study guide. A panel regression model was used for data analysis, and found that teacher turnover did have an effect on student test results. Additionally, the author

determined that absolute changes of students' perceptions regarding the validity of the exam changed the exam results significantly, and instructor evaluations were found to not be significantly related to student test results. Arnold (2015) concluded that students' perceptions regarding the exam had the strongest relationship to test results, and that teacher turnover was a source of variation in test results. Test difficulty was also found to be significantly related to variations in pass rates and scores.

Hultell, Melin, and Gustavsson (2013) conducted a quantitative study to examine teacher turnover and the development of teacher burnout. Data were collected from a nationwide longitudinal study that used questionnaires to collect information about teachers' health. Teacher burnout was measured using the Scale of Work Engagement and Burnout (SWEBO), and data were analyzed using univariate repeated-measures analysis of variance (rANOVA). Test-retest correlations were used to examine stability, and a cluster analysis was performed to identify and classify teachers with similar developmental paths.

Hultell et al. (2013) found that teacher burnout increased over the three years that data were examined. Seven clusters of teacher data were used in this study and each resulted in variances in teacher burnout. Two of the clusters with teachers that had low levels of burnout at the beginning of the study reported increases in burnout and turnover intentions towards the end. Additionally, two different clusters with teachers reporting high levels of burnout at the beginning found decreases towards the end of the study, but then burnout increased again along with turnover intentions. The other clusters in the study reported low burnout at the beginning with only small changes during the study. The authors determined that while burnout increased significantly over time, this increase

was small in magnitude. Hultell et al. (2013) concluded that teachers who are not confident within their job are more likely to develop burnout, and teacher burnout was positively related to teacher turnover intentions.

Summary

The literature regarding the relationship between high quality teacher characteristics and student achievement is mixed. Markson (2015) and Taut et al. (2016) determined that highly effective or high quality teachers produced higher achieving students; however, Bonney et al. (2015) concluded that no significant relationship exists between teacher quality and student achievement. Additionally, Goldhaber (2015) found an unequal distribution of quality teachers between low-SES and high-SES schools, but stated that this depends on the definition of a high quality teacher. The findings of Markson (2015), Taut et al. (2016), Bonney et al. (2015), and Goldhaber (2015) create additional questions in the literature regarding the characteristics of high quality teachers, and throughout the literature teacher education level and experience are two characteristics that are repeatedly identified (Akello, 2015; Fung et al., 2016; Musau & Abere, 2015). Teacher experience has been identified as having an effect on student achievement (Harris & Sass, 2010; Subedi et al. 2015). Cakir and Bichelmeyer (2016) found that teachers with four to six years of experience were more effective than teachers with 10 years of experience; however, experienced teachers were also found to be no more effective than less experienced teachers (Akello, 2015; Musau & Abere, 2015). Furthermore, Zakharov et al. (2016) determined that student achievement was negatively affected by teacher experience. Teacher education levels (i.e., bachelor's degree, master's degree, above master's degree) have also been identified as having positive,

negative, or no effect on student achievement (Akello, 2015; Fung et al., 2016; Masau &

Abere, 2015; Subedi et al., 2015). Hairrell et al. (2011), Enwelim (2016), and Subedi et

al. (2015) found that teacher education levels had a positive effect on student

achievement, and teachers holding an advanced degree had higher achieving students

than teachers who did not. In contrast, Akello (2015) and Musau and Abere (2015) found

that teacher experience and education level had no significant effect on student

achievement.

  Research examining teacher turnover has also produced conflicting findings

identifying teacher turnover as having an effect on student achievement (Kraft, 2013;

Ronfeldt et al., 2012). Blazar (2015), Hanushek et al. (2015), and Ost and Schiman

(2015) concluded that teacher turnover has a negative effect on student achievement;

however, Papay et al. (2013) found that this negative effect is not statistically significant

and only exists during the teacher's first year. Research continues to examine the

relationship between high quality teacher characteristics and student achievement

(Forman & Markson, 2015; Ronfeldt et al., 2013), but inconsistencies in these findings

continue to leave educational leaders uncertain as to which teacher characteristics are

most significant to student achievement (Akello, 2015; Cakir & Bichelmeyer, 2016;

Meroni et al., 2015).

Chapter 3: Research Method

The purpose of this quantitative correlational study was to determine whether relationships exist between U.S. public school fourth-grade teacher experience, education level, turnover, and student achievement. The problem was that PK12 teacher experience, education level, and turnover can have positive, negative, or no effect on student achievement, which is not seen under the current Education Productivity Theory (EPT) (Akello, 2015; Boonen, Van Damme, & Onghena, 2014; McCormick & O'Connor, 2015). This study was guided by a theoretical framework developed from EPT, which specifies that educational outcomes are a result of various variables active in the education process (Hanushek, 2008). Common inputs that have been analyzed within EPT include teacher experience, education level, gender, and race (Hanushek, 2008).

This study was guided by the following research question and aligned hypothesis:

RQ1. Are U.S. fourth-grade public school teacher experience, education level, and turnover predictors of public school fourth-grade student achievement on NAEP mathematics assessments?

H1$_0$. Fourth-grade teacher experience, education level, and turnover are not predictors of public school fourth-grade student achievement on NAEP mathematics assessments.

H1$_a$. Fourth-grade teacher experience, education level, and turnover are significant predictors of public school fourth-grade student achievement on NAEP mathematics assessments.

Research Methodology and Design

A quantitative design was used for this study because numeric values were necessary to identify if teacher experience, education level, and years at current school are predictors of fourth-grade student achievement scores earned on the NAEP mathematics assessment (Krathwohl, 2009). A quantitative method was most appropriate for this study because it allowed for examination of variables observed at a given time without manipulation, and because numeric archival data were collected to identify any relationships that exist between teacher experience, education level, and years at current school and student achievement (Field, 2013). A quantitative method was used instead of a qualitative method because the purpose of this study was to provide information regarding selected teacher characteristics on student achievement by determining whether relationships exist between the criterion variable and the three predictor variables (Creswell, 2015; Field, 2013). While a qualitative method could have been used to identify participant beliefs regarding the relationships between the study's variables, this method could not provide the statistical analysis required to remove subjectivity from the study which was completed using a quantitative method instead (Krathwohl, 2009).

A correlational design was used for this study as it allowed non-manipulated variables to be examined, and predictions to be made regarding the predictor variables effects on the criterion variable (Creswell, 2015; Field, 2013). A correlative design was justified for this study because it allowed for an analysis of relationships and predictive values among predictor criterion variables (Krathwohl, 2009), and a correlational approach allowed a determination to be made regarding relationships between the predictor and criterion variables to examine whether the predicator variables have

relationships with or predict the criterion variable. This quantitative correlational study was designed to examine the relationships between the criterion variable, fourth-grade student achievement scores earned on the NAEP mathematics assessment for all 50 states (NAEP, 2011), and three predictor variables: fourth-grade teacher (a) experience, (b) education level, and (c) years at current school as measured by the Schools and Staffing Survey (SASS) (NCES, 2014).

Population and Sample

The target population was the 209,000 fourth-grade students attending 8,500 public, charter, and private schools in all 50 states and Washington, D.C. who took the NAEP mathematics assessment during the 2011-2012 academic school year (NAEP, 2011). U.S. fourth-grade students were selected for this study because national level data were available; thereby expanding the geographic area of the study, which has been a key limitation in previous studies and findings (Akello, 2015; Ronfeldt et al., 2013). Fifty-one percent of the fourth-grade students who took the NAEP mathematics assessment were male, and 49 percent were female (NAEP, 2011). Forty-three percent were eligible for free lunch, five percent were eligible for reduced-price lunch, 46 percent were not eligible for free or reduced lunch, and six percent did not specify (NAEP, 2011). Additionally, the student population who took the NAEP mathematics assessment during the 2011-2012 academic school year was as follows: Caucasian 54%, African American 15%, Hispanic 22%, Asian/Pacific Islander 5%, American Indian/Alaska Native 1%, and two or more races 2% (NAEP, 2011). Approximately 197,100 fourth-grade students who took the NAEP mathematics assessment for all 50 states served as the sampling frame, with scores combined and reported as average scale scores for each state (NCES, 2014),

and focused on the fourth-grade students who took the NAEP mathematics assessment from all 50 states during the 2011-2012 academic school year (NCES, 2011).

According to NAEP (2011), sampling data for fourth-grade assessment scores are obtained using stratified random sampling within categories of schools with similar characteristics to ensure that all populations are represented within each participating state. A purposeful sampling was used because all 50 states had fourth-grade students enrolled in public schools and were administered the NAEP mathematics assessment. From the 209,000 fourth-grade students who took the NAEP mathematics assessment, approximately 197,100 were fourth-grade students attending public schools. The additional fourth-grade students attended charter and private schools, so this student data was not included in the state reported aggregated scores. A G*Power analysis for an *a priori* sample size for multiple linear regression (medium effect size = .15; power = .95; alpha = .05) indicated a minimum sample of 107 students was adequate for rigorous statistical analysis (Field, 2013).

Materials/Instrumentation

Data for this quantitative correlational study involved secondary analysis of previously collected archival data only, so no instrument was used in this study to collect new data. Therefore, no specific permissions were required. NCES has established an NAEP Validity Studies (NVS) Panel that is comprised of pilot tests, numerous developer reviews of assessment instruments, external groups, the National Assessment Governing Board, and state representatives that ensures the reliability and validity of all NAEP assessments (NCES, 2011). The archival data were previously collected using the National Assessment of Educational Progress (NAEP) mathematics assessment and the

Schools and Staffing Survey (SASS). The NAEP mathematics assessment is a

standardized achievement test that is administered to fourth-grade students in the United

States (NCES, 2011). This mathematics assessment is nationally administered every two

years to students in fourth-grade, and measures student achievement in the following

areas: number properties and operations, measurement, geometry, data analysis, statistics,

probability, and algebra as determined based on recommendations from policymakers,

educators, members of the general public, and the specific achievement levels set by the

Governing Board (NAEP, 2011). Regular content evaluations by subject-related NCES

standing committees, Governing Board staff, and external advisory groups are conducted

to review and evaluate the content validity of the NAEP assessments (NCES, 2016g).

The reliability of NAEP results are ensured through extensive quality control and

plausibility checks, which are conducted during each step of the analysis process; quality

control measures ensure that no errors or artifacts into the results exist, and plausibility

checks are designed to examine the results and determine face validity (NCES, 2016g).

Operational Definition of Variables

The criterion variable and three predictor variables for this study were

operationalized as follows.

National Assessment of Educational Progress (NAEP) student achievement

scores (criterion variable). The criterion variable for this study was fourth-grade

student achievement scores earned on the National Assessment of Educational Progress

(NAEP) mathematics assessment for all 50 states. (NAEP, 2011). This was a ratio-level

variable represented by the aggregate score range (0-500) based on scores earned by all

public school fourth-grade students from all 50 states who took the NAEP mathematics

assessment during the 2011-2012 academic school year. This variable was NCES

archival data from the NAEP mathematics assessment administered to students from randomly selected schools during the 2011-2012 academic school year (NAEP, 2011).

Teacher experience (predictor variable 1). Teacher experience was the first predictor variable for this study, based on the National Center for Education Statistics (NCES) definitions and measured by the Schools and Staffing Survey (SASS) for all K12 public school teachers. This predictor variable was represented on a nominal-level scale measured as public school fourth-grade teacher experience (zero to ten years; 10 to 20 years; and 21 or more years) (NCES, 2014). This variable was NCES archival data collected through the Schools and Staffing Survey (SASS) from the 2011-2012 academic school year (NCES, 2014).

Teacher education level (predictor variable 2). Teacher education level was the second predictor variable for this study, based on NCES definitions and measured by the SASS for all K12 public school teachers. This predictor variable was represented on a nominal-level scale measured as public school fourth-grade teacher education level (Bachelor's degree; Master's degree; and higher than Master's degree) (NCES, 2014). This variable was NCES archival data collected through the Schools and Staffing Survey (SASS) from the 2011-2012 academic school year (NCES, 2014).

Teacher total years at current school (predictor variable 3). Teacher total years at current school was the third predictor variable for this study, based on NCES definitions and measured by the SASS for all K12 public school teachers. This predictor variable was represented on a nominal-level scale measured as public school fourth-grade teacher total years at current school (zero to four years; five to nine years; and 10 or more years) (NCES, 2014). This variable was NCES archival data collected through the

Schools and Staffing Survey (SASS) from the 2011-2012 academic school year (NCES, 2014).

Study Procedures

This study received approval from Northcentral University's Institutional Review Board (IRB) prior to any part of this study being conducted. Data required for this study involved the collection of archival data only with no human subjects, so an exempt IRB approval was attained and no informed consent or parental consent for disclosure of student scores was required. Instead, student scores were reported as average scale scores for all 50 states. Archival data that were publicly available were accessed using the results of the SASS located on the NCES website for the 2011-2012 academic school year (see Appendix A). Archival data for the fourth-grade NAEP mathematics assessments were also publicly available and were located on the NCES website for the 2011-2012 academic school year (NCES, 2011). The NAEP does publish reports that are publicly available; however, the NAEP does not publish student names or other personally identifiable information in these reports. Names of all participating students do not leave the schools where the NAEP was administered, and a code of ethics is read and signed by all parties involved (NAEP, 2011). Additionally, in accordance with the General Provisions of the General Education Provisions Act (GEPA) and the Carl D. Perkins Vocational Education Act, the NCES must protect the confidentiality of all individual respondents to the SASS (NCES, 2016e). Record matching or deductive disclosure by any user is prohibited by law.

Data Collection and Analysis

Publicly available de-identified archival data of fourth-grade NAEP average scale scores for the 2011-2012 academic school year were collected and downloaded in Microsoft Excel format from the NCES website (NCES, 2011). These data were recorded as part of the 2011-2012 fourth-grade NAEP mathematics assessment administration for the U.S., and included a nationally representative sample of 209,000 fourth-grade students who took the fourth-grade NAEP mathematics assessment, and average scale scores for all 50 states were recorded for the 2011-2012 academic school year (NCES, 2011). No student names, personal identifiers, or coded data were contained in the document, as NAEP scores are not reported as individual or school scores but as state aggregated scores (NCES, 2011). Under the NAEP Authorization Act, the NAEP commissioner is charged with ensuring that no test questions ask test-takers about personal or family beliefs and that no personally identifiable student information is made public (NCES, 2016g). Additionally, the names of student participants are not allowed to leave the schools after administration, and because the possibility to identify participating schools from the data does exist, researchers must promise to keep all identities confidential or risk penalty of fines and jail time (NCES, 2016g).

Data assumptions for regression were assessed prior to hypothesis testing and included independence of errors, linearity, normality, and homoscedasticity (Field, 2013). Independence of errors were tested using Durbin-Watson for an acceptable range of 0-4 (Field, 2013). Linearity and normality of the criterion variable were examined and confirmed through a visual inspection of histograms, and a Q-Q plot was used to confirm homoscedasticity (Field, 2013). The criterion variable met the assumptions for multiple

regression analysis, so hypothesis testing was pursued and a multiple linear regression analysis was conducted to identify the relationship between each predictor variable and the criterion variable. This helped determine the teacher characteristic or characteristics that most significantly affected student achievement scores earned on fourth-grade NAEP mathematics assessments.

Data were tested and analyzed using SPSS software to identify whether the three predictor variables (teacher experience, education level, and years at current school) predicted the criterion variable (student achievement scores) (Creswell, 2015; Field, 2013). The nominal-level variables (teacher experience, education level, and years at current school) were converted to SPSS dummy variables to allow for multiple regression analysis (Field, 2013; Salkind, 2011).

Assumptions

The first assumption for this study was that the archival data records were accurately and appropriately collected, calculated, and stored to determine average scale scores for each state. Additionally, it was assumed that teachers accurately reported their years of experience, education level, and years at current school on the Schools and Staffing Survey (SASS). Clearly defined categories that included full-time and part-time teaching were used on the SASS, which allowed teachers to more accurately identify their years of experience, education level, and years at current school (NCES, 2014). It was also assumed that students were equally prepared for the assessment, and that their performance on this single assessment was a direct reflection of their skills and abilities.

Limitations

A limitation of this study was that students from each of the 50 states may have received a different amount of mathematics instruction, as well as a difference in standards and curriculum. These differences may have resulted in students from one state having a better mathematics foundation to assist with success on the fourth-grade NAEP mathematics assessment. Additionally, only average scale scores for each state were available for representation of student achievement, which prevented individual student scores from being examined. Finally, some states did not have fourth-grade public school teachers in every selected and available category (teacher experience, education level, and years at current school).

Delimitations

This study was delimited to data from one grade level, and included data from all 50 states. Additionally, the study was delimited to a single instrument for student average scale scores, the fourth-grade NAEP mathematics assessment, and one instrument for collected and archived teacher data, the SASS. The examined variables for this study were delimited to teacher experience, education level, years at current school, and student achievement scores.

Ethical Assurances

Data from the research site was publicly available data that may be accessed and analyzed for research. This study received approval from Northcentral University's IRB before any part of this study was conducted. Data required for this study involved the collection of archival data only with no human subjects, so an exempt IRB approval was attained. Individual student and school level scores were not reported in the data, but

instead were reported as state aggregated scores for all 50 states, so no informed consent or parental consent for disclosure of student scores was required.

Since no human subject participation was required for this study, no participants were contacted or exposed to any risks. According to the NAEP website, the NCES requires a code of ethics to be read and signed by all parties involved in the administration of the NAEP mathematics assessment, and the names of all participating students do not leave the schools where the exam was administered (NAEP, 2011). Following data collection, the NAEP does publish reports that are available to the public; however, the NAEP withholds students' names and other personally identifiable information from these reports (NAEP, 2011).

The NCES follows a similar protocol with the SASS data that is collected. In accordance with the General Provisions of the General Education Provisions Act (GEPA) and the Carl D. Perkins Vocational Education Act, the NCES must protect the confidentiality of individual respondents (NCES, 2016e). Record matching or deductive disclosure by any user is also prohibited by law. Data from both websites are public knowledge, and all personally identifiable information is safeguarded. This ensures privacy and confidentiality for all students.

Summary

The problem was that PK12 teacher experience, education level, and turnover can have both positive and negative effects on student achievement (Akello, 2015; Boonen, Van Damme, & Onghena, 2014; McCormick & O'Connor, 2015). The purpose of this quantitative correlational study was to determine whether relationships exist between U.S. public school fourth-grade teacher experience, education level, turnover, and student

achievement on fourth-grade NAEP mathematics assessments during the 2011-2012 academic school year. This study sought to determine the significance of each of the three predictor variables (teacher experience, teacher education level, and teacher years at current school) on the criterion variable (fourth-grade NAEP student achievement scores). Additionally, this study attempted to identify if teacher experience, education level, and turnover are predictors of the 2011-2012 fourth-grade NAEP mathematics student achievement scores.

A quantitative correlational design was used to study the relationships between the criterion variable (student achievement scores) and the three predictor variables (teacher experience, education level, and years at current school) as is required when trying to identify the relationship significance between several factors, and the predictive values between the criterion variable and the predictor variables (Field, 2013; Salkind, 2011). Archival data without student identifying information was entered into SPSS software to perform a multiple linear regression analysis (Field, 2013; Salkind, 2011). Data were collected from archival data located on the NCES website, and included a sampling frame of all 50 states. Average scale scores were publicly available for all 50 states and did not include any student identifying information because the NAEP does not report individual or state scores (NCES, 2011). One assumption for this study was that the archival data found on the NCES website was accurate and a representative of U.S. fourth-grade students' mathematics abilities. A limitation of this study was that fourth-grade public school teacher experience, education level, and turnover may affect fourth-grade NAEP student achievement scores differently across the U.S. because of differences in skill sets and teaching styles. This data were limited to one grade level and

one single assessment administration; however, geographically the data consisted of all

50 states. This study attempted to further identify the role that teacher experience,

education level, and turnover have on PK12 public school student achievement, and to

provide insight to educational leaders regarding which teacher characteristic or

characteristics most significantly affect student achievement.

Chapter 4: Findings

The purpose of this quantitative correlational study was to determine whether relationships exist between U.S. public school fourth-grade teacher experience, education level, turnover, and student achievement. A quantitative correlational design was used for this study to identify if three predictor variables (teacher experience, education level, and years at current school) were predictors of fourth-grade student achievement scores earned on the NAEP mathematics assessment, and the sampling frame included approximately 197,100 fourth-grade students attending public schools in all 50 states who took the NAEP mathematics assessment during the 2011-2012 academic school year (NAEP, 2011). Data for this quantitative correlational study were collected using publicly available de-identified archival data of fourth-grade NAEP average scale scores for the 2011-2012 academic school year, and teacher experience, education level, and years at current school as reported on the 2011-2012 Schools and Staffing Survey (SASS). Complete data sets were only available for 46 of the 50 states, so the final sample of archival records used to represent teacher experience, education level, and years at current school and student achievement scores were 46 states representing a sample of approximately 182,400 students. This chapter discusses and provides an evaluation of the study findings.

Validity and Reliability of Data

Data were checked for compliance with statistical assumptions for parametric regression analysis and included linearity, independence of errors, normality, and homoscedasticity (Field, 2013). Independence of errors was tested using Durbin-Watson and met the assumption for regression (2.098) within the acceptable range of 0-4.

Linearity and normality of the continuous criterion variable was confirmed by visual

inspection of a histogram, and a Q-Q plot (see Appendix B) were used to confirm

homoscedasticity (Field, 2013). The predictor variables were categorical, so

multicollinearity was not assessed (Field, 2013). Therefore, the criterion variable met the

assumptions for multiple regression analysis and hypothesis testing was pursued.

Results

Study results were based on a purposeful sample of 46 archival records of fourth-

grade NAEP average scale scores for the 2011-2012 academic school year, and teacher

experience, education level, and years at current school as reported on the 2011-2012

Schools and Staffing Survey (SASS). A multiple linear regression analysis was

conducted to determine the extent to which each predictor variable contributed to the

criterion variable (Creswell, 2015; Field, 2013). The nominal-level variables teacher

experience, education level, and years at current school were recoded as dummy variables

in SPSS for multiple regression analysis (Field, 2013). The values for teacher experience

were dummy coded as 1 (0 to 10 years), 2 (11 to 20 years), and 3 (more than 21 years);

teacher education levels were dummy coded as 1 (Bachelor's degree), 2 (Master's

degree), and 3 (higher than Master's degree); and years at current school were dummy

coded as 1 (0 to 4 years), 2 (5 to 9) years, and 3 (more than 10 years). Demographics for

the final sample of archival student NAEP records was Caucasian 54%, African

American 15%, Hispanic 22%, Asian/Pacific Islander 5%, American Indian/Alaska

Native 1%, and two or more races 2% (NAEP, 2011).

Research Question 1/Hypothesis

The following research question and hypothesis guided this study:

RQ1. Are U.S. fourth-grade public school teacher experience, education level, and turnover predictors of public school fourth-grade student achievement on NAEP mathematics assessments?

H1$_0$. Fourth-grade teacher experience, education level, and turnover are not predictors of public school fourth-grade student achievement on NAEP mathematics assessments.

H1$_a$. Fourth-grade teacher experience, education level, and turnover are significant predictors of public school fourth-grade student achievement on NAEP mathematics assessments.

To examine research question 1, a multiple regression analysis was conducted and the findings indicated that one predictor variable, teacher experience, was a significant predictor of student NAEP mathematics achievement scores (see Table 1).

Table 1

Multiple Regression Analysis: Teacher Experience, Education Level, & Years at Current School as Predictors of NAEP Student Scale Scores

Variable	*B*	*S. E.*	B	*T*	*p*
Constant	234.385	3.364		69.673	.000
TeachExp	2.705	1.194	.331	2.266	.029*
TeachEdu	.676	1.561	.062	.433	.667
TeachYearsAtSchool	.890	.894	.147	.995	.325
R²	.156				
F	2.58				

*Note. N=46; *p* < .05.*

Therefore, results of the regression analysis indicated that teacher experience was an individual significant positive predictor of fourth-grade student NAEP mathematics assessment scores (*p* = .029) meaning that as teacher experience increased, so did student

NAEP mathematics achievement scores. Therefore, the null hypothesis was rejected and support existed for the alternative hypothesis.

Evaluation of Findings

In this study, it was hypothesized that teacher experience, education level, and turnover were predictors of fourth-grade NAEP mathematics assessment scores, and data analysis concluded that the predictor variable, teacher experience, did significantly influence the criterion variable (student achievement scores). Therefore, the null hypothesis that teacher experience, education level, and turnover were not predictors of student achievement was rejected.

Hypothesis 1. Teacher experience was found to be a positive significant predictor of student achievement scores earned on the fourth-grade NAEP mathematics assessment (p=.029). The finding of this study concluded that a higher educational input value of teacher years of experience produced greater educational output values or student achievement, and contributed to Walberg's Education Productivity Theory (EPT) (1984) by identifying that one of the nine "productivity factors" (teacher experience) contributed to student achievement. Additionally, the indications of this finding support previous research that the educational input, teacher years of experience, is a significant positive predictor of educational output or student achievement (Hanushek, 2008, 2016; Subotnik & Walberg, 2006). This finding contributed to the conclusion that an increase in educational inputs resulted in an increase in educational output, which aligns with the current EPT model and the findings of Hanushek (2016) that identified that educational inputs have a significant positive influence on educational outputs (Hanushek, 2008, 2016).

Furthermore, this finding was supported by current research on the relationships between teacher experience, education level, and turnover and student achievement (Enwelim, 2016; Goldhaber et al., 2015; Harris & Sass, 2010; Z. Ozel & S. Ozel, 2013; Subedi et al., 2015). Similarly, Harris and Sass (2010) found that teacher experience level had a significant positive effect on student achievement early in a teacher's career; however, the effect became marginal after 10 years and teachers with 15-24 years of experience were comparable to a first-year teacher. Likewise, Z. Ozel and S. Ozel (2013) and Goldhaber et al. (2015) found that teachers' experience was positively related to student achievement. Furthermore, Kalogrides et al. (2013) found that teacher experience was positively related to student achievement, and that teachers with two to seven years of experience had higher achieving students, and Enwelim (2016) and Subedi et al. (2015) found that teacher experience positively influenced student achievement.

In contrast, Akello (2015) examined the relationship between teacher qualifications, experience, remuneration, and age and student achievement and found no significant relationship between teacher qualification, experience and student achievement, which contradicted the current EPT model finding that an increase in educational inputs (teacher experience and education level) did not produce an increase in educational output (student achievement). The finding of this study does not align with the findings of Akello (2015), and instead supports the current EPT model that increases in educational inputs do produce an increase in educational output. Bonney et al. (2015) also found no significant relationships between teacher experience and student achievement, and Wiswall (2013) further concluded that more experienced teachers were not more effective. Additionally, Zhang and Campbell (2013) determined that teacher

experience had no effect on student achievement, and Winters et al. (2011) found that teachers with seven or more years of experience had a negative effect on student achievement.

Summary

The purpose of this quantitative correlational study was to determine whether teacher experience, education level, and turnover could predict student achievement scores earned on the fourth-grade NAEP mathematics assessment. Multiple regression analysis was conducted and hypothesis 1 results indicated that teacher experience was a positive significant predictor of student achievement scores ($p = .029$). Teacher education level and years at current school were not significant predictors of student achievement scores ($p < .05$). Consistent with numerous studies, the findings of this study concluded that teacher experience was a significant predictor of student achievement scores (Enwelim, 2016; Goldhaber et al., 2015; Harris & Sass, 2010; Z. Ozel & S. Ozel, 2013; Subedi et al., 2015). However, current research also contradicts the findings of this study concluding that teacher experience is not a predictor of student achievement scores (Akello, 2015; Bonney et al., 2015; Zhang & Campbell, 2013; Winters et al., 2011; Wiswall, 2013; Zhang & Campbell, 2013). Despite an abundance of research, findings continue to produce variances in determining whether teacher experience, education level, and turnover are predictors of student achievement scores. Further research must be conducted to make a better determination as to whether teacher experience, education level, and turnover are significant predictors of student achievement, and the level of influence that each has on student achievement scores.

Chapter 5: Implications, Recommendations, and Conclusions

The purpose of this quantitative correlational study was to determine whether relationships exist between U.S. public school fourth-grade teacher experience, education level, turnover, and student achievement. Researchers have produced conflicting findings where teacher experience, education level, and turnover have had both positive and negative effects on student achievement (Akello, 2015; Chu et al., 2015; Ronfeldt et al., 2013). The specific problem of focus was that critical teacher characteristics must be considered in the hiring and retention of high quality teachers for PK12 student achievement; however, past researchers continue to reach conflicting conclusions regarding the significance of each characteristic on student achievement (Akello, 2015; Chu et al., 2015).

Limitations related to the results of this study included that students from each of the 50 states may have received a different amount of mathematics instruction with differences in standards and curriculum, only average scale scores for each state were available for representation of fourth-grade NAEP student achievement scores, and some states did not have fourth-grade public school teachers in every selected and available category (teacher experience, education level, and years at current school). Permission to access the publicly available de-identified archival records, which were exempt from parental consent, was attained form the Northcentral University Institutional Review Board (IRB) as an exempt study because no human subjects were involved. The publicly available de-identified archival data will be secured and maintained for minimum of seven years and will then be destroyed appropriately. This chapter discusses the

implications of the study, recommendations for practice and future research, as well as study conclusions.

Implications

Today's educational leaders continue to face challenges when hiring and retaining high-quality teachers (Akello, 2015), and these leaders must identify what characteristics have the most significant effect on student achievement. Teacher experience, education level, and turnover have been identified as influencing student achievement (Cakır & Bichelmeyer, 2016; Meroni, Vera-Toscano, & Costa, 2015). Numerous studies have examined teacher characteristics to include years of experience, education level, instructional styles, credentials, and attitudes (Akello, 2015; Boonen, Van Damme, & Onghena, 2014; McCormick & O'Connor, 2015); however, these studies have been geographically limited and continue to produce conflicting results (Ronfeldt, Loeb, & Wyckoff, 2013). Additionally, researchers have been unable to identify which of these teacher characteristics most significantly affects student achievement (Akello, 2015; Cakır & Bichelmeyer, 2016; Musau & Abere, 2015). Educational leaders need to understand which teacher characteristics have the most significant effect on student achievement to hire and retain high-quality teachers within their schools (Harris & Sass, 2010). The results of this study provided support for the consideration of teacher experience as a significant predictor of student NAEP mathematics assessment scores as discussed in the following implications.

Hypothesis 1. The findings of hypothesis 1 determined that a teacher experience was a positive significant predictor of student NAEP mathematics assessment scores and teacher education level and turnover were not predictors of student achievement scores in

this sample ($p < .05$). The first implication of this finding was that when hiring and

retaining high-quality teachers for NAEP mathematics assessment scores, teacher

experience remains a significant predictor of student achievement as supported by

previous research (Khan & Kiefer, 2007; Wiswall, 2013). The second implication of this

finding was that higher educational input values, in regard to teacher years of experience,

produced greater educational output values or student achievement, which contributed to

Walberg's Education Productivity Theory (EPT) (1984) by identifying that one of the

nine "productivity factors" (teacher experience) contributed to student achievement. This

finding in the current study, contradicted the EPT findings of Akello (2015) that found

that an increase in educational inputs (teacher experience and education level) did not

produce an increase in educational output (student achievement), and supports the current

EPT model that increases in educational inputs do produce an increase in educational

output. Likewise, the indications of this finding support previous research that the

educational input, teacher years of experience, is a significant positive predictor of

educational output or student achievement (Hanushek, 2008, 2016). This finding

contributed to the conclusion that an increase in educational inputs resulted in an increase

in educational output, which aligns with the current EPT model and the findings of

Hanushek (2008, 2016) who has extensively examined the influence of educational inputs

on educational output as questioned by policymakers and the findings of the Coleman

Report (Hanushek, 2016).

Recommendations for Practice

The first recommendation for practice was for PK12 educational leaders to focus

on hiring and retaining experienced teachers to ensure student achievement. Hiring and

retention should focus on experience teachers, as identified by this study, which determined that teachers with more years of experience predicted higher student achievement scores. Additionally, PK12 leaders should focus on teachers with five years of experience, as these teachers have been found to be more effective than first year teachers and teachers with 10 or more years of experience (Akello, 2015; Boonen, Van Damme, & Onghena, 2014; Enwelim, 2016; Goldhaber et al., 2015). The second recommendation for practice was for PK12 educational leaders to hold trainings and professional development opportunities where the more experienced teachers are mentoring the less experienced teachers. This recommendation was further supported by the findings of Kalogrides et al. (2013) and Meissel et al. (2016) who found that teachers with professional development opportunities had a greater influence on student achievement and were more likely to remain at their current school.

Recommendations for Future Research

The first recommendation for future research was to replicate this quantitative correlational study within districts in all 50 states with similar demographic populations, using NAEP mathematics achievement scores (NAEP, 2011) to determine if the results of this study were skewed by the limitations identified in this study. Additionally, because teacher education level and turnover were not predictors of student NAEP mathematics achievement scores, a second recommendation for future research was to conduct a quantitative study using logistical regression to determine if teacher remuneration, age, strategies, styles, and methods are predictors of student NAEP mathematics assessment scores (Akello, 2015; Enwelim, 2016; Hendricks, 2013). Continued research is needed to further consider teacher experience as it was found to be a significant predictor of student

achievement in the current study; yet, other teacher characteristics may also be predictors of student achievement as well.

A third recommendation for future research was to conduct a quantitative quasi-experimental study in a pretest-posttest design. Differences between levels of teacher experience, education, and turnover could be examined to identify the influence that each level has on student mathematics achievement scores. This study should be based on the number of teachers found within each predefined variable level, which would further expound on the amount of influence that the number of years of experience, the degree level, and the number of years at each school has on student achievement. Additionally, this would further the findings of this study by examining raw numbers of teachers rather than distribution percentages of teachers in each category by state, and the prediction values of each category as determined by using the pretest-posttest design.

Conclusions

One significant finding of this study determined that teacher experience was found to be a significant positive predictor of fourth-grade student NAEP mathematics assessment scores ($p = .029$), and teacher education level and years at current school were found not to be significant predictors of fourth-grade student NAEP mathematics assessment scores ($p < .05$). The implications of teacher experience as a significant predictor of mathematics assessment scores was supported by previous research (Khan & Kiefer, 2007; Wiswall, 2013). Recommendations for practice noted (a) PK12 educational leaders should focus on hiring and retaining experienced teachers to ensure student achievement (Akello, 2015; Boonen, Van Damme, & Onghena, 2014; Enwelim, 2016; Goldhaber et al., 2015) and (b) PK12 educational leaders should hold trainings and

professional development where the more experienced teachers are mentoring the less experienced teachers (Kalogrides et al., 2013; Meissel et al., 2016). Recommendations for future research included (a) a quantitative correlational study with an expanded sample of school districts in all 50 states with similar demographic populations, (b) to conduct a quantitative study using logistical regression to determine if teacher remuneration, age, strategies, styles, and methods are predictors of student NAEP mathematics assessment scores, and (c) to conduct a quantitative quasi-experimental study in a pretest-posttest design to examine differences between levels of teacher experience, education, and turnover on student NAEP mathematics achievement scores.

References

Akello, A. J. (2015). Impact of teacher characteristics on student academic achievement in Kisumu Central Sub-County, Kenya. *Journal of Educational Policy and Entrepreneurial Research, 2*(8), 47-56.

Arnold, I. J. (2015). Changing the guard: Staff turnover as a source of variation in test results. *Studies in Educational Evaluation*, *47*12-18. doi:10.1016/j.stueduc.2015.05.002

Barrett, N., & Toma, E. F. (2013). Reward or punishment? Class size and teacher quality. *Economics of Education Review*, *35*41-52. doi:10.1016/j.econedurev.2013.03.001

Benbow, C. P., Arjmand, O., & Wahlberg, H. J. (1991). Educational productivity predictors among mathematically talented students. *Journal of Educational Research*, *84*(4), 215.

Blazar, D. (2015). Grade assignments and the teacher pipeline: A low-cost lever to improve student achievement? *Educational Researcher*, *44*(4), 213-227.

Bonney, E. A., Amoah, D. F., Micah, S. A., Ahiamenyo, C., & Lemaire, M. B. (2015). The relationship between the quality of teachers and pupils academic performance in the STMA Junior High Schools of the Western Region of Ghana. *Journal of Education and Practice*, *6*(24), 139-150.

Boonen, T., Van Damme, J., & Onghena, P. (2014). Teacher effects on student achievement in first grade: Which aspects matter most? *School Effectiveness and School Improvement*, *25*(1), 126-152.

Çakır, H., & Bichelmeyer, B. A. (2016). Effects of teacher professional characteristics on student achievement: An investigation in blended learning environment with standards-based curriculum. *Interactive Learning Environments*, *24*(1), 20-32. doi:10.1080/10494820.2013.817437

Chu, J. H., Loyalka, P., Chu, J., Qu, Q., Shi, Y., & Li, G. (2015). The impact of teacher credentials on student achievement in China. *China Economic Review*, *36*, 14-24. doi:10.1016/j.chieco.2015.08.006

Cobb, C. W., & Douglas, P. H. (1928). A theory of production. *American Economic Review*, *18*(1)*,* 139-165. Retrieved from www.aeaweb.org/aer/top20/*18*.1.*139*-165.pdf

Creswell, J. W. (2015). *Educational research: planning, conducting, and evaluating quantitative and qualitative research.* (5th ed.) Pearson Education, Inc.

DeAngelis, K. J. (2013). A look at returning teachers. *Education Policy Analysis Archives*, *21*(13).

Donitsa-Schmidt, S., & Zuzovsky, R. (2016). Quantitative and qualitative teacher shortage and the turnover phenomenon. *International Journal of Educational Research*, *77*, 83-91. doi:10.1016/j.ijer.2016.03.005

Duyar, I. (2006). Analyzing education productivity. *Education Review*, *9*(4), 1-17. Retrieved from www.edrev.info/essays/v9n4index.html

Duyer, I., McNeal, L., & Kara, O. (2006). Productivity. In English, F. (Edit), *Encyclopedia of educational leadership and administration*, pp. 807-809. Thousand Oaks, CA, SAGE. doi:10.4135/9781412939584.n460

Enwelim, S. C. (2016). Teacher characteristics as correlates of students' achievement in social studies: A case study in Nigeria. *Journal of Education and Practice*, *7*(28), 110-114.

Feng, H., & Li, J. (2016). Head teachers, peer effects, and student achievement. *China Economic Review*, *41*, 268-283. doi:10.1016/j.chieco.2016.10.009

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. (4th ed.). London, England: Sage.

Forman, K., & Markson, C. (2015). Is "Effective" the new "Ineffective"? A crisis with the New York state teacher evaluation system. *Journal for Leadership and Instruction*, *14*(2), 5-11.

Fung, D., Kutnick, P., Mok, I., Leung, F., Pok-Yee Lee, B., Mai, Y. Y., & Tyler, M. T. (2017). Relationships between teachers' background, their subject knowledge and pedagogic efficacy, and pupil achievement in primary school mathematics in Hong Kong: An indicative study. *International Journal of Educational Research*, *81*, 119-130. doi:10.1016/j.ijer.2016.11.003

Goldhaber, D., Lavery, L., & Theobald, R. (2015). Uneven playing field? Assessing the teacher quality gap between advantaged and disadvantaged students. *Educational Researcher*, *44*(5), 293-307.

Hairrell, A., Rupley, W. H., Edmonds, M., Larsen, R., Simmons, D., Willson, V., & ... Vaughn, S. (2011). Examining the impact of teacher quality on fourth-grade students' comprehension and content-area achievement. *Reading & Writing Quarterly*, *27*(3), 239-260.

Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics*, *95*, 798-812. doi:10.1016/j.jpubeco.2010.11.009

Hanushek, E. A. (1979). Conceptual and empirical issues in the estimation of educational production functions. *Journal of Human Resources*, *14*(3), 351-388.

Hanushek, E. A. (2008). Education production functions. *The New Palgrave Dictionary of Economics Online*. Palgrave Macmillan. doi:10.1057/9780230226203.0448

Hanushek, E. A. (2016). What matters for student achievement? *Education Next*, *16*(2), 18-26.

Hanushek, E., Rivkin, S., & Schiman, J. (2016). Dynamic effects of teacher turnover on the quality of instruction. *Economics of Education Review*, *55*, 132-148. doi:10.1016/j.econedurev.2016.08.004

Hendricks, M. D. (2014). Does it pay to pay teachers more? Evidence from Texas. *Journal of Public Economics*, *109*, 50-63. doi:10.1016/j.jpubeco.2013.11.001

Hultell, D., Melin, B., & Gustavsson, J. P. (2013). Getting personal with teacher burnout: A longitudinal study on the development of burnout using a person-based approach. *Teaching and Teacher Education*, *32*, 75-86. doi:10.1016/j.tate.2013.01.007

Jones, M. D. (2013). Teacher behavior under performance pay incentives. *Economics of Education Review*, *37*, 148-164. doi:10.1016/j.econedurev.2013.09.005

Kalogrides, D., Loeb, S., & Béteille, T. (2013). Systematic sorting: Teacher characteristics and class assignments. *Sociology of Education*, *86*(2), 103-123. doi:10.1177/0038040712456555

Khan, S. R., & Kiefer, D. (2007). Educational production functions for rural Pakistan: A comparative institutional analysis. *Education Economics*, *15*(3), 327-342. doi:10.1080/09645290701273590

Klug, J., Bruder, S., & Schmitz, B. (2016). Which variables predict teachers' diagnostic competence when diagnosing students' learning behavior at different stages of a teacher's career? *Teachers and Teaching: Theory and Practice*, *22*(4), 461-484.

Knoell, C. M., & Crow, S. R. (2013). Exploring teacher influence on the lives of students from diverse elementary schools in a rural Midwestern community. *International Journal of Psychology: A Biopsychosocial Approach* 13(31-48). doi:10.7220/1941-7233.13.2

Kraft, M. A. (2015). Teacher layoffs, teacher quality, and student achievement: Evidence from a discretionary layoff policy. *Education Finance & Policy*, *10*(4), 467. doi:10.1162/EDFP_a_00171

Krathwohl, D. R. (2009). *Methods of educational and social science research: The logic of methods.* (3rd ed.). Long Grove, IL: Waveland.

Lochmiller, C. R., Sugimoto, T. J., Muller, P. A. (2016). Teacher retention, mobility, and attrition in Kentucky public schools from 2008 to 2012. REL 2016-116. *Regional Educational Laboratory Appalachia*.

Manzeske, D., Garland, M., Williams, R., West, B., Kistner, A. M., Rapaport, A., & Society for Research on Educational Effectiveness (2016). Teacher performance pay signals and student achievement: Are signals accurate, and how well do they work?

McCormick, M. P., & O'Connor, E. E. (2015). Teacher–child relationship quality and academic achievement in elementary school: Does gender matter? *Journal of Educational Psychology*, *107*(2), 502-516. doi:10.1037/a0037457

McInerney, D., Ganotice, F., King, R., Marsh, H., & Morin, A. (2015). Exploring commitment and turnover intentions among teachers: What we can learn from Hong Kong teachers. *Teaching and Teacher Education*, *52*, 11-23. doi:10.1016/j.tate.2015.08.004

McLean, L., & McDonald Connor, C. (2015). Depressive symptoms in third-grade teachers: relations to classroom quality and student achievement. *Child Development*, *86*(3), 945-954. doi:10.1111/cdev.12344

Meissel, K., Parr, J. M., & Timperley, H. S. (2016). Can professional development of teachers reduce disparity in student achievement? *Teaching and Teacher Education*, *58*163-173. doi:10.1016/j.tate.2016.05.013

Meroni, E. C., Vera-Toscano, E., & Costa, P. (2015). Can low skill teachers make good students? Empirical evidence from PIAAC and PISA. *Journal of Policy Modeling*, *37*(308-323). doi:10.1016/j.jpolmod.2015.02.006

Metzler, J., & Woessmann, L. (2012). The impact of teacher subject knowledge on student achievement: Evidence from within-teacher within-student variation. *Journal of Development Economics*, *99*, 486-496. doi:10.1016/j.jdeveco.2012.06.002

Musau, L. M., & Abere, M. J. (2015). Teacher qualification and students' academic performance in science mathematics and technology subjects in Kenya. *International Journal of Educational Administration and Policy Studies*, *7*(3).

NAEP overview. (2011). Retrieved March 22, 2016 from http://nces.ed.gov/nationsreportcard/about/

National Center for Education Statistics (NCES). (2011). *National assessment of educational progress at grades 4 and 8*. Retrieved from: http://nces.ed.gov/nationsreportcard/pdf/main2011/2012458.pdf

National Center of Education Statistics (NCES). (2014). Schools and staffing survey. Retrieved from: http://nces.ed.gov/surveys/sass/tables_list.asp#2012

National Center for Education Statistics (NCES). (2016a). NAEP overview. Retrieved from: http://nces.ed.gov/nationsreportcard/about/

National Center of Education Statistics (NCES). (2016b). What does the NAEP mathematics assessment measure? Retrieved from: https://nces.ed.gov/nationsreportcard/mathematics/whatmeasure.aspx

National Center of Education Statistics (NCES). (2016c). About us. Retrieved from: http://nces.ed.gov/about/

National Center for Education Statistics (NCES). (2016d). Schools and staffing survey. Retrieved from: https://nces.ed.gov/surveys/sass/

National Center of Education Statistics (NCES). (2016e). NCES procedures. Retrieved from: https://nces.ed.gov/surveys/sass/confidentiality.asp

National Center for Education Statistics (NCES). (2016f). Implementation Guide for Public Access to Research Data. Retrieved from: https://ies.ed.gov/funding/datasharing_implementation.asp

National Center for Education Statistics (NCES). (2016g). Frequently asked questions. Retrieved from: http://nces.ed.gov/nationsreportcard/faq.aspx#ques5

Oshio, T., Sano, S., & Suetomi, K. (2010). Estimate of the production function of education. *Japanese Economy*, *37*(2), 83-119.

Ost, B., & Schiman, J. (2015). Grade-specific experience, grade reassignments, and teacher turnover. *Economics of Education Review*, *46*, 112-126. doi:10.1016/j.econedurev.2015.03.004

Özel, Z. Y., & Özel, S. (2013). Mathematics teacher quality: Its distribution and relationship with student achievement in Turkey. *Asia Pacific Education Review*, *14*(2), 231-242.

Özoglu, M. (2015). Mobility-related teacher turnover and the unequal distribution of experienced teachers in Turkey. *Educational Sciences: Theory and Practice*, *15*(4), 891-909.

Papay, J., Kraft, M., Bloom, J., Buckley, K., Liebowitz, D. (2013). Missed opportunities in the labor market or temporary disruptions? How late teacher hiring affects student achievement. *Society for Research on Educational Effectiveness*.

Petty, T., Good, A., & Handler, L. (2016). Impact on student learning: National board certified teachers' perceptions. *Education Policy Analysis Archives*, *24*(49/50), 1-22. doi:10.14507/epaa.24.2227

Phillips, K. R. (2010). What does "highly qualified" mean for student achievement? Evaluating the relationships between teacher quality indicators and at-risk students' mathematics and reading achievement gains in first grade. *Elementary School Journal*, *110*(4), 464-493.

Popham, W. J. (2013). *Classroom assessment: What teachers need to know*? Needham Heights, MA: Allyn & Bacon.

Pullen, J. (2009). *The Marginal Productivity Theory of Distribution: A Critical History*. London, UK: Routledge.

Rice, J. K., & Urban Institute, N. (. (2010). The impact of teacher experience: Examining the evidence and policy implications. Brief No. 11. *National Center for Analysis of Longitudinal Data in Education Research*,

Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American Educational Research Journal*, *50*(1), 4-36.

Salkind, N. J. (2011). *Statistics for people who (think they) hate statistics*. Thousand Oaks, CA: Sage Publications.

Sirait, S. (2016). Does teacher quality affect student achievement? An Empirical Study in Indonesia. *Journal of Education and Practice*, *7*(27), 34-41.

Steele, J. L., Pepper, M. J., Springer, M. G., & Lockwood, J. (2015). The distribution and mobility of effective teachers: Evidence from a large, urban school district. *Economics of Education Review*, *48*, 86-101. doi:10.1016/j.econedurev.2015.05.009

Subedi, B., Reese, N., & Powell, R. (2015). Measuring teacher effectiveness through hierarchical linear models: Exploring predictors of student achievement and truancy. *Journal of Education and Training Studies*, *3*(2), 34-43.

Subotnik, R. F., & Walberg, H. J. (2006). *The Scientific Basis of Educational Productivity*, (Eds.), Greenwich, CT: Information Age Publishing, Inc.

Tatar, E., Tüysüz, C., Tosun, C., & İlhan, N. (2016). Investigation of factors affecting students' science achievement according to student science teachers. *International Journal of Instruction*, *9*(2), 153-166. doi:10.12973/iji.2016.9211a

Taut, S., Valencia, E., Palacios, D., Santelices, M. V., Jiménez, D., & Manzi, J. (2016). Teacher performance and student learning: Linking evidence from two national assessment programmes. *Assessment in Education: Principles, Policy & Practice*, *23*(1), 53-74.

Walberg, H. J. (1984). Improving the productivity of America's schools. Educational Leadership, *41*, 19-27.

Walberg, H. J., & Tsai, S. L. (1983). Matthew effects in education. *American Educational Research Journal*, *20*, 359-373. doi:10.3102/00028312020003359

Winters, M. A., Dixon, B. L., & Greene, J. P. (2012). Observed characteristics and teacher quality: Impacts of sample selection on a value added model. *Economics of Education Review*, *31*, 19-32. doi:10.1016/j.econedurev.2011.07.014

Wiseman, A. a., & Al-bakr, F. f. (2013). The elusiveness of teacher quality: A comparative analysis of teacher certification and student achievement in Gulf Cooperation Council (GCC) countries. *Prospects (00331538)*, *43*(3), 289-309.

Wiswall, M. (2013). The dynamics of teacher quality. *Journal of Public Economics*, *100*, 61-78. doi:10.1016/j.jpubeco.2013.01.006

Zakharov, A., Tsheko, G., & Carnoy, M. (2016). Do "better" teachers and classroom resources improve student achievement? A causal comparative approach in Kenya, South Africa, and Swaziland. *International Journal of Educational Development*, *50*, 108-124. doi:10.1016/j.ijedudev.2016.07.001

Zhang, D., & Campbell, T. (2015). An examination of the impact of teacher quality and 'opportunity gap' on student science achievement in China. *International Journal of Science & Mathematics Education*, *13*(3), 489-513. doi:10.1007/s10763-013-9491-z

Appendices

Appendix A: NCES Archival Data and Public Use Policy

The Institute of Education Sciences (IES) National Center for Educational Statistics website states that the rationale for providing public access to data is that "IES believes that data sharing is an important component of the scientific process. Data sharing provides opportunities for other researchers to review, confirm, or challenge study findings. In addition, data sharing can enhance scientific inquiry through a variety of other analytic activities, including the use of shared data to: test alternative theories or hypotheses; explore different sets of research questions than those targeted by the original researchers; combine data from multiple sources to provide potential new insights and areas of inquiry; and/or conduct methodological studies to advance education research methods and statistical analyses" (NCES, 2016f).

Archived data sets for the 2011-2012 Schools and Staffing Survey (SASS) for teacher experience:

http://nces.ed.gov/surveys/sass/tables_list.asp#2012

Archived data sets for the 2011-2012 Schools and Staffing Survey (SASS) for teacher education level:

http://nces.ed.gov/surveys/sass/tables/sass1112_2013314_t1s_004.asp

Archived data sets for the 2011-2012 Schools and Staffing Survey (SASS) for teacher experience level and years at current school:

http://nces.ed.gov/surveys/sass/tables/sass1112_2013314_t1s_003.asp

Archived data sets for fourth-grade National Assessment of Educational Progress (NAEP) mathematics assessment average scale scores:

http://nces.ed.gov/nationsreportcard/pdf/main2011/2012458.pdf

Appendix B: Data Assumptions

Histogram

Dependent Variable: StudentScaleScore

Mean = -3.42E-16
Std. Dev. = 0.966
N = 46

Normal Q-Q Plot of StudentScaleScore