The Relationship Between a School District's Administrative Information Technology Budget as Proportion of the Overall Undistributed Expenditures Budget and New Jersey 2016-2017 PARCC Performance

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THE RELATIONSHIP BETWEEN A SCHOOL DISTRICT’S ADMINISTRATIVE INFORMATION TECHNOLOGY BUDGET AS PROPORTION OF THE OVERALL UNDISTRIBUTED EXPENDITURES BUDGET AND NEW JERSEY 2016-2017 PARCC PERFORMANCE

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Submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Department of Education Leadership, Management, and Policy

Seton Hall University
2018
SETON HALL UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN SERVICES
OFFICE OF GRADUATE STUDIES

APPROVAL FOR SUCCESSFUL DEFENSE

Peter S. Lutchko, has successfully defended and made the required modifications to the
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form to the Office of Graduate Studies, where it will be placed in the candidate’s file and
submit a copy with your final dissertation to be bound as page number two.
ABSTRACT

The purpose of this relational, nonexperimental, explanatory, cross-sectional study with quantitative methods was to explain the relationship, if any, between the administrative information technology budget as a proportion of the overall undistributed expenditure account on PK-12 and K-12 New Jersey public school districts’ student achievement in English language arts (ELA) and mathematics, as measured by the high-stakes New Jersey standardized test entitled Partnership for Assessment of Readiness for College and Careers (PARCC), during the 2016–2017 school year. The administrative information technology budget refers to networking, technology infrastructure, and support, rather than hardware. Additionally, the study included examination of the influence of other student, district, and staff variables such as student absenteeism, percentage of students with disabilities, socioeconomic status, district enrollment size, percentage of faculty with advanced degrees, and faculty attendance on the PARCC 2016–2017 in both ELA and mathematics.

The target variable of interest, the administrative information technology budget as proportion of the overall undistributed expenditure account, was not found to be a significant predictor of achievement on PK-12 or K-12 New Jersey school districts PARCC scores in ELA or mathematics. The results of this study indicated that no statistically significant relationship exists between the proportion of the administrative information technology budget and proficiency percentages on PK-12 or K-12 New Jersey school districts PARCC scores in ELA or mathematics. Of the variables included in this study, student absenteeism, percentage of faculty with advanced degrees, and enrollment size were deemed statistically significant predictors when PARCC ELA was the dependent variable. When PARCC mathematics was the dependent
variable, student absenteeism and socioeconomic status were the identified statistically
significant predictor variables.

*Keywords:* PARCC, standardized test, student achievement, school finance, technology
budget
DEDICATION

First and foremost, this study is dedicated to my mother, Julie Lutchko. This project would not have come to fruition without her love and support through all these years. Since I was a little kid getting help with long division, to the completion of my doctoral degree, my mom has been there every step of the way, making sure I had everything I needed and being my biggest supporter. Mom, every day I strive to make you proud and live by the example you have set for me and our family. This degree and project is something I never thought was possible and without my mom’s encouraging words, it may not have been. My mom has told me from as far back as I can remember that anything is possible and whether it be completing this degree or traveling the world, my mom has been there every step of the way, making sure that all my dreams come true, no matter what obstacle the world may throw my way.
ACKNOWLEDGEMENTS

I am blessed to have a large family that consists of four siblings and 15 amazing nieces and nephews. Whether it be your encouraging words, lending a lap top to complete my dissertation, or providing much needed time away from this project, I need to personally thank Tracy, Julie, Bobby, Tara, Ashley, Taylor, Laryn, Lindsay, Brent, Connor, Aryana, Jayce, Mackenzie, Maddy, Logan, Ryan, Sarah, Nilah, and Gabby. To my best friend, Colleen, thank you for believing in me on the days I did not even believe in myself. Not many people are lucky to find their forever friend at such an early age and I am lucky to have you. I would be remiss if I did not mention my late father, Wayne Lutchko, who initially fueled my endless pursuit of education and drive for success in school. Dad, achieving this level of education is something you always dreamed for me and part of me knows that I inherited this dream not only from, but for you.

I would like to acknowledge my dissertation committee: Dr. Gerard Babo, Dr. Christopher Tienken, and Dr. Michael Kuchar for all their guidance and support throughout this dissertation process. I remember how excited I was when Seton Hall provided me the names of Dr. Babo and Dr. Tienken as the initial committee members because of the distinguished professionalism and reputation I had experienced in earlier degree courses. Eventually after completing my administrative internship and serving under additional graduate classes under Dr. Kuchar, I knew he was the right choice to complete my committee. My committee members provided me the guidance, advice, and tools that I needed to reach this end goal. I am forever grateful for the dedication you have given my study throughout this process. Thank you for helping this project become the greatest work of academia I have succeeded in completing.
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CHAPTER 1

INTRODUCTION

Background

The debate over whether money really matters in relation to student achievement has been controversial, with conflicting literature and studies on the topic. The Coleman Report is the first large piece of literature that indicated school finance did not really matter (Coleman et al., 1966). Hanusek (1996, 2016) completed several studies since this report that back up the claims submitted by Coleman et al. (1966). Coleman et al. and Hanusek (1996, 2016) have been challenged by other researchers that argue that money does matter (Greenwald, Hedges, & Laine, 1996a, 1996b; Hedges, Laine & Greenwald, 1994).

Technology and its impact on student achievement has also been debated by researchers and practitioners alike. For example, using a pretest–posttest method, Huang (2015) showed that the intervention of technology positively influenced student achievement in certain groups. This is in contrast to Shapley, Sheehan, Maloney, and Caranikas-Walker (2011), who studied a wide scale 1:1 immersion program in Texas and showed no influence on student achievement.

Few studies exist on the direct link between expenditures on technology and student achievement. DeLuca and Hinshaw (2013) grouped technology with instruction when comparing expenditures to student achievement. Other models are similar, but limited research exists on technology budget specifically and a possible relationship with student achievement.

Coleman et al. (1966) first initiated claims that other factors did not matter when socioeconomic status is taken into account, such as school finance, and claimed that socioeconomic factors had such a big impact that other factors, such as a budget, would have minimal impact. Hoy, Tarter, and Hoy (2006) challenged this with the construct of academic
optimism. They created this construct based on the variables of academic emphasis on schools, collective efficacy, and faculty trust in parents and students; and demonstrated how they work together to influence student achievement. This provides evidence that other variables can still affect student achievement even after socioeconomic status is controlled for.

Prior to the No Child Left Behind Act (NCLB, 2002), standardized testing existed, but the Act was the first formal legislative push by the federal government in regard to standardized testing and what comes out of schools. Prior to this, standardized testing was handled at the state level. The NCLB mandated that certain data be collected in a data warehouse to be decided by each state and mandated an annual standardized test in mathematics and English language arts (ELA) in Grades 3–8. The NCLB left the decision to develop the specific test at the state level. The American Recovery Reinvestment Act (ARRA) signed by former president Barrack Obama in 2009 amended this by mandating the Common Core standards that were previously developed by state commissioners.

The development of the Common Core standards led to the birth of the Partnership for Assessment of Readiness for College and Careers (PARCC) examination. According the State of New Jersey Department of Education (NJDOE, 2014) website, PARCC was first adopted in New Jersey during the 2014–2015 school year. This examination is primarily administered online and is based on the federal Common Core standards. During its first school year of implementation in 2014–2015, 98% of the students took the PARCC examination online (Heyboer, 2015). After New Jersey adopted the federal Common Core, the current New Jersey Student Learning standards lists technology explicitly as Standards 8.1 and 8.2. According to the NJDOE (2017c),

Readiness in this century demands that students actively engage in critical thinking, communication, collaboration, and creativity. Technology empowers students with real-
world data, tools, experts and global outreach to actively engage in solving meaningful problems in all areas of their lives. The power of technology discretely supports all curricular areas and multiple levels of mastery for all students. (Standard 8, Technology section, para. 4)

New Jersey further pushed the need for technology in schools and possible reorganization and infrastructure of current technology allotment with the adoption of the PARCC standardized test. According to the NJDOE (2015) frequently asked questions on PARCC, “Most students take the PARCC on the computer” (p. 1). The timeframe for PARCC administration is a relatively small window of about two months. This can place increased demands on the available technology within a school district or require the purchase of additional technology.

Recently, the Every Student Succeeds Act (ESSA) signed into law by President Obama in December 2015 specifically offers grant money for districts to use for digital learning. In a memo sent out by the U.S. Department of Education, the government specifically spells out how flexibility can be used to tailor technology investments to meet an individual district’s needs: “Yet many schools, particularly high-need schools, lack the connectivity, resources, and support for teachers and leaders needed to implement digital learning strategies as a means to improve student achievement” (South, 2017, p. 1). The federal government is aware of the connectivity and digital learning divide that exists, yet it supports the federal Common Core standards and standardized PARCC examination that is administered online. Meanwhile, there is limited research on how money spent on technology infrastructure affects student achievement. The money that is spent on technology infrastructure could allow for a smooth administration of the examination and, in turn, have an impact on student achievement.

A school budget is derived from the money that a school district has to allocate. The money primarily comes from taxpayers at the local government level. Additional monies can come from state funding. Like most other states, New Jersey’s funding formula is made up of
several components. In New Jersey, the state first determines a base rate that a school needs in order to educate a child at the elementary level and increases from there. Then, additional factors such as free-and-reduced-lunch populations, special education populations, and English language learners (ELLs) are taken into account and additional monies are provided based on the school district’s special populations. It is then determined based on money coming from property taxes and local government what can be provided to schools. The difference between what comes locally and what the state standard is comes from state aid. The district can apply for certain additional grants for specific programs through the federal, state, and local governments as well as the private sector. Donations through local education foundations can also contribute to a district’s budget (Jones, 2014). Budgets are known to be changed and adjusted based on increased needs or changes in the way money is allocated. A district can then develop the budgets to the needs of the district following certain budgetary limitations from the state. Certain budgetary lines and categories must be reported to the NJDOE and these are published on the NJDOE website, which includes the administration information technology budget used in the present study.

Statement of the Problem

Legislation such as the ESSA (2016) and the NCLB (2002) has increased funding in the area of technology. There are also several grants that are available in the area of technology education in New Jersey (NJDOE, 2017b). More specifically, since the online state-mandated test PARCC came into existence, many have questioned whether computer-based testing could implicate student achievement on the PARCC examination. Those that took the PARCC in 2014–2015 tended to score lower than those that took the paper version of the test. For example,
in Illinois, 43% of students that took the ELA examination on paper scored proficient or above versus 36% of the students who took the computer-based test (Herold, 2016).

PARCC testing has also driven increases in technology budgeting in districts. As noted previously, the test is mostly administered online. This means that districts must build the technology infrastructures of their schools to meet these demands. This often means increased funding. It is unclear whether this increase in technology budgeting and spending really benefits students in the end. According to Herold (2016), the online application of the test potentially hurt students in Illinois.

Studies exist that do claim that technology in education does in fact make a difference on student achievement (Huang, 2015; Kiger, Herro, & Prunty, 2012; Storz & Hoffman, 2013). However, there are many studies that challenge these findings (Harris, Al-Bataineh, & Al-Bataineh, 2016; Shapley et al., 2011; Williams & Larwin, 2016). There are also studies and reports that state money does matter in relation to student achievement (Coleman et al., 1966; Hanushek 1996, 2016). There are also studies that suggest contrary results (Greenwald et al., 1996a, 1996b; Hedges et al., 1994). Few studies exist in which technology budgets were compared to student achievement. For example, DeLuca and Hinshaw (2013) did not look at technology budget alone, but instead grouped it with other components identified as instruction. I found no peer-reviewed studies in New Jersey regarding the possible relationship between a school district’s technology budget and student achievement, let alone the system and network infrastructure budgets. Consequently, with the existence of a state-mandated, high-impact online examination, now more than ever there is a compelling need to expand research in this area. There is no denying that technology is an important component in today’s society and real-world applications. However, identifying how much a district should spend on technology
infrastructures and systems to adequately meet student needs could be critical to how school
districts budget and fund technology overall.

**Purpose of the Study**

The purpose for this study was to explain the influence, if any, of the percentage of the
district’s administrative information technology budgets on a New Jersey K-12 district’s student
achievement in mathematics and ELA as measured by the 2016–2017 PARCC examination. In
addition, the study was aimed to determine the amount of variance that could be explained by
administration information technology budgets when controlling for additional factors that
influence student achievement, such as the school district’s percentages of special education,
ELL students, student attendance, and of students receiving free and reduced lunch. The results
of the study could help policy makers and administrators identify appropriate administration
information technology budgets for maintaining student achievement on the PARCC, save
district resources by eliminating unnecessarily high administration information technology
budgets, and/or increasing technology budgets to result in increased student achievement on the
PARCC. In this study, the administrative information technology budget refers to networking,
technology infrastructure, and support rather than hardware as defined by the NJDOE (2017d).

**Research Questions**

This study encompassed the following overarching research question:

What is the nature of the relationship between a New Jersey PK-12 or K-12 school
district’s administration information technology budget in relation to the overall budget
on the percentage of students who perform at a Level 4 (L4) or level 5 (L5) on the 2016–
2017 Partnership for Assessment of Readiness for College and Careers (PARCC)
examination when controlling for district, student, and staff variables?
There were also two subsidiary research questions:

Research Question 1: What is the nature of the relationship between a New Jersey PK-12 or K-12 school district’s administration information technology budget in relation to the overall undistributed expenditures budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 English Language Arts (ELA) Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?

Research Question 2: What is the nature of the relationship between a New Jersey PK-12 or K-12 school district’s administration information technology budget in relation to the overall undistributed expenditures budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 Mathematics Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?

**Null Hypotheses**

Null Hypothesis 1: No statistically significant relationship exists between a New Jersey PK-12 or K-12 school district’s percentage of the administration information technology budget in relation to the overall budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 English Language Arts (ELA) Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for staff, student, and district variables.

Null Hypothesis 2: No statistically significant relationship exists between a New Jersey PK-12 or K-12 school district’s percentage of the administration information technology budget in relation to the overall budget on the percentage of students who perform at a Level 4 (L4)
or Level 5 (L5) on the 2016–2017 Mathematics Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for staff, student, and district variables.

**Theoretical Framework: Input–Output Theory**

The theoretical framework used to guide the study was the input output theory, also known as the production function theory. Originally, the theory is rooted in economics and its base meaning is that inputs produce outputs. In education, one area would be the resources (i.e., financial, human, organizational, etc.) that go into schools with the expectations for producing certain outcomes. Regarding this theory, Hanushek (2008) explained, “The common inputs are things like school resources, teacher quality, and family attributes, and the outcome is student achievement. The area is, however, distinguished from many because the results of analyses enter quite differently into the policy process” (p. 2). Drawing upon input–output theory, I used the administrative technology budget as the input that potentially influences student achievement as an outcome, which was measured by PARCC scores.

**Independent Variables: District Published Budgets and the NJ School Performance Report**

The unit of analysis for this study was school district. The independent variables in this study were retrieved from K-12 district budgets that are published annually on the NJDOE website and from the annually published New Jersey School Performance Reports. The NJDOE collects data on various aspects of a school and district and publishes them annually by school and possible district in 2017–2018 in a performance report. The variables used in this study were based on the literature regarding what potentially influences student achievement as shown in Table 1.
Table 1

District-Level Variables as determined by Peter Lutchko

<table>
<thead>
<tr>
<th>Variables (at the district level)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staff variables</strong></td>
</tr>
<tr>
<td>Staff attendance rate</td>
</tr>
<tr>
<td>Faculty and administrators with a master’s degree or higher</td>
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</table>

**Dependent Variables**

The PARCC examination has been used as the state assessment in New Jersey since the 2014–2015 school year, replacing the New Jersey Assessment of Skills and Knowledge (NJ ASK) assessment (NJDOE, 2015). The PARCC examination is aligned to the federal Common Core Standards. The examination is aimed to test students in ELA and mathematics curriculum components of the Common Core.

According to the NJDOE Frequently Asked Questions (2015), the PARCC exam improved the NJ ASK and the even earlier High School Proficiency Assessment (HSPA) exam by providing parents and educators with more information on students for improved instruction by schools receiving “more comprehensive data that can help improve overall instructions and can be used to develop personalized support for individual students” (p. 1). The NJDOE (2015) also stated the following about the online use of technology to administer the test:

Most students take the PARCC exams on computer, which is becoming common among other tests (for instance, the GED test is now computer-based, and the SAT college-entrance exams will be). Schools will benefit because, as the test progresses, results will
be returned to schools far more quickly—allowing schools to immediately address academic issues. (pp. 1–2)

However, NJDOE (2015) failed to identify possible challenges.

PARCC is going to become even more high-stakes and important to students as the years progress. According to the NJDOE (2018), New Jersey uses the PARCC exam as one of several paths to graduation. Currently, students can take an Accuplacer exam for college entrance, use SAT or ACT scores, or create a portfolio appeal if the student cannot meet any of the test cut-offs from the tests listed above. This is true for the classes of 2017–2019. Beginning in 2020, students can only take the second pathway (alternative test) or third pathway (portfolio appeal) if they have taken all of the required PARCC examinations for the classes in which they are enrolled. Beginning in 2021, there will be no alternative test option (NJDOE, 2018). The PARCC cannot, at this time, be used for class placements or other high impact decisions, although there is no data on how policy and actual practice differ on this regulation.

New Jersey is one of seven states, including the District of Columbia, using the PARCC examination as a measure of student achievement. At one point, this number was over 20 schools (Clark, 2016). The test is used to score students in the areas of ELA and mathematics. There is a 5-point scoring system with Level 1 (L1) indicating not yet meeting expectations, Level 2 (L2) indicating partially meeting expectations, Level 3 (L3) indicating approaching expectations, Level 4 (L4) indicating meeting expectations, and Level 5 (L5) indicating exceeding expectations. In order for a student to get an L1, they must score between 650–700, L2 is 700–725, L3 is 725–750, L4 is 750–790, and L5 is 790–850. Each content area or subject matter has performance indicators that determine where a student must be to make each cutoff. Those scoring below an L4 are considered not on track for their grade and may require additional help to meet standards (PARCC, 2018b).
Significance of the Study

Online, state-mandated testing has brought about many changes in school districts in regard to the delegation of funds and technology. There is varied and limited research both on how technology effects student achievement, if at all, and if overall money really matters in relation to student achievement. The literature indicates that what is spent actually does not matter because once other factors such as socioeconomic status are controlled for, school finance is invalidated (Coleman et al., 1966). Currently, there is debate over whether online administration of tests such as the PARCC examination effects student achievement (Herold, 2016). Many of the previous studies on school finance and its relation to student achievement were focused on the school level. The present study expanded upon this by using district-level data.

Policy makers and school practitioners could benefit from additional research in the area of how technology budgets and, more specifically, the administration information technology budget, and student achievement relate to each other. This is due largely to research suggesting that the online administration of tests can actually hurt students as well as the limited research on the topic of technology budgets and student achievement (Herold, 2016). For the current study, I found no published studies in New Jersey in the area of school budgets and student achievement or school technology budgets and student achievement. With this new kind of testing bringing about new questions for school districts, including how to budget for administration information technology, there is a need for this type of study. If the results of the study show a high correlation between the percent of administration information technology budget and PARCC examination scores, New Jersey districts may try to raise funding in these areas. If the results of the study reflect a low correlation between the percentage of administration information
technology budget and PARCC examination scores, implications would be conveyed to those generating district and technology budgets, including those at the state level, as well as those administrators who implement and apply budgets.

Limitations, Delimitations, and Assumptions

Limitations

True pure experimental studies can rarely be implemented within the educational field. This causes researchers to use the correlational design that allows discussion of observed relationships between the variables; however, cause and effect cannot be determined.

This study was limited by the variables that the bureaucrats of the NJDOE determined important enough to collect and report out annually, either on its website or through the New Jersey School Performance Report. Two variables that have been known to affect student achievement, as indicated in the literature review, are student mobility and attendance which are no longer reported annually.

In addition, the standardized tests themselves contain limitations. Tienken and Wilson (2005) listed the limitations by questioning content validity, low reliability of cluster scores, and a lack of score precision.

The results might also have been limited by the reporting of the data on the NJDOE websites and the accuracy of those results. Finally, I used the revised 2016–2017 school year budgets as a measure of expenditures instead of the actual dollars spent.

Delimitations

The data collection was limited to K-12 public school districts in New Jersey. Therefore, data may not be projected to other school district types or locations in other states. Data were collected from schools from varying district factor groups A–J within the entire state of New
Jersey. Data were aggregated at the district level and not done by school building. Data are only reflective of PARCC examination scores from the 2016–2017 school year. The data were collected for only one point in time, which was the 2016–2017 school year. A final delimitation was using the broad budget line of the administrative information technology budget without knowing how that money was used and implemented.

**Assumptions**

It was assumed that the data available on the New Jersey website overall budgets and administration information technology budgets were accurate. It was assumed that the data presented in the New Jersey School performance reports were also accurate. Finally, it was also assumed that the data were accurately transferred into the Statistical Package for the Social Sciences (SPSS).

**Definition of Terms**

*Achievement Gap:* The difference or disparities in student achievement scores between different groups of students.

*Administration Information Technology Budget:* Used to assess how school districts are budgeting for the various technology infrastructure budgets. Included in this budget are costs associated with the administration and supervision of technology personnel, systems planning and analysis, systems application development, systems operations, network support services, hardware maintenance and support, and other technology related administrative costs (NJDOE, 2017e).

*District Factor Group (DFG):* Classification system previously used to compare school districts with similar socioeconomic status within New Jersey by the DOE. They were then placed in one of eight groupings: A, B, CD, DE, FG, GH, I, and J, with J being the
highest on the economic scale. Factors used to determine classification were percentage of adults with no high school diploma, percent of adults with some college education, occupational status, unemployment rate, percent of individuals living in poverty, and median family income. It was published every 10 years with the last one published in 2000 (NJDOE, 2011).

**English Language Learner (ELL) Students:** The percentage of ELL students in a district is determined by taking the total number of students who are eligible for, but not necessarily receiving, ELL services and dividing it by the entire population (NJDOE, 2011).

**New Jersey School Performance Report:** Report published annually the NJDOE that highlights student achievement, enrollment, and demographic totals based on various state report submissions (NJDOE, 2017d).

**Partnership for Assessment of Readiness for College and Careers (PARCC):** The statewide standardized examination currently used to test students in the state of New Jersey. The PARCC is based on the federal Common Core standards and tests students on the curriculum goals for each respective grade, including the areas of ELA and mathematics in Grades 3–11 (NJDOE, 2015).

**Student Achievement:** In this study, the PARCC district scores from the 2016–2017 school year were used to define student achievement. Student achievement is considered to be met when scores are within the meeting or exceeding expectations levels on this examination.

**Student Attendance Rate:** District-level totals are calculated by dividing the total days of possible attendance of all students in a district by the total number of students’ days present in a district for the 2016–2017 school year (NJDOE, 2011).
Students With Disabilities: The percentage of students determined to be eligible for special education and related services based on an eligibility assessment. This is calculated by taking the total enrollment of students eligible for special services and dividing it by the total number of students in a district (NJDOE, 2011).

Student to Faculty Ratio: Calculated using the total student enrollment in a district as of the October snapshot by the total full-time equivalencies (FTEs) of classroom teachers and educational support services (NJDOE, 2011).

Organization of the Study

Chapter 1 encompassed the background of the study and a presentation of the problem between the PARCC examination scores in K-12 districts and the administration information technology budget. Further investigation is needed in this area with the emergence of the new high-impact state standardized test that is now administered online.

Chapter 2 includes a literature review to present a theoretical framework that links school and district budgets with student achievement. The literature review also covers the various student, staff, and district variables that were controlled for in this study.

Chapter 3 includes discussion of the research design and methods used in the study. The data for the independent, dependent, and control variables were collected from the NJ School Performance Report and the NJDOE website.

Chapter 4 is a detailed presentation of the data and the results of the statistical findings of the study, while Chapter 5 includes the statistical summary and data implications on policy and practices as well as suggestions for future research. In addition, Chapter 5 contains conclusions based on the primary research question: What is the nature of the relationship between a New Jersey PK-12 or K-12 school district’s administration information technology budget in relation
to the overall budget on the percentage of students who perform at a Level 4 (L4) or level 5 (L5) on the 2016–2017 Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?
CHAPTER 2

LITERATURE REVIEW

My purpose in conducting the study was to explain the strength and direction of the relationships between the administration information technology budget and other identified control variables found through an extensive literature review as well as PARCC examination scores in New Jersey K-12 districts or PK-12 districts in the area of ELA and mathematics. As a guide to the review of the literature, I used the overarching research question: “What is the nature of the relationship between a New Jersey PK-12 or K-12 school district’s administration information technology budget in relation to the overall budget on the percentage of students who perform at a Level 4 (L4) or level 5 (L5) on the 2016–2017 Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables? The literature review includes the current literature, legislation, and relative literature on the relationship between school budgets and student achievement. The objective of this review was to identify studies that show statistical significance, if any, in relation to student, school, and teacher variables on student achievement in K-12 districts as measured by the New Jersey PARCC examinations in ELA and mathematics.

The Coleman Report is a pivotal work on factors that influence student achievement, suggesting that student achievement is most influenced by socioeconomic factors and that little else matters once this is taken into account (Coleman et al., 1966). However, researchers continue to challenge this belief. In their study on academic optimism Hoy et al. (2006) created a construct consisting of academic emphasis on schools, collective efficacy, and faculty trust in parents and students work together to significantly influence student achievement. Studies of this kind lend themselves to other factors also impacting student achievement.
Standardized tests are becoming more high impact today. In New Jersey, changing graduation requirements have become more of a focus on the PARCC exam. As years progress, the NJDOE will offer fewer and fewer alternatives to taking the PARCC for a pathway to graduation (NJDOE, 2018). With the new standardized test being administered online, questions of whether this will have an impact on student achievement arise. Illinois has already noticed a difference in student achievement based on the test application (Herold, 2016). As an extension of this, the present study served to question whether the amount that a school district spends on administration information technology budget is related to student success on the PARCC examination.

**Methodological Issues**

The literature review process uncovered many issues in relation to the studied variables, particularly in terms of the technology budget’s effect on student achievement. Very little literature exists about these variables together. Even the literature that exists on the subject groups technology with other variables (De Luca & Hinshaw, 2013). In addition, early 2018 was the first time that the New Jersey bureaucrats released school report card data at the district level. This meant that this study was reliant on their processes for calculating the data and limiting the amount of district-level studies that could be conducted prior to this one. The variables presented were based on empirical research, but limited to what New Jersey bureaucrats deemed important enough to collect and report to the public via the NJ School Performance Reports.

**Inclusion and Exclusion Criteria for Literature Review**

Studies that were completed in the United States involving technology, budgets, and their effect on student achievement were included in this study. Studies that were done in other countries were not included in the study. Most of the research was culled from the years 2005–
2017. However, due to the fact that there is such limited literature on technology budgets and student achievement, but considerable research exists from outside the date range on school finance and student achievement, some literature from before 2005 was used in this review. Current studies, peer-reviewed articles, scholarly works, government reports, books, and relevant current legislation, as well as seminal works that included background information of the studies variables were used.

**NJ School Performance Report**

The NJDOE publishes the annual NJ School Performance Report, which replaces the old NJ School Report Card. The NJ School Performance Report informs the public and local school districts on their progress for accountability purposes. This is required since the NCLB and state legislation mandated it to see how well schools are performing and determine college and career readiness. Many of the variables utilized in this study were extracted from the 2016–2017 school year NJ School Performance Report. The Report is broken into several sections that include overview, demographic data, academic achievement, student growth, college and career readiness, climate and environment, staff, accountability and narrative (NJDOE, 2017d).

**Literature Review Procedures**

The literature reviewed for this chapter was accessed via online databases including EBSCO host, ProQuest, ERIC, JSTOR, and Academic Search Premier. In addition, online and print versions of legislation, relative news articles, peer-reviewed educational journals, dissertations, books, and reports were utilized.

A variety of search terms were used when conducting the literature review including *standardized testing, high stakes testing, school finance, student achievement, school/district budgets, technology, technology infrastructure, school variables, socioeconomic status, students*

This review includes current and relative literature on the relationship between school budgets and student achievement scores on the 2017 PARCC examination. In addition, the review also includes an overview on student, district, and teacher variables and how they relate to student achievement. Bibliographies were used to identify other important works of scholarly literature on the subject matter.

Most of the studies examined were quasi-experimental or correlational. The variables that are studied are difficult in the sense that they do not really lend themselves to a true experimental design.

**The Theoretical Framework**

The theoretical framework of this study was based on the economic input–output theory, also referred to as the production function theory (Beggs, 2018). Put simply, this theory suggests that whatever one puts into something will affect what comes out of it. From an economic perspective Raa (2010) described it as an “important quantitative economic technique that shows the interdependencies between various branches of a national economy and even between the various branches of different, possibly competing economies” (p. xiii). According to Raa, this theory in economics went away for some time, but is making a return due to globalization and increased competition. Schools are constantly competing for resources, which oftentimes comes in the form of money. This is why this theory still applies in education today. High-impact standardized test scores only increase the competition between schools and districts by creating rankings and assigning numbers to them.
In the present study, the input variables would be the various independent variables including percentage of administrative information technology budget to the overall general expense budget, school size, percentage of students identified as being chronically absent, percentage of economically disadvantaged students, percentage of students eligible for ELL services, and percentage of students with disabilities; faculty attendance, and the percentage of faculty with a master’s degree or higher. These would be all the variables that would have an impact of effect on the outcome or dependent variable, based on current literature and available data. The dependent variable was student achievement and was measured as those students that are labeled in the L4 or L5 category of the PARCC examination and therefore labeled as meeting or exceeding expectations and standards on the test during the 2016–2017 school year.

**History of School Finance and Technology**

The ongoing debate that still exists today in terms of school finance is focused on adequacy and equity, which are two sides of the same coin. School finance equity is defined and described as “fairness in the treatment of students. . . . Equity and equality are not synonyms. Although some degree of inequality will exist, it should be minimized” (Brimley, Verstegen, & Garfield, 2012, p. 8). According to Park (2011), school equity should close the gap between school districts’ abilities to provide funds. Park then described adequacy as, “the principle that states should provide enough funding for all students to be able to meet academic expectations” (para. 1). There has been a trend lately to move away from focusing so much on financial equity and toward reaching economic adequacy (Hanushek, 2016). This is the move away from the inputs that a school provides, such as funding, and toward the outputs that a school produces, such as student achievement. This ongoing discussion has prompted many legal cases and state law reforms to address what makes a school equitable and adequate as well as what minimum
funding requirements are needed to allow a student successful achievement. The federal and state mandates that resulted from these reforms shifted much of the power from the local level to the federal and state governments in order to bridge these equity and adequacy gaps.

An example of this was demonstrated in a study by Chung (2013) in Maryland after their school finance reforms. Under their new state funding formula identified groups such as free-and-reduced-lunch students, special education students, and ELLs received a larger proportion of funding. The results of the study showed increased spending for these groups and shifted the power from local funding to state funding (Chung, 2013). Chung used student dropout rates as a measure of student achievement and compared it to the new funding formula to measure the level of funding adequacy. Although the results and finding of this study were negative, they were not significant. This leads to the conclusion that the reform helped to make funding more equitable, but not necessarily adequate.

The history of finance change started with the Coleman Report (Coleman et al., 1966). The Department of Education funded a report about school equality, which resulted in the Coleman Report. The study showed that funding had little effect on student achievement, while student background and socioeconomic status were more predictive of student achievement than were school funding amounts (Coleman, 1966). At the time, there were larger implications such as the support for desegregated schools.

In terms of federally funding technology, the NJDOE (2014) technology website lists E-Rate program as being in effect today. This program came out of The Telecommunications Act of 1996. The Universal Science Fund (USF), also known as the E-Rate program, provided $2.25 billion annually to provide schools and libraries across the nation with discounts on telecommunications services such as Internet access and internal connections. This was the
federal government’s responding to the growth of the Internet, allowing for the continued growth and equitable access of it.

The NCLB (2002) signed by President George W. Bush substantially increased the role of the federal government in public education and school finance. The purpose of the NCLB is “distributing and targeting resources sufficiently to make a difference to local educational agencies and schools where needs are the greatest . . . to ensure that all children have a fair, equal, and significant opportunity to obtain a high-quality education” (sec. 1001). This meant that the federal government would be providing additional monies through grants for states and local governments that followed certain set guidelines and for identified groups such as special education students, ELLs, and free-and-reduced-lunch students.

Another component of the NCLB (2002), later amended by the ARRA (2009) is the development of state tests. The NCLB federally mandated that states develop a test in ELA and mathematics in Grades 3–8 to test on progress annually. Although the NCLB prohibited any nationally developed standardized test, the ARRA amended the NCLB with the Common Core standards and resulted in the development of PARCC testing, which was focused on criterion-referenced questions that would align with Common Core standards.

Part D of the NCLB is particularly related to technology; its primary goal is to improve student achievement through access to technology. This includes pushing states and local governments to use and implement technology effectively in elementary and secondary schools through professional development, evaluation of programs, increasing access to technology, technology expansion, and integration of technology into the curriculum. The funding for these programs from the federal government includes 50% from a federal formula and 50% from grant programs.
The ARRA of 2009 signed by Barack Obama was implemented as an economic stimulus package. Included in these programs was the Race to the Top program of 2011, which provided $4.35 billion for education. The Race to the Top initiative included designing assessments and standards to help students become more college-ready, creating data systems to track student and teacher progress for improved instruction, recruiting and maintaining teachers and school administrators, and helping to fix the lowest performing schools. Race to the Top provided funds to those schools that followed these guidelines and showed improvements by being awarded points. As a part of this program, Priority 2 of the Race to the Top Executive Summary (p. 1) addresses science, technology, engineering, and math (STEM) research and requires that all schools, in order to be eligible for the grant, provide higher-level curricula in STEM. Schools must also work with STEM experts and partners to integrate STEM content across all subjects and grade levels and prepare students for careers and STEM-related studies beyond secondary schooling. Race to the Top reinforces the federal government's role in prioritizing technology in secondary schools.

In addition to all of the federal government initiatives, programs, and grants, there have been several New Jersey-specific grants. Grants that are directly related to New Jersey and listed on the NJDOE website are Assistive Technology Grants, Star-W Students Using Technology to Achieve Reading-Writing, Matrix or Math Achievement to Realize Individual Excellence, the Access-Collaboration-Equity Plus (ACE+) grant, Pairing and Sharing, Technology Fellowship, Implementing New Curricular Learning with Universally Designed Experiences (INCLUDE), and Teaching & Learning with Essential New Technologies in the 21st Century (Talent 21). These grants are available through the federal programs outlined above and state mandates such as the addendum to Common Core State Standards and the New Jersey Core Curriculum Content
Standards (NJCCS), entitled 21st Century Learning Skills. An additional grant named the Future Ready NJ Grant Program is aimed to provide money to schools to enable them to support the technology and digital learning infrastructure of the PARCC examination. The maximum award for this program is $250,000 and the project period ran from March 1, 2016 to August 31, 2016. It was open to local education authorities (LEAs) as well as charter and renaissance schools, and showed the state’s commitment to the federally designed Common Core standards, PARCC examination, and technology.

**Variables of Interest**

As mentioned, the Coleman Report (Coleman et al., 1966) was one of the first large-scale published studies that suggested student achievement and funding were not really related. Since then there have been numerous studies that were focus on the subject. Hanushek (1989, 1997; Hanushek & Benson, 1994) conducted multiple studies that all show there is little relationship between funding and student achievement. Hanushek (1989) first proposed the idea of moving away from the input-directed approach that was institutionalized at the time. In this approach, schools were measured by what was put into the school, such as money, teacher quality, and class sizes. Beginning with the NCLB, we have moved away from this model and more to an output approach in measuring school quality. In this approach, schools are measured by standardized test scores and, in New Jersey, by student growth objectives (SGOs). Hanushek (1989) proposed to policymakers that a performance, incentive-driven approach was the best to improve student achievement based on his analysis of the studies at that time. Hanushek (1989) maintained that when one controls for family background, the strong positive correlations that exist between student achievement and funding disappear. Based on prior research in many different educational settings, Hanushek (1989) found there is strong evidence that does not
systematically link expenditures and student achievement. Furthermore, Hanushek (1989) posed questions that had no answers, such as the limited pressure for the efficient use of resources and what incentives or motivating factors will help schools increase their outputs and results. Many of these factors remain unidentified today.

Despite conducting more studies and writing articles, Hanushek and Benson (1994) did not go without criticism (see Greenwald et al., 1996a, 1996b; Hedges et al., 1994). Hedges et al. (1994) and Greenwald et al. (1996a) conducted meta-analyses of previous studies by Hanushek using combined significance tests and in 1994 utilized different samples at the school district level or smaller. They found that there were significant positive effects in these studies and relatively few negative results. Greenwald et al. (1996a) directly criticized Hanushek’s work, claiming that Hanushek changed his views to a more liberal view on the subject and that resources, particular financial resources, can matter; it just depends under what circumstances. Greenwald et al. (1996a) claimed Hanushek would analyze the same data multiple times rather than individual data sets. Additionally, Greenwald et al. (1996a) claimed that he was merely concerned with vote counting whether a study result is significant or not, rather than the power and direction of the statistical analysis. Hanushek (1996) rejected these claims, stating that Greenwald et al.’s (1996b) work and analysis were systematically flawed and biased toward significant results. Hanushek (1996) claims they only used studies that demonstrated significant results to skew their meta-analysis and also raised concerns over these results, comparing data across states when he believed it should be done state by state. Finally, Hanushek (1996) criticized Greenwald et al. (1996b) using a quasi-longitudinal design because true longitudinal designs would result in negative resource effects.
The one thing all the researchers discussed in this debate agree on is that schools should not just be given money without incentive or direction on what to do with that money. Hanushek’s (2016) review of the Coleman Report included this very issue. Hanushek (2016) stated that the research does not show that money matters or that it never matters and further claimed that giving money to schools without incentives or rules for the funding will not lead to increased achievement. Spending in U.S. schools has quadrupled since the 1970s, but student achievement rates remain mostly unchanged (Hanushek, 2016). Hanushek (2016) maintained the findings of the Coleman Report that student achievement is much more closely related to family, neighborhood, and peer environment. He stated that based on real state funding changes, the historical data from the last half century show that changes in state spending per pupil is uncorrelated with fourth grade changes in reading, with similar findings in ELA and eighth grade ELA and mathematics (Hanushek, 2016). Finally, Hanushek (2016) proclaimed that no one, to date, has found what level of funding is necessary, adequate, or sufficient in improving student achievement.

Odden, Goetz, and Picus (2008) devised a minimum, per-pupil expenditure on the national level that would ensure adequate funding. They did this by using a prototype district based on national averages of ELL students, free-and-reduced-lunch students, and special education students (Odden et al., 2008). Based on their research, Odden et al. concluded that the minimum funding is $9,391 per pupil, but pointed out that this amount was based on the best available data at the time and that states would have to analyze separately using individual demographic data. They included further research recommendations of more randomized trials, more studies on districts that were highly successful in raising student achievement, studies of what constitutes an adequate teacher salary; and studies on how technology affects student
achievement and, in turn, reduces personnel requirements of schools (Odden et al., 2008). The present study was an examination of technology funding and student achievement, to reveal more about technology funding adequacy.

**School Finance**

There is no doubt that Hanushek (1989, 1996, 1997, 2008, & 2016) has contributed vastly to the research findings on student resource allocation and student achievement, although his research methodology has faced much criticism. There are several studies today that continue the debate about if and when money matters in schools. Cullen, Polnick, Robles-Piña, and Slate (2015) conducted a statewide analysis of student instructional expenditure ratios to student achievement test scores of all districts in Texas from 2005–2006 thru 2009–2010. They found significant positive relationships between increases in instructional spending and student achievement in the areas of reading, math, writing, science, and social studies passing rates for all five school years, with a particularly strong relationship in math and science. A pairwise groups analysis demonstrated that those in the 55–57.49% ratio group scored lower than the other groups for all 5 years (Cullen et al., 2015). This study shows that there is the potential for a strong relationship between instructional expenditures and student achievement.

Another study that links student achievement and expenditures was done in Georgia by James et al. (2011). This study included 2 years of data from 180 Georgia school districts; the examination encompassed the Grade 8 Criterion-Referenced Competency Test (CRCT) in mathematics and reading and the 11th grade Georgia High School Graduation Test (GHSGT) in mathematics and ELA. James et al. compared the results on these assessments using forward multiple regressions to seven different financial expenditure categories on student achievement variables. The predictor variables were teacher salaries and benefits, instruction, pupil services,
improvement of instructional services, media services, technology, and other. Overall, it was determined that financial expenditures had a significant, although small, effect on student achievement (James et al., 2011). Interestingly, improvement of instructional services had a significant effect on every student achievement variable. Technology, teacher salary and benefits, and improvement of instructional services predicted 18.8% of the variance in the ELA GHSGT. For every 1% increase in technology funding, the 11th grade ELA GHSGT assessment went down by .107 percentage points. James et al. pointed out that the literature and other potential benefits of technology did not agree with their findings.

Papke (2005, 2008) found that “Proposal A” school finance reform in Michigan increased spending in previously lower-spending and higher-spending districts, but average-spending districts did not spend quite as much after the Proposal when compared to lower-spending districts. Papke (2005, 2008) also found that the reform and increases in spending significantly influenced student achievement in fourth grade math standardized test scores. Papke’s 2008 study replicated his 2005 study, but included district-level instead of school-level data and allowed a longer “lag” time for the after-effects of Proposal A. The results were particularly strong for those districts that initially demonstrated below-average pass rates on the test. The results were presented using fixed-effects instrumental variable estimates. Papke’s (2008) conclusion was that, on average, a 10% increase in real spending for the current and previous 3 years increased students performing satisfactorily by 2.5 percentage points. By allowing for the longer lag time and taking the dramatic increase in funding that occurred, Papke (2008) was able to control for some of the traditional effects of school input research in which unobserved variables such as economic and demographic variables can affect student outcomes. Therefore, sometimes high spending can be linked to student achievement when it is, in reality, linked to
some other unobserved variable. In the present study, I allowed this by using the population of the desired districts and hierarchical regression to check for strength of impact and influence of the variable of interest.

In addition to the Coleman Report (Coleman et al., 1966) and the multiple Hanushek (1989, 1996, 1997, 2008, & 2016) articles previously mentioned, not all contemporary studies indicate significant relationships between funding and student achievement. De Luca and Hinshaw (2013) studied student achievement and school expenditures in 607 of 613 Ohio school districts. The other districts were left out because they were outliers due to small enrollment and incomplete data. The data were based on the 2009–2010 student achievement data from state assessments and were grouped by the three different levels identified as highest, continuous improvement, and lowest. Expenditure categories were grouped into the following categories: administration, building operations, instruction, pupil support, and staff support. Most technology was grouped in the instruction category. The stepwise regression analysis showed weak and inconclusive results between instructional expenditures and student achievement (De Luca & Hinshaw, 2013). Interestingly, after residual tests were run, De Luca and Hinshaw found that income might have more to do with student achievement than did classroom instructional expenditures.

**Technology**

Technology and student achievement do not have a clearly defined relationship, and every researcher defines technology differently. For the present study, it was defined as the administrative information technology budget as a percentage of the overall general expense budget. Shapley et al. (2011) conducted an experimental design study in the Texas school systems that received grants for the 1:1 technology immersion program. A Likert scale survey
was used to gain insight into technology proficiency, classroom activities, and small-group work. Attendance measures and disciplinary measures were taken from the Texas educational data warehouse, PEIMS. Experimental schools were paired with control groups that were not a part of the program. It is important to note that these control schools still had access to technology; they just were not in the 1:1 laptop immersion program. The technology immersion program had significant positive effects on technology proficiency, frequency of technology-based instruction, and small-group interactions. Discipline rates declined, but control group students tended to attend school somewhat less frequently than did the experimental groups. There were no significant effects on reading or math scores, but they were significantly positive across cohorts and most significant in Cohort 1 math scores when poverty was taken into effect. The leaders in the treatment group stressed the importance of technology and improving 21st century skills for students. Shapley et al. stressed the need to not just throw computers and software at school districts; instead, there is professional development, technology factors, and a myriad of other factors that go into helping a school successfully implement technology.

A study by Harris et al. (2016) showed that 1:1 technology could have an impact on student achievement. In their study, Harris et al. used fourth grade elementary students in a Title I school. The data used to assess student achievement included the Pearson enVision Math series with topic tests, Discovery Education Assessment results, and attendance records. The study was quantitative in nature and utilized one elementary classroom that was piloting a 1:1 laptop program and another that was still using traditional teaching methods. The study did not identify any instances that would indicate that technology and, more specifically, a 1:1 program have an effect on student achievement or motivation. Harris et al. used descriptive statistics such as mean scores to compare the districts and ultimately concluded that it did not appear that
technology had a high impact on student achievement, but noted that scores on Discovery Tests A and B did appear to be higher in the experimental group. The study utilized a small sample size of 25 in the experimental classroom and 22 students in the traditional classroom. The small sample size and very limited setting were very large limitations of the study.

Williams and Larwin (2016) conducted a study in Ohio schools using data from the Ohio Graduation Test (OGT) as a measure of student achievement and matched control schools that did not have 1:1 computing with an experimental school that did. They measured on multiple subjects including math, science, reading, social studies, and writing (Williams & Larwin, 2016). In order to gather the data, Williams and Larwin administered a survey to all high schools in Ohio asking whether a 1:1 program was used, if students were able to take the laptops home, and for how long the 1:1 program had been implemented. Schools that did not meet the guidelines for the study were excluded. Schools were paired on based on Ohio’s Department of Education webpage for year 2013 based on factors related to average daily membership, median income, population density, student demographic data for minority enrollment and poverty, and adult demographic percentages for college degrees and professional jobs. Ultimately, 24 high schools were identified as meeting the criteria set forth by Williams and Larwin. The data were analyzed for 5 to 8 years based on when the 1:1 program was introduced and, additionally, an interrupted time series method was utilized to analyze student achievement scores before the 1:1 program was introduced and compare it to years after the deployment of the program. Individual student scores were analyzed for research questions that required full sample or individual scaled scores. Williams and Larwin found that, overall, no significant differences occurred between the control and treatment schools of the 48 schools utilized. However, it is important to note as schools are broken down into smaller clusters, such as longevity of 1:1 programs, inconsistent significant
results do start to emerge. It is also interesting that schools using netbooks rather than laptops or iPads showed significantly greater gains in all five content areas. As demonstrated by other studies, there were five treatment schools that showed consistently positive and five treatment schools that showed consistently negative trends across multiple content areas when compared to control schools (Williams & Larwin, 2016). This trend cuts across devices used and deployment or implementation time, which indicates other factors that are related to the deployment of a 1:1 program and its relationship to student achievement.

A similar study was conducted by Huang (2015), using a mixed-method approach and focusing on a Southern U.S.-based second grade class. Huang used a similar design setup where there was one experimental group and one control group. For the quantitative side, Huang administered the Expressive Vocabulary Test-2 for pretest and posttest tracking. The experimental group utilized technology in the instruction such as E-PowerPoints, rhymes, simple sentences, and short stories accompanied by voiceovers, sound, and animations. The control group used pen-pencil, textbook, and other traditional methods. The experimental group still had access to these methods as well. The population was economically disadvantaged, and between the two classes, there were 40 students in the study. For the qualitative portion of the study, Huang interviewed students on their perceptions of literacy learning and the technology aspects of it. Observations were conducted before and during treatment. The experimental group showed significant changes in pre- and posttest scores based on the dependent sample t test that was run between the scores, while the control group demonstrated no changes (Huang, 2015). The experimental group was shown to be more engaged in class. However, the study utilized a small sample size, which invites criticism. In addition, only two vocabulary software programs were utilized in the experimental group, which could limit generalizability.
Kiger, Herro, and Prunty (2012) compared the effects of a mobile learning intervention on third grade students in mathematics at a Midwestern elementary school. There were four classrooms observed in total, two were an experimental group and two were a control group. In total there were 87 students, which was 97% of the third grade class. The control group utilized Everyday Math and practiced multiplication using flashcards, while the experimental group used Everyday Math and web apps for the IPod touch. Several factors were controlled for, including teacher’s master’s degree in educational technology, student demographics (free-and-reduced lunch, and ethnicity), student absences during intervention, student math effort and attitude during intervention, state third grade math test before intervention, multiplication pretest, and the previous teacher. The results showed that there was a significant difference between experimental students’ postintervention test results and those of the comparison students. There was a single-step regression analysis conducted and 68.1% of the variance was explained by Kiger et al.’s model. Other than the pretest score, the mobile learning intervention was the biggest predictor of performance on the posttest. The medium-sized performance advantage for the experimental group was significant at the .01 alpha level. This could have implications to encourage districts to purchase devices and apps that could help students learn multiplication.

Major limitations were the amount of time over which the study was conducted that could make the learning device new or novelty, the sample size was small and hence could yield larger results, there could be confounding pretreatment group differences, and the Kiger et al. did not evaluate the teacher’s role in the treatment groups.

A qualitative study was conducted by Storz and Hoffman (2013) in which Grade 8 students and teachers were interviewed before and after the implementation of a 1:1 initiative in a Midwestern urban middle school. Storz and Hoffman interviewed 47 students, representing
about half of the eighth grade class as well as eight teachers. The school had a large (85%) African American population and more than half (65%) were economically disadvantaged. The school had not met the adequate yearly progress designated by the state for the previous 3 years. The teachers indicated the range of students interviewed were representative of the eighth grade class in terms of technology ability levels and personalities. The interviews were semistructured in design and the postintervention interviews were conducted about two months after the rollout of the program. The themes that emerged from the analysis of the transcripts were changes in teacher pedagogy, student learning changes, impact on classroom behavior and management, need for better communications, and need for additional professional development (Storz & Hoffman, 2013). Students of different ability levels reported having learning benefits even though there was now the added distraction potential of communication and online gaming via the computers. The technology-based instruction allowed students to learn in differentiated and creative ways; however, increased demands were placed on teachers. With the varied level of experience and preparedness for a 1:1 initiative, teachers reported being unprepared and frustrated, although they offered suggestions for professional development moving forward beyond the initial implementation of the program.

Student Variables

**Student socioeconomic status.** Socioeconomic status in this current study was defined by the percentage of students on free and reduced lunch as recorded by the New Jersey bureaucrats and reported annually on the NJ School Performance Report. The importance of socioeconomic status as it relates to student achievement was stressed by Coleman et al. (1966) in the Coleman Report. The Report included data collected from 640,000 superintendents, principals, teachers, and students. The intent of the Report was to understand the inequality or
segregation of schools. Coleman et al. found that schools remained segregated and unequal, but the critical finding was that schools do not really have an impact on student achievement. As discussed previously, Coleman et al (1966) concluded that school funding does not greatly affect student achievement, and socioeconomic status has the highest impact.

Other researchers also have concluded the importance of socioeconomic status on student achievement. Emphasizing the importance of student achievement, Tienken (2012) discussed that economically disadvantaged students have never been reported as scoring higher than middle class or more affluent peers, regardless of state or grade. The Organization for Economic Co-operation and Development (OECD, 2012) reported that more than other OECD countries, in the United States, two students from different socioeconomic backgrounds will vary greatly. The OECD (2012) also reported that as much as 17% of the variation in student performance can be explained by differences in socioeconomic status.

A study to examine the Florida Comprehensive Assessment Test (FCAT) mathematics scores confirmed what Ravitch concluded: the schools with the lowest socioeconomic standing scored the worst on the exam and scores got better as poverty decreased (as cited in Lumpkin, 2016). This is one of the strongest predictors of student achievement (Lumpkin, 2016).

**English language learners (ELLs).** ELLs are also required to take the PARCC examination. The NJDOE reported that for the 2016–2017 school year, 6.2% of the student population was classified as ELLs. Under the NCLB (2002), students that are classified as ELL, unless new to the school, were mandated to take the annual standardized assessment required under NCLB within reasonable accommodation. ELL learners is a broad category and thus the various ethnicities and languages that make up the ELL population carry specific characteristics and challenges. Nationally, the population of ELL students is increasingly on the rise, as evident
from the National Center for Education Statistics (NCES, 2018) report that in the 2014–2015 school year, 4.6 million or 9.4% of students were considered ELL. This was up from the 2004–2005 school year that had 4.3 million or 9.1% of students considered ELLs (NCES, 2018).

In one study completed by using the publicly available data in the state of Texas, Flores and Drake (2014) evaluated the likelihood of an ELL student to need remedial services when entering college. Flores and Drake determined that some precollege characteristics that impacted Latino or Hispanic families have no impact on Asian students. One interesting factor that impacted both groups is the negative impact of segregation in the high school setting (Flores & Drake, 2014).

In Tennessee, Miley and Farmer (2017) conducted a study to compare ELL and non-ELL students’ performance on the Tennessee Comprehensive Assessment Program (TCAP) and ELL student’s performance on the WIDA ELL exit examination and performance on the TCAP. The WIDA examination measures English proficiency and an ELL student’s ability to exit the program. The study consisted of 302 elementary and middle schools from the 2015 school year. After independent $t$ tests were run, Miley and Farmer determined that there was a significant difference between ELL students’ performance on the TCAP examination and non-ELL students’ performance. Non-ELL students’ achievement levels in both ELA and mathematics were higher than those of students that passed the WIDA exit examination (Miley & Farmer, 2017).

**Students with disabilities.** In 2004 the Individuals with Disabilities in Education Act (IDEA) was passed, mandating that students aged 3–21 be provided a free and appropriate education. The NCES (2017) reported that as of 2014–2015, the number of special education students was 6.6 million or 13% of the total public-school education population. The NJDOE
(2018) reported in the School Performance report for the 2016–2017 school year that 16.9% of students were classified as students with disabilities and served with an Individualized Education Plan (IEP).

There are various ways to educate students with disabilities and there is a wide array of studies on the different programs and their effects on student achievement. In one study, Packard, Hazelkorn, Harris, and McLeod (2011) looked at ninth grade students with IEPs in a southern state. Of the 28 students with IEPs, who had a learning disabled (LD) classification, 14 were studied. Some of those students were assigned to a resource room and some were assigned to a coteaching classroom based on the recommendation in their IEPs. The scores were compared using analysis of covariance (ANCOVA) and chi-squared analysis. Although there were no significant differences, students appeared to make greater gains on the state standardized test in the resource room classroom then did those in the cotaught classroom (Packard et al., 2011).

Gage, Adamson, MacSuga-Gage, and Lewis (2017) looked at the academic achievement of students with emotional-behavioral disorders and compared it to characteristics of highly qualified teachers such as teachers’ education, certification status, and years of experience. Then, Gage et al. examined the data in the Special Education Elementary Longitudinal Study (SEELS) nationally and, using a weighted sample of 39,561 students, analyzed those students in three waves based on age. Using hierarchical linear modeling, Gage et al. found low academic achievement for students with emotional-behavioral disorders, a null effect for change in academic achievement over time, and a null effect for the relationship between characteristics of highly qualified teachers (identified above) and student academic achievement.
In another study, Gronna, Jenkins, and Chin-Chance (1998) used data collected in Hawaii on students that took the Stanford Achievement Test 8th edition (Stanford 8) and compared performance of students that have disabilities and those that do not. At the time testing was completed in grades 3, 6, 8, and 10. The study used three longitudinal cohorts in grades 3 to 6, 6 to 8, and 8 to 10 and ANOVA were run to determine the differences between disabled and nondisabled students that took the exam. The study found significant differences in performance between students classified and specific learning disabled, emotional impairment, and mild mental retardation and their nondisabled counterparts.

**Student attendance.** In the present study, attendance was controlled for by the district’s percentage of chronic absenteeism as reported on the NJ School Performance Report. In New Jersey, the district rate of chronic absenteeism statewide was 10.3% during the 2016–2017 school year. This rate was 11.2% for ELLs and 16.2% for students with disabilities.

A study of Ohio schools showed a statistically significant relationship between student attendance averages and student achievement on their fourth, sixth, ninth, and 12th grade Ohio Proficiency Tests (Roby, 2004). A total of 3,171 schools were selected from publicly available data on the Ohio Department of Education’s website. The study used the Pearson r statistic to determine the strength and relationship of the variables. Due to the large sample size, Roby (2004) were able to calculate the Pearson r at the .01 confidence level. Roby (2004) found the strongest positive correlation in Grade 9 with a Pearson r value of .78 and explained 60% of the variance, while 32% of the variance was explained in Grade 4 and 29% of the variance in Grades six and 12.

Gershenson (2016) compared teacher effectiveness and its relation to student achievement and student absences using longitudinal data from North Carolina’s public schools
for students who attended during the 2005–2006 and 2009–2010 school years in Grades 3 through 5. The North Carolina year-end criterion referenced, state-mandated test was used as the measure of student achievement. In total, 446,244 student-year observations were used in 27,943 unique classrooms that consisted of 13,391 unique teachers (Gershenson, 2016). Based on the results, Gershenson reported similar magnitudes in standard deviation (SD) for teacher absences related to teacher effectiveness as for teacher effectiveness in student achievement. There were strong, negative, and significant relationships identified by teacher effectiveness and student achievement. The adjusted $R^2$ value to report the amount of absences based on teacher effectiveness was .38. According to Gershenson, teacher effectiveness mattered more in the subject of mathematics than in reading.

Staff Variables

Percentage of faculty with advanced degrees. In the Coleman Report, Coleman et al. (1966) looked at teacher quality and determined, especially as related to minority children, that verbal acumen scores and educational background had the highest correlation to student achievement in relation to staff variables. Coleman et al. noted that teacher education will matter more to a student who does not typically experience a highly educated teacher than one who is used to this type of teacher. Due to reporting by the bureaucrats, especially in New Jersey, up until recently, limited data analysis was available for teacher experience based on graduate degrees or licensing (Hanushek, 1997; Hedges et al., 1994). Today, the state reports the percentage of faculty that hold bachelor’s, master’s, or doctoral degrees by district, school, and at the state level. In the 2016–2017 year the NJ School Performance Report indicated that statewide there were 57% bachelor’s, 42% master’s, and 1% doctoral degree teachers.
Clotfelter, Ladd, and Vigdor (2007) looked at teacher characteristics and their relationship to student achievement in North Carolina, using the year-end examination as the measure of student achievement and looked at whether advanced degree, teaching experience, quality of undergraduate institution, licensure type, and score on licensure examination affected student achievement. While teaching experience, competitiveness of undergraduate institution, licensure type, and score on licensure examination all seemed to have an effect on student achievement, the graduate degree status did not (Clotfelter et al., 2007). In the study, Clotfelter et al. (2007) determined that if the graduate degree is sought after 5 years of teaching, there tends to be a negative effect on student achievement. Similar results were found by Clotfelter et al. (2012), except in this later study, they found a small positive coefficient of .004 that is significant at the 10% level in their regression analysis. This study was also conducted using North Carolina end-of-course content examinations. In this later study, Clotfelter et al. (2012) also found a negative effect with teachers that possess a Ph.D., but it is important to note the small sample size. Graziano (2012) confirmed that “faculty mobility and MA + are statistically significant predictors for HSPA performance ($F$ change= 6.968; $df = 2.236$; and $p <.001$)” (p. 140). Graziano (2012) further reported that schools tend to perform better when there are more teachers with advanced degrees.

**Faculty attendance.** There is limited research on the relationship between faculty attendance and student achievement, but from the research that exists, there is a relationship. In a study conducted by Clotfelter et al. (2007) conducted a longitudinal study of students in North Carolina and “were able to control for time-invariant skill and effort levels of teachers and provided causal evidence that teacher absences negatively affect student achievement” (p. 184).
Miller (2012) highlighted the recent focus on teacher absenteeism. The Civil Rights Data Collection is a report collected on the national level and the 2012 school year was the first time that teacher absenteeism was collected as part of the submission. Miller pointed out the cost of teacher attendance as a scarce resource and emphasized its importance: “Teachers are the most important school-based determinant of a students’ academic success. It’s no surprise researchers find that teacher absence lowers student achievement” (p. 1).

This report was a follow-up to a study by Miller, Murnane, and Willet (2007), in which they examined a large urban school district to look at teacher absence and mathematics and ELA student achievement on year-end tests. The comparison showed that 10 days of absence by teachers can reduce achievement 3.3% of a standard deviation. The achievement differences had a negative relationship on both the math and ELA sections, but the disparities were greater in terms of mathematics (Miller et al., 2007).

A study conducted by Tingle et al. (2012) in an urban school district in the Southwestern United States produced mixed results on the relationship between teacher absences and student achievement. This study resulted from a question by the accountability office and the school board and utilized both school-level and teacher-level data to predict student achievement. Interestingly, Tingle et al. found that in schools where teacher absences were low, there was a negative relationship between teacher absences and student achievement. However, where teacher absences were identified as high, there was no relationship between the two variables or a “wash-out” occurred (Tingle et al., 2012).

**Conclusion**

Data are often not published at the district level and, therefore, there are no seminal works on how the percentage of certain line-item school budgets relate to student achievement.
Electronic standardized testing is on the rise with PARCC examination, so it is crucial to look at the percentage of money being spent on technology infrastructure and its relationship, if any, to student achievement on these new, online, high-stakes tests.

Since the publication of the Coleman Report (Coleman et al., 1966), there has been extensive conflicting literature on whether school budgets really matter in relationship to student achievement. Extensive literature shows that other factors controlled for in the present study do influence student achievement, including socioeconomic status, special education status, ELL status, student attendance, faculty attendance, and percentage of faculty with advanced degrees. Therefore, by controlling for these factors, this study will add to the current literature on school finance and technology’s influence on student achievement.
CHAPTER 3

METHODOLOGY

I conducted a quantitative research study to explain the possible relationship between student, staff, and school district variables on student achievement and used New Jersey school districts’ administration information technology budget as a percentage of the overall total undistributed expense funds as a variable of interest. Due to the limited lack of existing quantitative research on technology school finance and student achievement, I explored the administration information technology budget as percentage of overall undistributed expense funds to K-12 and PK-12 districts’ student achievement in New Jersey school districts. This was measured by the results from the PARCC exam grades for the 2016–2017 school year in ELA and mathematics. This study adds to the existing literature providing policymakers and administrators with data they need to help better understand the nature of the relationship between school district spending on technology infrastructure and student achievement.

Organization of the Chapter

The chapter is organized starting with the purpose of the study, followed by discussion of the research questions. The second half of this chapter encompasses the research design, including discussion of the sample, variables, and data collection. Finally, the chapter concludes with a discussion of the reliability and validity of the study and the data analysis procedures.

Purpose of the Study

The purpose of this study was to explain the influence, if any, of the percentage of districts’ administrative information technology budgets on a New Jersey K-12 or PK-12 district’s student achievement in mathematics and ELA as measured by the 2016–2017 scores on the PARCC examination. I also included the amount of variance that could be explained by
administration information technology budgets when controlling for additional factors that influence student achievement, such as the school district’s percentage of special education, percentage of ELL students, student attendance, faculty attendance, percentage of faculty with advanced degrees, district size, and percentage of students on free and reduced lunch. The results of the study may help policy makers and administrators identify appropriate administration information technology budgets for maintaining student achievement on the PARCC, save district resources by eliminating unnecessarily high administration information technology budgets, and/or increasing technology budgets to increase student achievement on the PARCC.

**Research Questions**

Research Question 1: What is the nature of the relationship between a New Jersey K-12 or PK-12 school district’s administration information technology budget in relation to the overall undistributed expenditures budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 English Language Arts (ELA) Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?

Research Question 2: What is the nature of the relationship between a New Jersey K-12 or PK-12 school district’s administration information technology budget in relation to the overall undistributed expenditures budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 Mathematics Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?
Null Hypotheses

Null Hypothesis 1: No statistically significant relationship exists between a New Jersey K-12 or PK-12 school district's percentage of the administration information technology budget in relation to the overall undistributed funds budget on the percentage of students who perform at a Level 4 (L4) or level 5 (L5) on the 2016–2017 English Language Arts (ELA) Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for staff, student, and district variables.

Null Hypothesis 2: No statistically significant relationship exists between a New Jersey K-12 or PK-12 school district’s percentage of the administration information technology budget in relation to the overall undistributed funds budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 Mathematics Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for staff, student, and district variables.

Research Design

I used a quantitative, nonexperimental, correlational, cross-sectional, explanatory research design to explain the relationship that potentially exists between a New Jersey K-12 or PK-12 school district’s administration information technology budget as a percentage of the overall undistributed funds budget and student achievement on the ELA and mathematics sections of the 2016 PARCC examination.

I first used simultaneous multiple regression to explain the influence of the independent variable on the dependent variables. This was used to determine the overall impact of the variables. Based on the results of the simultaneous multiple regression models, I developed hierarchical regression models and used them to determine if the variable of interest, percent of
administrative information technology budget, adds value to explaining the relationship between all of the predictor variables and the outcome variable of 2016–2017 PARCC scores (Leech, Barrett, & Morgan, 2011). I used the following student variables: overall percentage of special education students in the district, overall percentage of ELLs in the district, overall percentage of student chronic absenteeism for the district, and the overall percentage of students on free and reduced lunch in the district. I also used the following staff variables: overall staff attendance rate and percentage of teachers with advanced degrees for the district. Finally, the following district variables were utilized in the study: district size determined by overall enrollment, administration information technology annual budget as percentage of overall undistributed expenditure annual budget, and the percentage of students receiving an L4 or L5 on both the mathematics or ELA portions of the 2016–2017 PARCC examination. These scores identify students who have met or exceeded expectations on both the mathematics and ELA portions of the 2016–2017 PARCC. I was able to determine the strength and significance of the relationship between the variables through the use of simultaneous multiple regression and hierarchical multiple regression analyses.

**Sample Population and Data Source**

The sample for this study consisted of all public K-12 and PK-12 school districts within 20 of the 21 counties of New Jersey. None of the districts listed in Salem County were classified as either PK-12 or K-12, so they were excluded from the study. Table 2 shows the breakdown with number of districts from each county.
Table 2

*Number of Districts by County in New Jersey Utilized in Present Study as Calculated by Peter Lutchko*

<table>
<thead>
<tr>
<th>County</th>
<th>Number of districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic</td>
<td>5</td>
</tr>
<tr>
<td>Bergen</td>
<td>30</td>
</tr>
<tr>
<td>Burlington</td>
<td>8</td>
</tr>
<tr>
<td>Camden</td>
<td>11</td>
</tr>
<tr>
<td>Cape May</td>
<td>2</td>
</tr>
<tr>
<td>Cumberland</td>
<td>3</td>
</tr>
<tr>
<td>Essex</td>
<td>15</td>
</tr>
<tr>
<td>Gloucester</td>
<td>6</td>
</tr>
<tr>
<td>Hudson</td>
<td>9</td>
</tr>
<tr>
<td>Hunterdon</td>
<td>1</td>
</tr>
<tr>
<td>Mercer</td>
<td>9</td>
</tr>
<tr>
<td>Middlesex</td>
<td>17</td>
</tr>
<tr>
<td>Monmouth</td>
<td>12</td>
</tr>
<tr>
<td>Morris</td>
<td>13</td>
</tr>
<tr>
<td>Ocean</td>
<td>8</td>
</tr>
<tr>
<td>Passaic</td>
<td>7</td>
</tr>
<tr>
<td>Somerset</td>
<td>8</td>
</tr>
<tr>
<td>Sussex</td>
<td>1</td>
</tr>
<tr>
<td>Union</td>
<td>11</td>
</tr>
<tr>
<td>Warren</td>
<td>2</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td><strong>178</strong></td>
</tr>
</tbody>
</table>

The study excluded school districts that maintained magnet schools, vocational schools, charter schools, and special education schools. The school districts that were included in the sample met the following criteria:

- The school districts were classified as public.
• The schools were classified as either a K-12 or PK-12 district.

• The school districts reported all testing, budget, and demographic information to the NJDOE.

The number of school districts that had complete data for each subject for K-12 and PK-12 districts included the following:

• Mathematics \((n = 178)\)

• ELA \((n = 178)\)

The rationale for the PK-12 and K-12 district selection was that these district types encapsulate all grades that would take the PARCC examination in the 2016–2017 school year. Any district serving schools Grades 3–11 must take the PARCC exam. The enrollment in the districts ranged from 738 to 40,802 students served.

Data Collection

The data for this study were retrieved from the NJDOE’s (2017a, 2017d) website. The 2016–2017 District Performance Report Excel spreadsheet was downloaded and saved in a data file. Data from all public K-12 and PK-12 school districts that tested students in Grades 3–11 on the PARCC examination were used in this study. The Excel file from the NJ School Performance Reports and budget file for the 2017–2018 school year obtained from (NJDOE, 2017d) and imported into Microsoft Access. The 2017–2018 file was used because the revised 2016–2017 budget is included in this file, which is the same year as the testing data. Queries were designed to create a table using identified variables, and this table was then exported into Excel. Various sorting options served to remove data that did not meet the study criteria. Districts that had incomplete or missing data were also removed from the study. The remaining
districts were organized in Microsoft Excel alphabetically. The data retrieved from the NJDOE and utilized in the Excel spreadsheet using the variables and descriptors shown in Table 3.

Table 3

Variables and Descriptors as Created and Determined by Peter Lutchko

<table>
<thead>
<tr>
<th>Data element</th>
<th>Level of measurement</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>County code</td>
<td>Nominal</td>
<td>Unique code used by state to determine which county a school district is in</td>
</tr>
<tr>
<td>District name</td>
<td>Nominal</td>
<td>The formal district name</td>
</tr>
<tr>
<td>Grade span</td>
<td>Nominal</td>
<td>The grades served by each district</td>
</tr>
<tr>
<td>District code</td>
<td>Nominal</td>
<td>Unique code used by state to determine specific district</td>
</tr>
<tr>
<td>Faculty attendance</td>
<td>Ratio</td>
<td>The percentage of days that faculty were marked present during the school year</td>
</tr>
<tr>
<td>Percentage of faculty with a master’s degree</td>
<td>Ratio</td>
<td>Percentage of faculty that hold a master’s degree from an accredited university</td>
</tr>
<tr>
<td>Percentage of faculty with a doctoral degree</td>
<td>Ratio</td>
<td>Percentage of faculty that hold a doctoral degree from an accredited university</td>
</tr>
<tr>
<td>Combined percentage of faculty with master’s degree or higher</td>
<td>Ratio</td>
<td>Manually combined column of total faculty with master’s and doctoral degrees</td>
</tr>
<tr>
<td>Overall district enrollment</td>
<td>Ratio</td>
<td>Total number of students served in a district</td>
</tr>
<tr>
<td>Percentage of students eligible for ELL services</td>
<td>Ratio</td>
<td>Percentage of students eligible to receive ELL support</td>
</tr>
<tr>
<td>Percentage of students with disabilities</td>
<td>Ratio</td>
<td>Percentage of students served by an IEP</td>
</tr>
<tr>
<td>Percentage of students labeled economically disadvantaged</td>
<td>Ratio</td>
<td>Percentage of students receiving free and reduced lunch in a district</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Data element</th>
<th>Level of measurement</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of students marked chronically absent</td>
<td>Ratio</td>
<td>Percentage of students marked chronically absent, determined by ESSA as a student missing more than 10% of the days enrolled in a district.</td>
</tr>
<tr>
<td>Percentage of students receiving an L4 or L5 of meeting or exceeding standards on the PARCC examination in ELA literacy</td>
<td>Ratio</td>
<td>Percentage of students that received either an L4 or L5 on the ELA portion of the PARCC examination in 2016–2017 testing year.</td>
</tr>
<tr>
<td>Percentage of students receiving an L4 or L5 of meeting or exceeding standards on the PARCC examination in mathematics</td>
<td>Ratio</td>
<td>Percentage of students that received either an L4 or L5 on the Mathematics portion of the PARCC Examination in 2016–2017 testing year.</td>
</tr>
<tr>
<td>Undistributed expenditure budget total</td>
<td>Ratio</td>
<td>The total funds allocated to the undistributed expenditure funds budget. These are funds that are not readily assignable to a specific program.</td>
</tr>
<tr>
<td>Undistributed administrative information technology budget</td>
<td>Ratio</td>
<td>A specific undistributed account that is a support services account and includes administration of supervision of technology personnel, systems planning and analysis, systems application development, systems operations, network support services, hardware maintenance and support, and other technology related administrative costs.</td>
</tr>
<tr>
<td>Undistributed administrative information technology budget as a percentage of the overall undistributed expenditure budget total</td>
<td>Ratio</td>
<td>This is a manually manipulated field that covers the administrative information technology budget as a percentage of the overall undistributed expenditure budget.</td>
</tr>
</tbody>
</table>
The overall percentage of faculty with a master’s degree or higher was determined by combining the columns of faculty with master’s degrees and doctoral degrees. This was done in Excel by creating a formula for the sum of the percentages of the two columns.

The percentage of administrative technology and overall undistributed expense budgets for the districts were added to the spreadsheet and percentage was calculated. This was calculated by taking the administrative information technology budget and dividing it by the overall undistributed expense budget and then taking the value and turning it into a percent. One column represented the total undistributed expenditure budget, one represented the undistributed administrative information technology budget, and the third represented a formula of the administrative information technology budget column divided by the total undistributed expenditure budget. The values in the third column were then converted to a percent in Excel (see Appendix for spreadsheet layout). The data were retrieved from the NJDOE (2017a) for the 2016–2017 school year.

**Dependent Variables**

The percentage of students that were rated as meeting or exceeding expectations on the 2016–2017 PARCC examination in ELA and mathematics were the dependent variables. The PARCC examination is used to evaluate students in both the areas of ELA and mathematics. There is a 5-point scoring system, including L1 (*not yet meeting expectations*), L2 (*partially meeting expectations*), L3 (*approaching expectations*), L4 (*meeting expectations*), and L5 (*exceeding expectations*). In order for a student to get an L1, he or she must score between 650–700, L2 is 700–725, L3 is 725–750, L4 is 750–810, and L5 is 810–850. Each content area or subject matter has performance level indicators (PLIS) that determine where a student must be to make each cutoff. Those scoring below an L4 are considered not on track for their grade and
may require additional help to meet standards. The test is aligned with the federal Common Core standards (PARCC, 2018b).

The test serves various uses. In New Jersey, it is used to meet high school graduation pathway requirements. By the high school graduation class of 2021, the only pathway to graduation will be to pass the PARCC ELA Grade 10 and PARCC Algebra I. The only other option will be to do a portfolio appeal that is only available if all required PARCC exams have been taken (NJDOE, 2018). The tests can also be used to identify districts, schools, or students that need remedial help.

**Reliability and Validity**

Every year following the administration of the PARCC examination, Pearson releases the technical report on the reliability and validity of the previous year’s examination. The test was created, scored, and dispersed (most electronically) by Pearson. Pearson has conducted several studies in addition to the technical report to ensure reliability and validity. This includes a field test during test development, automated scoring research studies, accessibility studies, benchmarking studies (to ensure their performance level descriptors were on target), device comparability (tablet, laptop, desktop), quality of items, and cognitive complexity studies (PARCC, n.d.).

The PARCC (2018a) Technical Report for the 2016–2017 administration of the PARCC examination was published in March 2018. To ensure reliability, Pearson published stratified reliability alpha rather than the more common Cronbach’s reliability coefficient because the PARCC examination is a mixed-method type including dichotomous and polytomous items. The reliability score will range from 0 to 1, with 1 indicating the most reliable test or indicating a student’s likelihood to achieve the same score under similar testing situations. For computer-
based administration of the ELA PARCC test for Grades 3–11, the reliability alpha ranged from .962 to .970. For the paper-based administration, the scores ranged from .958 to .970. The standard error of measurement (SEM) ranges from 8.394 to 11.773 for computer-based testing and between 8.064 and 11.838 for paper-based administration.

In terms of mathematics the average reliability alpha ranges from .919 to .943 for computer-based testing and .909 and .944 for paper-based assessments in Grades 3–11. For high school assessments, the range is .923 to .942 for computer-based assessments and .927 to .943 for paper-based assessments. In terms of SEM, there was a range of 9.590 to 13.466 for computer-based administration and 9.716 to 14.460 for paper-based administration in Grades 3–11. For high school assessments, the scale score ranges for SEM were 9.855 to 14.479 for computer-based administration and 9.787 to 15.160 for paper-based administration.

The PARCC Technical Report (2018a) affirmed that construct validity is obtained through the internal test design by including hundreds of educators in the test and item design. The federal Common Core standards are used as a measure to determine item inclusion. There are also several studies, such as the one discussed below, that confirm the test’s validity.

Doorey and Polikoff (2016) compared the ACT Aspire test, PARCC, Smarter Balanced, and the Massachusetts Comprehensive Assessment System to check for the quality, reliability, and validity of these standardized tests. In the areas of ELA content and depth they claimed PARCC has an excellent match and for mathematics content and depth, PARCC received a good match (Doorey & Polikoff, 2016). The scale ranged from excellent match, good match, limited/uneven match, to weak match. Doorey and Polikoff stated, “PARCC and Smarter Balanced are a better match on the CCSSO criteria, which is not surprising, given they were both developed with common core in mind” (p. 3). Doorey and Polikoff also noted that in developing
a test there will be tradeoffs, but that the PARCC does a good job at measuring what it is supposed to measure.

Standardized tests that have high-impact decisions such as the PARCC examination do not go without criticism. Tienken (2008) stated,

The technical characteristics for the test results and the inherent social justice issues cannot justify the possible negative consequences attached to their use in a high-stakes manner. The confluence of sub-domain reliability estimates, relationships between District Factor Group and student test results, and sizeable standard error of measurement creates a conundrum for educators. (p. 58)

The tests continue to be supported by New Jersey bureaucrats through its continued use and by Pearson through its multiple studies and publications on the test, including the PARCC (2018a) 2017 Technical Report, as a valid and reliable measure of student achievement.

**Data Analysis**

The sample sizes necessary to achieve statistical significance of the regression models were calculated based on being able to identify a $p$ value at the .05 significance level and an effect size of at least 0.50. The strength and direction of the relationships between independent and dependent variables were determined by using the standardized beta in the models. For the simultaneous multiple regression models and hierarchical regression models, I used the formula that Field (2013) suggested to determine the required sample sizes to then determine statistical significance. The formula is $104 + k$, where $k$ represents the number of predictor variables. There were seven predictor variables utilized in this study. The minimum predictor variables were $104 + 7 = 113$ for enough statistical power to utilize the 95% confidence level and at least .50 effect size.

Six districts were dropped from the study due to not submitting the variable of interest (i.e., the administrative information technology budget) to the NJDOE. The overall sample size came to a total of $N= 172$. 55
Conclusion

By using the hierarchical regression model, I was able to successfully answer the research questions and determine the influence, if any, that the percentage of the undistributed expenditures has on PARCC examination scores. I checked this regression model against both the ELA and mathematics sections of the PARCC examination to fully answer all research questions.

Chapter 4 includes interpretation of these results based on the regression model. Significance was based on the .05 significance level to determine if the variable of interest—percentage of undistributed expenditures—has a significant effect on PARCC examination scores. The percentage of the influence of undistributed expenditures on student achievement were also determined while controlling for the other district, staff, and student variables.

Finally, Chapter 5 includes recommendations for policy, practice, and future research based on these interpretations.
CHAPTER 4

ANALYSIS OF THE DATA

My reason for conducting this cross-sectional, correlational, explanatory study was to explain the relationship between the percentage of the overall expenditure account to the overall undistributed expenditure account on the total percentage of students who met or exceeded expectations on the PARCC examination in both ELA and mathematics in New Jersey K-12 and K-12 school districts during the 2016–2017 school year.

The chapter is organized into three primary parts: (a) the procedures for collecting the data, (b) a review and report of all the descriptive statistics of the sample, and (c) the results of the statistical analyses based on each research questions posed. Lastly, this chapter concludes with a brief section articulating the results in a succinct manner to answer each research question.

Procedure

The first step of the data analysis process was to analyze the descriptive statistics of all variables. For the variable of interest, the percent of the administrative information technology budget as percent of the undistributed expenditure budget and the proportion of the overall undistributed expenditure accounts was utilized as the metric of choice for this analysis. The undistributed accounts are budget accounts that are not readily assignable to a specific program. The administrative information technology budget is one of these budget line items. Subsequently, the following steps were performed for each subject area of the PARCC examination to potentially identify the significant independent variables and their strength of influence. The first step was to run a simultaneous multiple regression that included all independent variables to determine which, if any, of the independent variables were statistically significant predictors. During this step, it was identified in all simultaneous models that the ELL
variable created multicollinearity issues and was dropped from the models. The regression models indicated that a strong relationship existed between the variable ELL (Ell) and socioeconomic status (freereduce), which could be potentially creating multicollinearity issues in the models. Since the relationship was strong, ELL could be considered a relative proxy variable for socioeconomic status and possibly obfuscate the regression analyses. Consequently, the prudent and practical solution was to drop ELL from the models. Subsequently, the simultaneous regression analyses were run again, excluding the variable ELL.

From the results of the initial regression analysis, hierarchical regression models were formed. All significant $p$ values were included in order of significance in each hierarchical model and the variable of interest was added last to determine if the variable of interest provided for a “value-added” effect. Based on the results from the hierarchical model the following statistics were noted and interpreted:

1. The overall statistical significance from the ANOVA table.
2. The $R^2$ and the $R^2$ changes were used to find out which variables contribute most to the overall variance of the outcome–dependent variable. These are displayed in the model summary tables throughout this chapter.
3. The Durbin-Watson statistic was noted from the model summary tables to check for autocorrelation between the variables in the regression analysis to confirm the assumption that the residuals are not correlated. A Durbin-Watson value between 1 and 3 indicates that the assumption has been met for that specific regression analysis (Field, 2013).
4. The partial correlation values were noted from the coefficients table, paying close attention to the statistically significant coefficients.
The collinearity statistics including tolerance and variance inflation (VIF) from the coefficients table were also provided for each analysis. VIF is defined as the variance inflation factor and determines the severity of multicollinearity between variables in a multiple regression analysis. Tolerance is another statistic that is used for the detection of multi-collinearity between variables in regression analysis (Leech et al., 2011).

**Descriptive Statistics**

The unit of analysis for this study was school district. The means and SDs for the dependent and independent variables used in the regression analyses were calculated and are reported below. The mean percentage of students who achieved meeting (L4) or exceeding expectations (L5) was approximately 49% with an SD of approximately 7.2. The mean percentage of students who qualified for free or reduced lunch was 34.2. The mean enrollment was 5,181 and mean of the administrative budget to overall undistributed expenditure budget was 1.46%. The percentage for students with disabilities was around 16% and for chronic absenteeism, 9.6%. The percentage of faculty with advanced degrees combined was about 44% and faculty attendance was about 96% days present. The full table of descriptive statistics is listed in Table 4.
Table 4

*Descriptive Statistics Table for Overall Population*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample N</th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabilities</td>
<td>172</td>
<td>16.30</td>
<td>16.35</td>
<td>3.24</td>
</tr>
<tr>
<td>Ell</td>
<td>172</td>
<td>5.61</td>
<td>3.30</td>
<td>6.01</td>
</tr>
<tr>
<td>chronicabsent</td>
<td>171</td>
<td>9.62</td>
<td>8.40</td>
<td>5.31</td>
</tr>
<tr>
<td>Enrollment</td>
<td>172</td>
<td>5180.72</td>
<td>3627.00</td>
<td>5255.22</td>
</tr>
<tr>
<td>freereduce</td>
<td>171</td>
<td>34.12</td>
<td>28.30</td>
<td>25.92</td>
</tr>
<tr>
<td>Facultyattend</td>
<td>170</td>
<td>96.23</td>
<td>96.70</td>
<td>1.86</td>
</tr>
<tr>
<td>advdegreecombine</td>
<td>172</td>
<td>44.35</td>
<td>44.50</td>
<td>14.48</td>
</tr>
<tr>
<td>ELA</td>
<td>172</td>
<td>49.06</td>
<td>49.00</td>
<td>7.21</td>
</tr>
<tr>
<td>MATH</td>
<td>172</td>
<td>49.7209</td>
<td>50.0000</td>
<td>7.45399</td>
</tr>
<tr>
<td>Peradminsinfotech</td>
<td>172</td>
<td>.0146</td>
<td>.0100</td>
<td>.00926</td>
</tr>
</tbody>
</table>

*Note.* Ell = ELL; chronicabsent = chronically absent; freereduce = free or reduced lunch; Facultyattend = faculty attendance; advdegreecombine = faculty with advanced degree combined; peradminsinfotech = percentage of administration information technology budget.

**Research Question 1**

The first research question was as follows:

What is the nature of the relationship between a New Jersey K-12 school district’s administration information technology budget in relation to the overall undistributed expenditures budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 English Language Arts (ELA) Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?

The sections that follow include the process used to answer Research Question 1.
Simultaneous Multiple Regression: ELA

I ran the first simultaneous regression model with all the predictor variables included. The model summary for the initial simultaneous regression run is shown in Tables 5 and 6. The ANOVA results table indicated that the regression was statistically significant ($F(7,160) = 8.755, p = .001$) and that the $R^2$ squared for this regression model is .277. This indicates that 27.7% of the outcome variable of PARCC ELA is explained by the variables in the regression model.

Table 5

ELA Model Summary

<table>
<thead>
<tr>
<th>Model summary$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

*Note. $^a$Dependent variable: ELA. $^b$Predictors: (Constant), advdegreecombine (faculty with advanced degree combined), enrollment, peradminsinfotech (percentage of administration information technology budget), disabilities, facultyattend (faculty attendance), chronicabsent (chronically absent), freereduce (free or reduced lunch).*

Table 6

English Language Arts ANOVA Table

<table>
<thead>
<tr>
<th>ANOVA$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>Residual</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

*Note. $^a$Dependent variable: ELA. $^b$Predictors: (Constant), advdegreecombine (advanced degree combined), enrollment, peradminsinfotech (percentage of administration information technology budget), disabilities, facultyattend (faculty attendance), chronicabsent (chronically absent), freereduce (free or reduced lunch).*
The coefficients table (see Table 7) showed that the statistically significant variables in the regression were chronic absenteeism, faculty with advanced degree combined, and enrollment. For chronic absenteeism ($t = -3.967, p < .001, \beta = -.362$) the partial correlation value (-.299) indicates that it explains 8.9% of the overall variance of the model. Since the relationship is negative, it indicates that as the rate of chronic absenteeism increases, the level of performance on the PARCC ELA decreases. For percentage of faculty with advanced degrees ($t = 2.909, p < .001, \beta = .223$) the partial correlation value of .224 indicates that 5% of the overall variance in the model can be explained by the percentage of faculty with advanced degrees. Furthermore, the relationship is positive, which indicates that as the percentage of faculty increases, so does the performance on the PARCC ELA. Finally, for enrollment size ($t = 2.644, p < .001, \beta = .204$) the partial correlation value of .205 indicates that 4.2% of the overall variance in the regression model can be explained by enrollment. The $\beta$ is positive, which indicates that as enrollment numbers in a school district increase, so does performance on the PARCC ELA. The variable of interest—the percentage of administrative information technology budget to overall undistributed expenditure budget—was not significant ($t = -.460, p = .646, \beta = -.032$). Although not significant, this demonstrates that the relationship is negative; as percentage of administrative information technology budget increases, performance on the PARCC ELA decreases. Finally, the partial correlation value of -.036 indicates that < 1% (.13) of the overall model can be explained by the percentage of administrative information technology budget.
Table 7

*English Language Arts Coefficients Table*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>Correlations</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aB</td>
<td>Std. Error</td>
<td>Beta</td>
<td>t</td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>33.516</td>
<td>28.014</td>
<td>1.196</td>
<td>.233</td>
</tr>
<tr>
<td>disabilities</td>
<td>-.167</td>
<td>.158</td>
<td>-.076</td>
<td>-1.061</td>
</tr>
<tr>
<td>freereduce</td>
<td>-.008</td>
<td>.026</td>
<td>-.027</td>
<td>-.295</td>
</tr>
<tr>
<td>enrollment</td>
<td>.000</td>
<td>.000</td>
<td>.204</td>
<td>2.644</td>
</tr>
<tr>
<td>chronicabsent</td>
<td>-.490</td>
<td>.123</td>
<td>-.362</td>
<td>-3.967</td>
</tr>
<tr>
<td>facultyattend</td>
<td>.180</td>
<td>.286</td>
<td>.046</td>
<td>.631</td>
</tr>
<tr>
<td>peradminsoftech</td>
<td>-24.780</td>
<td>53.827</td>
<td>-.032</td>
<td>-.460</td>
</tr>
<tr>
<td>advdegreecombine</td>
<td>.111</td>
<td>.038</td>
<td>.223</td>
<td>2.909</td>
</tr>
</tbody>
</table>

Note. freereduce = free or reduced lunch; chronicabsent = chronically absent; facultyattend = faculty attendance; peradminsoftech = percentage of administration information technology budget; advdegreecombine = faculty with advanced degree combined.

*aDependent Variable: ELA.

**Hierarchical Linear Regression: ELA**

Based on the results of the initial simultaneous regression as reported in Table 7, a hierarchical linear regression model was developed. The statistically significant variables identified in the initial simultaneous regression were entered into the model in steps or blocks with chronic absenteeism entered first, followed next by advanced degrees combined, and third was enrollment size. I used both the significance value and the partial correlation coefficient to determine the model order. The most significant variable was added first, followed by the second, and the third. The variable of interest, or percent of administrative information technology budget, was added last to see if the variable added any value to the overall model.

The variables of faculty attendance, free and reduced lunch status, and students with disabilities
were excluded from the model because they were not significant and had a $p$ value of greater than .05.

Table 8 shows the model summary for the hierarchical linear regression models. Model 1 only uses chronic absenteeism as it was the most significant variable in the simultaneous multiple regression, with an $R^2$ of .157. This means that chronic absenteeism explains 15.7% of the overall model. The significant $F$ change is $< .000$. In Model 2, I added the second most significant variable of percentage of faculty with advanced degrees, with an $R^2$ change of .072. This means that an additional 7.2% of the outcome variable of the PARCC ELA can be taken into account when percentage of faculty with advanced degrees is added to the model. There was an $F$ change from Model 1 to Model 2. The significant $F$ change for both models is .000, indicating that including the additional variable was significant.

In Model 3, I added the last significant variable from the simultaneous multiple regression of enrollment size. There was an $R^2$ change of .039, meaning an additional 3.9% of the outcome variable of the PARCC ELA can be explained by taking into account enrollment numbers. The significant $F$ change from Model 2 to Model 3 is .003. In Model 4, I added the variable of interest of the percentage of administrative information technology budget to overall undistributed budget and found no $R^2$ change. This suggests that the variable of interest adds nothing to explaining the variance in the outcome variable of the PARCC ELA. There is no significant $F$ change when moving from Model 3 to Model 4 (.812). This indicates that Model 3 is the model of best fit because there is no $R^2$ change from the Model 3 to Model 4 when the variable of interest is added. Additionally, the significant $F$ change value does not indicate statistical significance. The Durbin-Watson value of 1.688 demonstrates no auto-correlation between the variables within the regression analysis (Field, 2013).
Table 8

*ELA Hierarchical Regression Model Summary Table*

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>Std. error of the estimate</th>
<th>$R^2$ change</th>
<th>$F$ change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. $F$ change</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.396</td>
<td>.157</td>
<td>.152</td>
<td>6.61653</td>
<td>.157</td>
<td>31.399</td>
<td>1</td>
<td>169</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.479</td>
<td>.229</td>
<td>.220</td>
<td>6.34534</td>
<td>.072</td>
<td>15.754</td>
<td>1</td>
<td>168</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.517</td>
<td>.268</td>
<td>.255</td>
<td>6.20229</td>
<td>.039</td>
<td>8.839</td>
<td>1</td>
<td>167</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>.518</td>
<td>.268</td>
<td>.250</td>
<td>6.21988</td>
<td>.000</td>
<td>.057</td>
<td>1</td>
<td>166</td>
<td>.812</td>
<td>1.688</td>
</tr>
</tbody>
</table>

*Note.* aDependent variable: ELA. bPredictors: (Constant), chronicabsent (chronically absent). cPredictors: (Constant), chronicabsent (chronically absent), advdegreecombine (faculty advanced degree combined). dPredictors: (Constant), chronicabsent (chronically absent), advdegreecombine (faculty advanced degree combined), enrollment. ePredictors: (Constant), chronicabsent (chronically absent), advdegreecombine (faculty advanced degree combined), enrollment, peradminsinfotech (percentage of administrative information technology budget).

The ANOVA results table indicates that all models were statistically significant for this hierarchical regression. Table 9 includes these results.
### ELA ANOVA Results Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Regression</td>
<td>1374.594</td>
<td>1</td>
<td>1374.594</td>
<td>31.399</td>
<td>.000&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Residual</td>
<td>7398.567</td>
<td>169</td>
<td>43.779</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8773.161</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Regression</td>
<td>2008.922</td>
<td>2</td>
<td>1004.461</td>
<td>24.947</td>
<td>.000&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Residual</td>
<td>6764.239</td>
<td>168</td>
<td>40.263</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8773.161</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Regression</td>
<td>2348.945</td>
<td>3</td>
<td>782.982</td>
<td>20.354</td>
<td>.000&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Residual</td>
<td>6424.216</td>
<td>167</td>
<td>38.468</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8773.161</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Regression</td>
<td>2351.130</td>
<td>4</td>
<td>587.783</td>
<td>15.193</td>
<td>.000&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Residual</td>
<td>6422.030</td>
<td>166</td>
<td>38.687</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8773.161</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.**<sup>a</sup>Dependent variable: ELA. <sup>b</sup>Predictors: (Constant), chronicabsent (chronically absent). <sup>c</sup>Predictors: (Constant), chronicabsent (chronically absent), advdegreecombine (faculty advanced degree combined). <sup>d</sup>Predictors: (Constant), chronicabsent (chronically absent), advdegreecombine (faculty advanced degree combined), enrollment. <sup>e</sup>Predictors: (Constant), chronicabsent (chronically absent), advdegreecombine (faculty advanced degree combined), enrollment, peradminsinfotech (percentage of administrative information technology budget).

The coefficients table indicates the significant variables from each of the models (see Table 10). In Model 4, chronic absenteeism, percentage of faculty with advanced degrees, and enrollment were all significant, but percentage of administrative information technology budget to overall budget was not. The variable of interest was not statistically significant ($t = -.238, p = .812, \beta = -.016$) and contributed very little (.03%), if anything, to the overall model.

Consequently, it can be concluded that Model 3 is the best predictive model of the PARCC ELA performance. This demonstrated that these variables all had a significant relationship with the ELA portion of the PARCC examination. Their partial correlation coefficients reveal the impact they had on the dependent variable of PARCC ELA scores. Chronic absenteeism had a strong negative relationship with the PARCC ELA scores and explained 12.3% of variance of the
model. The negative relationship indicates that as chronic absenteeism in the district increases, the PARCC ELA performance decreases. The next variable of percentage of faculty with advanced degrees had a partial correlation value of .277 and explained 7.7% of the overall variance of the model. The positive beta indicates that as the percentage of faculty with advanced degrees increases, so does student performance on the PARCC ELA exam.

Enrollment size had a partial correlation coefficient of .224 and explained 5% of the variance of the model. The positive relationship indicates that as enrollment numbers increase, so does performance on the PARCC ELA examination.

Table 10

*ELA Hierarchical Regression Coefficients*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>Correlations</th>
<th>Collinearity statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. error</td>
<td>t</td>
<td>Sig.</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>54.274</td>
<td>1.050</td>
<td>51.679</td>
</tr>
<tr>
<td></td>
<td>chronicabsent</td>
<td>-.536</td>
<td>.096</td>
<td>-.396</td>
</tr>
<tr>
<td>2</td>
<td>(Constant)</td>
<td>46.560</td>
<td>2.189</td>
<td>21.272</td>
</tr>
<tr>
<td></td>
<td>chronicabsent</td>
<td>-.393</td>
<td>.099</td>
<td>-.290</td>
</tr>
<tr>
<td></td>
<td>advdegreecombine</td>
<td>.143</td>
<td>.036</td>
<td>.289</td>
</tr>
<tr>
<td>3</td>
<td>(Constant)</td>
<td>46.577</td>
<td>2.140</td>
<td>21.770</td>
</tr>
<tr>
<td></td>
<td>chronicabsent</td>
<td>-.497</td>
<td>.103</td>
<td>-.367</td>
</tr>
<tr>
<td></td>
<td>advdegreecombine</td>
<td>.132</td>
<td>.035</td>
<td>.266</td>
</tr>
<tr>
<td></td>
<td>enrollment</td>
<td>.000</td>
<td>.000</td>
<td>.210</td>
</tr>
<tr>
<td>4</td>
<td>(Constant)</td>
<td>46.778</td>
<td>2.306</td>
<td>20.288</td>
</tr>
<tr>
<td></td>
<td>chronicabsent</td>
<td>-.499</td>
<td>.103</td>
<td>-.369</td>
</tr>
<tr>
<td></td>
<td>advdegreecombine</td>
<td>.131</td>
<td>.036</td>
<td>.265</td>
</tr>
<tr>
<td></td>
<td>enrollment</td>
<td>.000</td>
<td>.000</td>
<td>.213</td>
</tr>
<tr>
<td></td>
<td>peradminsinfotech</td>
<td>-12.570</td>
<td>52.882</td>
<td>-.016</td>
</tr>
</tbody>
</table>

*Note.* chronicabsent = chronically absent; advdegreecombine = faculty advanced degree combined; peradminsinfotech = percentage of administrative information technology budget.

*Dependent variable: ELA.*
Table 10 shows that none of the models or variables had a VIF greater than 2, so it can be assumed there are no multicollinearity issues. Tolerances are also all within a value that is less than 1 - $R^2$.

**Research Question 2**

The second research question was as follows:

What is the nature of the relationship between a New Jersey K-12 school district's Administration Information Technology budget in relation to the overall undistributed expenditures budget to the percentage of students who perform at a Level 4 or Level 5 on the 2016-2017 Mathematics Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?

The sections that follow include the process used to answer Research Question 2.

**Simultaneous Multiple Regression: Mathematics**

I ran the first simultaneous multiple regression model with all the predictor variables included. The model summary for the initial simultaneous regression is shown in Tables 11 and 12. The ANOVA results table indicated that the regression was statistically significant ($F (7,160) = 6.852, p = .001$) and that the $R^2$ square for this regression model is .231. This indicates that 23.1% of the outcome variable of the PARCC Mathematics is explained by the variables in the regression model.
Table 11

*Mathematics Model Summary*

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>$R^2$</th>
<th>Adjusted $R^2$</th>
<th>Std. error of the estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.480$^b$</td>
<td>.231</td>
<td>.197</td>
<td>6.59398</td>
<td>1.681</td>
</tr>
</tbody>
</table>

*Note.* $^a$Dependent variable: MATH. $^b$Predictors: (Constant), advdegreecombine (advanced degree combined), enrollment, peradminsinfotech (percentage of administrative information technology budget), disabilities, facultyattend (faculty attendance), chronicabsent (chronically absent), freereduc (free or reduced lunch).

Table 12

*Mathematics ANOVA Table*

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of squares</th>
<th>$df$</th>
<th>Mean square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>2085.593</td>
<td>7</td>
<td>297.942</td>
<td>6.852</td>
<td>.000$^b$</td>
</tr>
<tr>
<td>Residual</td>
<td>6956.883</td>
<td>160</td>
<td>43.481</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9042.476</td>
<td>167</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* $^a$Dependent variable: MATH. $^b$Predictors: (Constant), advdegreecombine (advanced degree combined), enrollment, peradminsinfotech (percentage of administrative information technology budget), disabilities, (faculty attendance), chronicabsent (chronically absent), freereduc (free or reduced lunch).

The coefficients table showed that the statistically significant variables in the regression were chronic absenteeism and free and reduced lunch status (see Table 13). For chronic absenteeism ($t = -3.123, p < .001, \beta = -.294$) the partial correlation coefficient ($-.240$) indicates that this variable explains 5.8% of the overall variance of the model and that the relationship is negative. This indicates that as the rate of chronic absenteeism increases, the level of performance on the PARCC Mathematics decreases. The results of percentage of free and reduced lunch indicates a statistically significant variable ($t = -2.933, p < .001, \beta = -.282$). The partial correlation coefficient ($-.226$) indicates that 5.1% of the overall variance in the model can be explained by the percentage of free and reduced lunch. The negative relationship indicates
that as a school district’s rate of free-and-reduced-lunch population increases, performance on the PARCC Mathematics decreases. The variable of interest, percentage of administrative information technology budget to overall undistributed expenditure budget was not found to be statistically significant ($t = -1.97$, $p = .197$, $\beta = -0.14$). Although not significant, this demonstrates that the relationship is negative; as percentage of administrative information technology budget increases, performance on the PARCC Mathematics decreases. Finally, the partial correlation coefficient (-.016) indicates that < 1% (.03) of the overall model can be explained by the percentage of administrative information technology budget.

Table 13

Mathematics Coefficients Table

<table>
<thead>
<tr>
<th>Coefficientsa</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>Zero-order</th>
<th>Partial</th>
<th>Part</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>B</td>
<td>Std. error</td>
<td>Beta</td>
<td>t</td>
<td>Sig.</td>
<td>Zero-order</td>
<td>Partial</td>
</tr>
<tr>
<td>(Constant)</td>
<td>76.660</td>
<td>29.619</td>
<td>2.588</td>
<td>0.111</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>disabilities</td>
<td>.103</td>
<td>.167</td>
<td>.046</td>
<td>.620</td>
<td>.078</td>
<td>.049</td>
<td>.043</td>
</tr>
<tr>
<td>freereduce</td>
<td>-.080</td>
<td>.027</td>
<td>-.282</td>
<td>-.293</td>
<td>.004</td>
<td>-.420</td>
<td>-.226</td>
</tr>
<tr>
<td>enrollment</td>
<td>.000</td>
<td>.000</td>
<td>.114</td>
<td>1.426</td>
<td>.156</td>
<td>-.091</td>
<td>.112</td>
</tr>
<tr>
<td>chronicabsent</td>
<td>-.407</td>
<td>.130</td>
<td>-.294</td>
<td>-3.123</td>
<td>.002</td>
<td>-.420</td>
<td>-.240</td>
</tr>
<tr>
<td>facultyattend</td>
<td>-.234</td>
<td>.303</td>
<td>-.058</td>
<td>-.775</td>
<td>.440</td>
<td>.091</td>
<td>-.061</td>
</tr>
<tr>
<td>peradminsinfotech</td>
<td>-11.213</td>
<td>56.910</td>
<td>-.014</td>
<td>-.197</td>
<td>.844</td>
<td>-.023</td>
<td>-.016</td>
</tr>
<tr>
<td>advdegreecombine</td>
<td>.001</td>
<td>.040</td>
<td>.002</td>
<td>.025</td>
<td>.980</td>
<td>.203</td>
<td>.002</td>
</tr>
</tbody>
</table>

Note. freereduce = free or reduced lunch; chronicabsent = chronically absent; facultyattend = faculty attendance; peradminsinfotech = percentage of administrative information technology budget; advdegreecombine = faculty advanced degree combined.

aDependent variable: MATH.

Hierarchical Linear Regression: Mathematics

Based on the results of the initial simultaneous multiple regression as reported in Table 12, a hierarchical linear regression model was developed. The statistically significant variables
identified in the initial simultaneous regression were entered into the model in steps or blocks with chronic absenteeism entered first, followed by free and reduced lunch status. I used both the significance value and the standardized beta to determine the model order. The strongest variable was added first, followed by the second. The variable of interest—percent of administrative information technology budget—was added last to see if the variable added any value to the overall model. The variables of faculty attendance, enrollment, percentage of faculty with advanced degrees, free and reduced lunch status, and students with disabilities were excluded from the model because they were not significant and had $p$ values of greater than .05.

Table 14 shows the model summary for the hierarchical linear regression models. Model 1 only utilized chronic absenteeism as it was the most significant variable in the simultaneous multiple regression with an $R^2$ of .171. This means that chronic absenteeism explains 17.1% of the overall model. The significant $F$ change is =.000. In Model 2, I added the second most significant variable, percentage of free and reduced lunch status. There was an $R^2$ change of .044. This means that an additional 4.4% of the outcome variable of the PARCC Mathematics can be explained when percentage of free and reduced lunch status is added to the model. The significant $F$ change from Model 1 to Model 2 is .003. In Model 3, I added the variable of interest of the percentage of administrative information technology budget to overall undistributed budget and found no $R^2$ change. This suggests that the variable of interest adds nothing to explaining the outcome variable of the PARCC Mathematics. Since the significant $F$ change from Model 2 to Model 3 is .989, it can be concluded that Model 2 is the model of best fit because there is no $R^2$ change from the Model 2 to Model 3 and the added variable is not statistically significant. The Durbin-Watson value of 1.721 confirms that there is no autocorrelation between the variables within the regression analysis (Field, 2013).
Table 14

Mathematics Hierarchical Regression Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Std. error of the estimate</th>
<th>R² change</th>
<th>F change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F change</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.413&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.171</td>
<td>.166</td>
<td>6.69190</td>
<td>.171</td>
<td>34.577</td>
<td>1</td>
<td>168</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>.464&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.215</td>
<td>.205</td>
<td>6.53059</td>
<td>.044</td>
<td>9.402</td>
<td>1</td>
<td>167</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.464&lt;sup&gt;d&lt;/sup&gt;</td>
<td>.215</td>
<td>.201</td>
<td>6.55022</td>
<td>.000</td>
<td>.000</td>
<td>1</td>
<td>166</td>
<td>.989</td>
<td>1.721</td>
</tr>
</tbody>
</table>

<sup>a</sup>Dependent variable: MATH. <sup>b</sup>Predictors: (Constant), chronicabsent (chronically absent). <sup>c</sup>Predictors: (Constant), chronicabsent (chronically absent), freereduce (free or reduced lunch). <sup>d</sup>Predictors: (Constant), chronicabsent (chronically absent), freereduce (free or reduced lunch), peradminsinfotech (percentage of administrative information technology budget).

The ANOVA results table indicates that all models were statistically significant for this hierarchical regression (see Table 15).

Table 15

Mathematics ANOVA Results Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>1548.413</td>
<td>1</td>
<td>1548.413</td>
<td>34.577</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>7523.287</td>
<td>168</td>
<td>44.781</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>9071.700</td>
<td>169</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Regression</td>
<td>1949.391</td>
<td>2</td>
<td>974.696</td>
<td>22.854</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>7122.309</td>
<td>167</td>
<td>42.649</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>9071.700</td>
<td>169</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Regression</td>
<td>1949.399</td>
<td>3</td>
<td>649.800</td>
<td>15.145</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>7122.301</td>
<td>166</td>
<td>42.905</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>9071.700</td>
<td>169</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>Note</sup>. <sup>b</sup>Dependent variable: MATH. <sup>c</sup>Predictors: (Constant), chronicabsent (chronically absent). <sup>d</sup>Predictors: (Constant), chronicabsent (chronically absent), freereduce (free or reduced lunch), peradminsinfotech (percentage of administrative information technology budget).

The coefficients table indicates the significant variables from each of the models (see Table 16). In Model 3, chronic absenteeism and percentage of free and reduced lunch were both significant, but percentage of administrative information technology budget to overall
The variable of interest was not statistically significant ($t = -0.014, p = .989, \beta = -0.001$) and contributed very little (0.001%), if anything, to the overall model. Consequently, it can be concluded that Model 2 is the best predictive model of the PARCC Mathematics performance. This demonstrated that these variables all had a significant relationship with the Mathematics portion of the PARCC examination. Their standardized betas reveal the impact they had on the dependent variable of Mathematics PARCC scores. Chronic absenteeism had a strong negative relationship with the PARCC Mathematics scores, explaining 4.5% of variance of the model. The negative relationship indicates that as chronic absenteeism in the district increases, the PARCC Mathematics performance decreases. The second variable of percentage of free and reduced lunch had a partial correlation coefficient of -0.231 and explained 5.3% of the variance of the model. The negative beta indicates that as the percentage of free and reduced lunch increases, performance on the PARCC Mathematics examination decreases.
Table 16

**Mathematics Coefficients and VIF Table**

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficients</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>Correlations</th>
<th>Collinearity statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. error</td>
<td>t</td>
<td>Sig.</td>
<td>Zero-order</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Part</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VIF</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>55.298</td>
<td>1.067</td>
<td>51.848</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>chronicabsent</td>
<td>-.570</td>
<td>.097</td>
<td>-5.880</td>
<td>-.413</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.413</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.413</td>
</tr>
<tr>
<td>2</td>
<td>(Constant)</td>
<td>55.648</td>
<td>1.047</td>
<td>53.145</td>
<td>.609</td>
</tr>
<tr>
<td></td>
<td>chronicabsent</td>
<td>-.338</td>
<td>.121</td>
<td>-2.786</td>
<td>-.413</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.211</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.191</td>
</tr>
<tr>
<td></td>
<td>freereduce</td>
<td>-.076</td>
<td>.025</td>
<td>-3.066</td>
<td>-.422</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.231</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.210</td>
</tr>
<tr>
<td>3</td>
<td>(Constant)</td>
<td>55.659</td>
<td>1.310</td>
<td>42.495</td>
<td>.606</td>
</tr>
<tr>
<td></td>
<td>chronicabsent</td>
<td>-.338</td>
<td>.122</td>
<td>-2.776</td>
<td>-.413</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.211</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.191</td>
</tr>
<tr>
<td></td>
<td>freereduce</td>
<td>-.076</td>
<td>.025</td>
<td>-3.048</td>
<td>-.422</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.230</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.210</td>
</tr>
<tr>
<td></td>
<td>peradminsinfotech</td>
<td>-.744</td>
<td>54.670</td>
<td>-.014</td>
<td>.989</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.001</td>
</tr>
</tbody>
</table>

**Note.** chronicabsent = chronically absent; freereduce = free or reduced lunch; peradminsinfotech = percentage of administrative information technology budget.

a. Dependent variable: MATH.

Table 16 shows that none of the models or variables had a VIF greater than 2, so it may be assumed there are no multicollinearity issues. Tolerances are also all within a value that is less than 1 - R².

**Conclusion**

I conducted the analysis of both the ELA and Mathematics portions of the PARCC exam on the percentage of administrative information technology budget to overall undistributed expenditure budget for K-12 and PK-12 school districts when controlling for district, student, and staff variables in New Jersey during the 2016–2017 school year. Both a simultaneous multiple regression and hierarchical regression model were run in each subject area. The variable of interest proved to not be significant in either subject area. Furthermore, in both subject areas, the variable did not add any value to the overall models when the hierarchical
regression models were run based on the results of the simultaneous multiple regression. A more in-depth discussion of these results as they relate to previous research done on the topic, policy and practice, and future research is included in Chapter 5.
CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Organization of the Chapter

This chapter begins with an introduction to highlight the purpose of the study and a discussion of the research questions with null hypotheses as well as answers to the research questions. The second part of the chapter includes the conclusions and findings of the study and how they relate to previously reviewed literature. Also included are recommendations for policy, practice, and future research, followed by a short conclusion.

Earlier in the study, I highlighted finance as a limited resource that must be maximized in order to produce results. One of these results or educational outputs is student achievement as identified by results of the PARCC in ELA and mathematics in the 2016–2017 school year. Another important educational input, specifically, is administrative technology infrastructure that is budgeted for in the administrative information technology budget. Based on the study results, I found that the percentage of this budget to the overall undistributed expenditures budget does not have an impact on student achievement. However, I did identify other variables that were significant in predicting student achievement, which reinforces previous literature.

Technology is embedded in the life of everyone today. Whether it be computers, laptops, tablets, smart phones, e-readers, or educational technology, today’s students encounter technology almost every day. New Jersey places an emphasis on technology through the state curriculum standards and numerous grants that were highlighted earlier in Chapter 2 of this study such as the Future Ready Schools grant and the Talent 21 grant. Federal initiatives such as the NCLB, the ARRA, and the ESSA placed a heavy emphasis on technology and its budget. The PARCC examination is the high-stakes standardized test administered in New Jersey. It is a test
that is primarily administered online. In point of fact, in 2015, its first year of implementation, 98% of the examination was administered online in New Jersey (Heyboer, 2015). Its online administration sometimes requires districts to increase not only their hardware, but also their technology infrastructure in order to meet system requirements for administering the PARCC examination. The results of this study served to determine that the percentage of the administrative information technology budget to overall undistributed expenditure budget has no significant relationship with the PARCC ELA or Mathematics examination performance in K-12 or PK-12 New Jersey school districts during the 2016–2017 school year.

**Purpose of the Study**

The purpose of this study was to explain the influence, if any, of the percentage of district’s administrative information technology budgets on New Jersey K-12 districts’ student achievement in mathematics and ELA as measured by the 2016–2017 PARCC examination. I also examined the amount of variance that could be explained by administration information technology budgets when controlling for additional factors that influence student achievement, such as the school district’s percentage of special education students, student attendance, and percentage of students on free and reduced lunch. This study adds to the body of research literature on school finance and technology, specific to New Jersey K-12 and PK-12 school districts, and their relationship to student achievement. This study also lays the groundwork for future studies in this area.

**Research Questions and Answers**

This was a nonexperimental, cross-sectional, explanatory study using quantitative research design methods to determine the influence of district, faculty, and student variables on
student performance in PK-12 and K-12 school districts on the PARCC ELA and Mathematics examinations. The overarching research question for this study was as follows:

What is the nature of the relationship between a New Jersey K-12 school district’s the administration information technology budget in relation to the overall budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?

Two simultaneous multiple regressions were run for both the ELA and Mathematics portion of the PARCC exam. The results indicated that the administrative information technology budget as a proportion of the overall undistributed expenditure account was not a significant variable in either content areas in PK-12 and K-12 New Jersey school districts. It was also determined that no significant relationship was found between the proportion of the administrative information technology budget and PK-12 and K-12 school districts PARCC exams when controlling for student, district, and staff variables.

**Research Question 1**

What is the nature of the relationship between a New Jersey K-12 school district’s administration information technology budget in relation to the overall undistributed expenditures budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 English Language Arts (ELA) Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?
Null Hypothesis 1

No statistically significant relationship exists between a New Jersey PK-12 or K-12 school district’s percentage of the administration information technology budget in relation to the overall budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on the 2016–2017 English Language Arts (ELA) Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for staff, student, and district variables.

Research Question 1: Answer

Based on the simultaneous and hierarchical regression analyses of the data, the null hypothesis was retained. It was determined that no statistically significant relationship exists between the proportion of the administrative information technology budget and total undistributed expenditure budget on PK-12 and K-12 New Jersey ELA PARCC scores when controlling for district, faculty and staff, and student variables.

Simultaneous multiple regression was conducted by entering all seven predictor variables into the model. Using this model, the $R^2$ value was .277, indicating that 27.7% of the variability in district performance on the 2016–2017 PARCC ELA exam can be explained by the overall model. Further analysis of the model indicated that of the seven variables, three predictor variables were determined to be significant. By examining and squaring the standardized beta, it was determined that the rate of chronic absenteeism was the strongest statistically significant predictor of student achievement that accounted for 13.1% of the district performance on the 2016–2017 PARCC ELA portion of the examination. The next strongest statistically significant variable was percentage of faculty with advanced degrees. This had a standardized beta of .223 which explained roughly 5% of the explained variance of student performance on the PARCC
ELA portion on the 2016–2017 examination. The final significant variable, district enrollment, had a standardized beta of .204 which explained 4.2% of the explained variance of student performance on the PARCC ELA portion of the 2016–2017 examination. The administrative information technology budget as a proportion of the overall undistributed expenditure account, the variable of interest in this study, was not a statistically significant predictor variable of student achievement on the PARCC ELA portion of the 2016–2017 exam for PK-12 and K-12 New Jersey school districts ($p > .646$).

Using the three significant predictor variables identified in the simultaneous multiple regression, in addition to the variable of interest, a 4-step hierarchical regression model was used to identify specific contributors to the explained variance of the significant predictors. The hierarchical regression reinforced what was found in the initial simultaneous multiple regression and, therefore, for this research question, the null hypothesis is retained.

**Research Question 2**

What is the nature of the relationship between a New Jersey K-12 school district’s administration information technology budget in relation to the overall undistributed expenditures budget on the percentage of students who perform at a Level 4 (L4) or level 5 (L5) on the 2016–2017 Mathematics Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for district, student, and staff variables?

**Null Hypothesis 2**

No statistically significant relationship exists between a New Jersey PK-12 or K-12 school district’s percentage of the administration information technology budget in relation to the overall budget on the percentage of students who perform at a Level 4 (L4) or Level 5 (L5) on
the 2016–2017 Mathematics Partnership for Assessment of Readiness for College and Careers (PARCC) examination when controlling for staff, student, and district variables.

**Research Question 2: Answer**

Based on the simultaneous and hierarchical regression analyses of the data, the null hypothesis was retained. It was determined that no statistically significant relationship exists between the proportion of the administrative information technology budget and total undistributed expenditure budget on PK-12 and K-12 New Jersey PARCC Mathematics examination scores when controlling for district, faculty and staff, and student variables.

Simultaneous multiple regression was conducted by entering all seven predictor variables into the model. Using this model, the $R^2$ value was .231, indicating that 23.1% of the variability in district performance on the 2016–2017 PARCC Mathematics examination can be explained by the overall model. Further analysis of the model indicated that of the seven variables, two predictor variables were significant. By examining and squaring the standardized beta, it was determined that the rate of chronic absenteeism was the strongest statistically significant predictor of student achievement and accounted for 8.6% of the district performance on the 2016–2017 PARCC Mathematics portion of the examination. The second and least significant variable was socioeconomic status. This had a standardized beta of -.282, which accounted for roughly 8% of the explained variance of student performance on the PARCC Mathematics portion of the 2016–2017 examination. The administrative information technology budget as a proportion of the overall undistributed expenditure account, the variable of interest in this study, was not a statistically significant predictor variable of student achievement on the PARCC Mathematics portion of the 2016–2017 examination for PK-12 and K-12 New Jersey school districts ($p > .844$).
Using the two significant predictor variables identified in the simultaneous multiple regression, in addition to the variable of interest, a 3-step hierarchical regression model was used to identify specific contributors to the explained variance of the significant predictors. The hierarchical regression reinforced what was found in the initial simultaneous multiple regression and, therefore, for this research question, the null hypothesis is retained.

**Conclusions and Discussion**

This study provides evidence that a strong positive relationship does not exist between the percentage of the administrative information technology budget and the percentage of students meeting or exceeding expectations on the PARCC exam in New Jersey K-12 or PK-12 school districts. The study presented the opportunity for differences on PARCC passing percentages to be displayed, specifically in terms of the percentage of the administrative information technology budget as a percentage of the overall undistributed expenditure accounts. For both ELA and mathematics for K-12 and PK-12 school districts, the percentage of the administrative information technology budget was not a statistically significant variable in explaining the overall variance in PARCC scores and evidence provided by this study seems to indicate a weak relationship between the variables. Due to the extremely limited literature on this topic, it is difficult to relate the findings here or contextualize them to previous and similar studies. In order to do this, one would have to look to the broader topic of school finance as a general topic and its relationship to student achievement.

For the ELA variable, advanced degree combined was the strongest predictor, followed by student chronic absenteeism, and then student enrollment. However, the percentage of the administrative information technology budget was not a significant contributor to the regression models and it did not add value to predicting the PARCC scores on the ELA portion of the
examination. Interestingly, socioeconomic status, determined to be pivotal in Coleman et al.’s (1966) study as well as in subsequent studies, was not a significant predictor variable in this current study. The percentage of the administrative information technology budget not being significant does confirm the claims of Coleman et al. and supporters such as Hanushek (1989, 1997, 2016; Hanushek & Benson, 1994) that school finance does not matter when other determinants of student achievement are considered. Coleman et al. did indicate that socioeconomic status was the biggest contributor to student achievement, which was not the case in the present study either. Enrollment numbers, although significant for the PARCC ELA examination, indicated an interesting trend. The relationship is positive, both in the initial simultaneous multiple regression and in the hierarchical regression best fit model. This shows that as enrollment numbers increase in schools, so do scores on the PARCC ELA examination. This contradicts much of the research suggesting that smaller schools lead to better student performance (Alspaugh, 1998; Ready, Lee, & Welner, 2004).

For the PARCC Mathematics examination, there were two significant variables: socioeconomic status and chronic absenteeism. Again, the percentage of the administrative information technology budget was not a significant contributor to the initial simultaneous multiple regression nor did it add any value to predicting achievement on the PARCC Mathematics examination when added to the hierarchical model. This reinforces the work of Coleman et al. (1966) and subsequent researchers in terms of socioeconomic status being a significant indicator of student achievement. It is interesting that socioeconomic status still had a lower significance value than chronic absenteeism did in terms of predicting outcome on the PARCC Mathematics examination. These were the only two significant variables identified in the present study. More recently, Hanushek (2016) posited that money can matter if there are
guidelines and direction. School budgets are strictly regulated, and it seems that neither budget nor its level of regulation had an influence in either subject area in the present study with respect to the budget area analyzed.

There is limited research in the area of specific technology line item budgets and its impact on student achievement. There has been conflicting research in terms of school finance as a whole and its subsequent influence or impact on student achievement. This study adds to the body of literature initially posed by Coleman et al. (1966), Hanushek (1989, 1997, 2016; Hanushek & Benson, 1994), Chung (2013), and other researchers who proposed that school finance does not influence student achievement when other significant predictor variables are controlled for. The present study conflicts with the findings of James et al. (2011), Cullen et al. (2015), Hedges et al. (1994), and Greenwald et al. (1996a, 1996b). James et al. (2011) found that certain predictor expenditure categories, such as improvement of instructional services, did significantly influence student achievement. In a longitudinal study, Cullen et al. (2015) found the same results in terms of instructional spending. Finally, in a meta-analysis of school district level or smaller, Hedges et al. (1994) and Greenwald et al. (1996b) found significant positive relationships and few negative relationships when looking at expenditures and high-stakes tests in the prior studies they analyzed. Newly published district-level data and specific publicly available data regarding district budgets has made the present study possible. This newly available data will certainly prompt further research studies in this area of school finance as more questions are raised over the scrutiny of high-stakes testing continues.

**Recommendations for Policy**

In order to address the policy issues determined from the present study, lawmakers need to focus on the issues that were highlighted both in the literature review presented earlier and
again in the results of the study. Variables identified through the substantial literature review that were determined to be predictors of student achievement are percentage of faculty with advanced degrees, faculty attendance, students with disabilities, socioeconomic status, student attendance, ELL status, and district size. Of these variables, the following variables were identified as significant in the study and therefore should be addressed by policymakers: combating chronic absenteeism, recruiting faculty with advanced degrees or encouraging pursuit of them, and confronting socioeconomic status.

Chronic absenteeism was determined to be a significant predictor variable in both ELA and mathematics. There are several programs or steps policy makers can take to combat absenteeism. According to Adelman and Taylor, “Students who attend school between 85 and 100 percent of the time pass state tests at much higher rates than students who attend less than 85 percent of the time, according to the Center for Mental Health at UCLA” (as cited in Duke, Sterrett, & Carr, 2013, p. 220). Duke et al. (2013) recommended several strategies for combatting chronic absenteeism, with most of them revolving around student, parent, and community involvement. Duke et al. (2013) also suggested the current common trend to use truant officers and enforce policy are not working to combat student absenteeism.

One way that school districts can maintain communication with parents is by allowing parents to report an absence and schools contacting parents whenever a child is absent. This approach creates an open line of communication and helps discourage student truancy. Although it can be costly, there are automated systems that will help with the costs of this type of communication. Duke et al. (2013) recommended expanding on counseling services, providing academic support to avoid students falling behind on coursework, providing social supports through community involvement or peer-to-peer mentoring, expanding extracurricular and sports
activities, building transitional programs between grade levels; and identifying special needs, including home instruction for injured or ill students or students who need to be outside a regular school setting. These programs can all be very costly, but will help students stay engaged in the classroom environment. Policymakers need to provide grants and additional monies to be allocated to funding these types of programs.

Recruiting highly qualified faculty with advanced degrees can also be costly, but was determined as a significant determining variable of PARCC ELA examination scores. In New Jersey, 55.3% of teacher’s salaries come from the local government, 40.9% from the state government, and 3.8% from the federal government (Chang, 2018). If the federal government placed an emphasis on grants to recruit and retain highly educated educators, especially in areas where performance is lower on the PARCC examination, there might be improvements on the scores (Clotfelter et al., 2007; Graziano, 2012). The positive relationship indicates the higher the percentage of teachers with master’s or doctoral degrees in a district, the higher the scores will be on the PARCC ELA examination. Policymakers can take away salary caps for superintendents that discourage teachers from pursuing advanced degrees. In addition, they can provide additional funding to districts based on the percentage of faculty that hold advanced degrees.

The last significant variable was in the PARCC Mathematics portion of the test and it was socioeconomic status. The negative relationship indicated by the standardized beta indicates that as the percentage of free-and-reduced-lunch students in a school district increases, the performance on the PARCC Mathematics examination decreases district-wide. Coleman et al. (1966) produced the first widespread report that indicated the importance of socioeconomic status in terms of student achievement above all else. Many researchers, as previously
highlighted in the literature review, have come to reinforce and support Coleman et al.’s conclusions (De Luca & Hinshaw, 2013; Hanushek 1989, 1997; Hanushek & Benson, 1994). According to Coleman et al., “Finally, it appears that a pupil’s achievement is strongly related to the educational backgrounds and aspirations of the other students in the school” (p. 22). Steps must be taken to balance the disparities and create a positive school culture for all students. Lawmakers need to do more to support these families. They can create zoning laws that decrease the income disparities between districts by combining districts or creating inclusionary zoning programs. In these types of programs, a certain percentage of homes are sold below market value to encourage less fortunate families to move in.

They can also do more to assist families with everyday living expenses such as housing, quality child care, and early child education. The disparities between rich and poor is highlighted by the following statement:

Children from middle and upper-class environments who enter pre-school at age 4 have heard approximately 45 million words compared to a child from a family on welfare who has heard only 16 million words during his first four years of life. Hart and Risely (1995) coined the difference between the language exposure of rich and poor children ‘the 30-million-word gap.’” (Tienken, 2012, p. 4)

Early childhood education programs that are funded at all governmental levels will help fix this gap or, at the very least, lessen it.

**Recommendations for Practice**

School leaders need to be able to address those needs that are most important to their school community. The literature review in Chapter 2 included details about some of the known variables that influence student achievement. This study provides further support for some of those variables.

The PARCC Mathematics examination hierarchical regression analysis model of best fit showed socioeconomic status as a significant variable influencing test scores. There are several
steps school leaders can take to identify and support this population of students. First is making sure school districts are reaching out to these families and ensuring that students in need are identified. Once the population is identified, then promoting after-school activities, community involvement, and fostering smaller class sizes can help battle some of the negative impacts of being a part of this population (Gottfried, 2009). There should be steps within the district to identify populations struggling to meet basic needs at home that may not know support is available. There also may be people that may barely meet state and federal cut-offs for classification as low socioeconomic status, but may still require added support. After-school activities can be held to ensure that certain needs, such as homework help, additional meals, or other everyday needs are guaranteed to be met. Fostering community relationships through food drives and fundraisers can also provide additional support to these families. Finally, linking these families to other community programs that can provide financial support in times of need can also provide added relief and alleviate stress for these families. For example, many communities have organizations that will pay all or part of a monthly bill or expense during times of documented financial hardship. Schools can support these organizations and link these families to these organizations. This will provide extra relief to families and allow them to meet other day-to-day needs.

Chronic absenteeism is a variable that was indicated in the best-fit models for the hierarchical regression in both ELA and mathematics. “Missed educational time in school may lead to poor grades and further absenteeism, leading to a vicious cycle that is a major concern of all educators” (Parke & Kanyongo, 2012, p. 1). Community and school engagement initiated by the school district will foster relationships that lead the student to be less likely to miss school. Engagement can be gained by offering before- and after-school programs, after-school activities,
volunteer opportunities, and by the school reaching out to local businesses and organizations and keeping them involved in the school. Businesses and organizations can be involved by being invited to school events, offering fundraising opportunities, and allowing the businesses to use school facilities. Smaller class sizes or teams can create support groups that will leave the student feeling less isolated. Groups that may be more sensitive to missing school, such as transfer students, kindergarten students, students entering middle or high school for the first time, pregnant teens, socially isolated students, academically struggling students, students with low socioeconomic status, and students with language barriers should be identified and provided the extra support and guidance that they require (Duke et al., 2013). An administrator can do this by setting up action plans for identification of at-risk students, providing counseling, and creating appropriate follow-up action plans.

Another step to combat absenteeism that goes hand-in-hand with community engagement is parent support and participation. Programs can be run by the school to ensure Internet access, open lines of communication, and include parent nights and workshops in which parents can keep up with the challenging coursework their students may be facing. Many of the systems offered today to communicate with parents, display coursework, and grades are through the Internet and computers. School districts should offer Internet or a place where parents can go to access the Internet.

Low socioeconomic status and absenteeism both require support from the school counselors. Counselors can help identify families that have these individual, yet often interrelated, issues. After identification, it is critical that counselors come up with the appropriate plan to tackle the unique student’s situation on a case-by-case basis. No two students’ situations are going to be identical and that is when the counselor would assist. The
administration needs to make sure that the programs and staff are in place with the counselors overseeing the execution of those plans.

Finally, in terms of the PARCC ELA, percentage of faculty with advanced degrees was identified as a significant predictor variable in the hierarchical regression model of best fit. School districts must be able to recruit and retain highly qualified and educated faculty. To ensure this, the school can make sure it works cooperatively with the union and create a positive relationship that benefits both the school and the faculty. The contract should allow for more flexibility or professional development. Beyond that, schools can allow for a competitive tuition reimbursement program that encourages faculty to continue their education. The school district can set up many opportunities for professional development.

Staying competitive in terms of salaries offered is also an effective way to attract highly educated staff. This would require school leaders to stay on top of what comparable positions are being paid in similar districts. The school district needs to be more lenient, flexible, and fair to make sure that these elements are negotiated for in the collective bargaining agreements with the union, given that prior research determines it significant predictors in terms of student achievement. Finally, offering competitive health and other benefits will attract a highly educated staff. These suggestions were also iterated in both Graziano (2012) and Clotfelter et al. (2012).

The initial theory guiding theory of input/output in this current study relates directly to the implications for both policy and practice. The four variables identified as significant through the regressions all represent what is put into schools. Combating chronic absenteeism involves a strong staff to continue communication and set up programs to keep students involves. Teachers with advanced degrees requires recruiting and maintaining a highly qualified staff into schools.
Free and reduced lunch requires staff to identify and support students that are economically disadvantaged both through programs and funding. Finally, enrollment is defined by the number of students in a district, school, and class. Adjusting the inputs affected by these significant variables may influence, for the better, the output measure of student achievement.

**Recommendations for Future Research**

This study was conducted to look at the influence of the percentage of the administrative information technology budget as a percentage of the overall undistributed expenditure budgets for the 2016–2017 school year on the PARCC ELA and PARCC Mathematics scores in PK-12 and K-12 New Jersey school districts. To build upon the conclusions of this study, it is important that future studies expand upon this topic with some of the suggested areas of research listed below:

- Replicate this study in another state, using PARCC or another reliable and valid measure of student achievement.
- Replicate this study on the national level.
- Use school building, rather than district, as the unit of analysis when designing the study.
- Use total operating budget, rather than the undistributed accounts, to determine the percent of administrative information technology budget when designing the study.
- Design a study to examine the difference in the amount spent on administrative information and various school or school district socioeconomic statuses.
- Design a study that looks at different budget items or programs and their influence on student achievement. This may be related to a specific program initiated or technology hardware.
• Design a study to include examination of science standardized test scores as the dependent variable and budgetary impacts.

Conclusions

Continued research and improvements in the education world will bring about positive change for all students. It is important that policymakers, bureaucrats, and practitioners alike pay attention to current research to stay abreast of potential implications. In this study, I found that there is no statistically significant impact on the PARCC ELA or PARCC Mathematics examinations in PK-12 and K-12 New Jersey School districts based on the percentage of money budgeted for administrative technology from the overall undistributed expenditure accounts budget. There was no added value to predicting PARCC assessment results when the percentage of administrative information technology budget was added to the hierarchical models and the significant variables were considered. Another take-away from this study is that variables that were controlled for do have a significant impact. These variables are chronic absenteeism, percentage of teachers with advanced degrees, and enrollment size in the PARCC ELA examination and chronic absenteeism and socioeconomic status in the PARCC Mathematics examination.

High-stakes tests such as PARCC are being pushed to be administered online with limited paper administration options, causing districts to react to meet the system requirements of this test. This can be a more cost-effective measure at the state level, but often has implications for the district in terms of test administration. This often leads the district to inflate their already high-technology budgets to meet the demands of the test. This study suggests that there is little to no impact based on the percentage of money spent in New Jersey. This study highlights the
variables that have continuously come up in the literature as significant in determining student achievement, continue to do so.

There has been little research in terms of specific technology budgets and their impact on student achievement. Due to new data collected by the NJDOE, at the district and state levels, this study was possible. The study provides specific insight for a specific point in time for the relationship between school finance and student achievement. This study and newly available data opens the door for this area to be examined and researched further.

“A well-educated mind will always have more questions than answers.”

-Helen Keller
REFERENCES


APPENDIX

Data File (Truncated into three rows--in Excel File as one continuous row)

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