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The Influence of Professional Development Methods on Student Mathematics Performance in New Jersey Public Elementary Schools

by

Xanthy Karamanos

Submitted in partial fulfillment of the requirements for the degree

Doctor of Education

Department of Education Leadership, Management and Policy

Seton Hall University

February 2020

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COLLEGE OF EDUCATION AND HUMAN SERVICES

SETON HALL UNIVERSITY

APPROVAL FOR SUCCESSFUL DEFENSE

Xanthy Karamanos has successfully defended and made the required modifications to the text of the doctoral dissertation for the Ed.D. during this **Spring Semester 2020**.

DISSERTATION COMMITTEE

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Abstract

This quantitative study was developed to determine the influence of professional development methods on student academic performance in elementary mathematics. The study also reviews the relationship between content that was delivered in professional development programs and student performance. Additionally, the research analyzes the difference in student math performance when professional development decisions are made by administrators versus a mixed group of stakeholders. An online survey was conducted to collect data from district- and school-level administrators in New Jersey public school districts that serve elementary students from grades three to six. The study includes representation from 11.4% of public school districts across the state. The results of the survey were examined with public data from New Jersey Department of Education district performance reports. Regression models were used for each of the three research questions and identified the control variables as the percentage of students with disabilities, the percentage of English learners, and the percentage of economically disadvantaged students. The results indicate that the content that was delivered and the decision maker were more significant factors for the influence of professional development on student academic performance compared to the provided methods.

Keywords: professional development, student academic performance, mathematics, elementary

Dedication

This work is dedicated to the memory of Dr. Gerard Babo, an extraordinary, patient, and caring teacher who taught me to never doubt myself and helped me believe that the sky is the limit. May his memory be eternal.

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Chapter I

Introduction

Context of the Problem

K-12 public education is an ongoing topic of conversation. From President Lyndon B. Johnson's Elementary and Secondary Education Act (ESEA) in 1965 and President George W. Bush's No Child Left Behind Act (NCLB) of 2001 to President Barack Obama's Every Student Succeeds Act (ESSA) in 2015, politicians and governing bodies have constantly changed the landscape of education in a variety of ways. Federal, state, and local governments continue to influence public school funding, standards, and teaching quality. Throughout years of change, providing students with a high-quality education has remained a priority.

One way in which these governments have attempted to ensure a high-quality education for students is by focusing on teacher quality. Research has consistently evidenced that teacher quality is the most important school-based factor for improving student outcomes in terms of, for example, achievement, attendance, and graduation (Darling-Hammond, 2000; Garet, Porter, Desimone, Birman, & Yoon, 2000; Guskey, 2009; Mizell, 2010). In 2004, NCLB stated that, by 2006, all teachers must be considered "highly qualified" to obtain teaching positions in public schools. The state of New Jersey defines a highly qualified teacher as an individual with at least a bachelor's degree, a valid state certification, and demonstrated expertise in their core academic subject area (NJDOE, 2014).

Although hiring individuals who are deemed "highly qualified" to teach students is a vital step, it is critical for teachers to continue their professional growth throughout their careers, as research has indicated that "professional development is viewed as an integral part of one's career cycle" (Guskey, 1994; Zambak, Alston, Marshall, & Tyminski, 2017). Over the decades,

states, school districts, and researchers have dedicated a significant amount of time and resources to studying the effects of professional development. They have found that high-quality, sustained, and intensive professional development has an active role in student learning and achievement (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). Professional development provides an opportunity for districts to support teachers in learning and advancing in their content areas and professions; therefore, it is important for professional development to be executed thoroughly and thoughtfully (Corcoran, 1995; Guskey, 2009; Kelly, 2012).

In an effort to improve the quality of teaching, districts have spend billions of federal dollars annually on professional development that aims to enhance student performance and meet federal and state mandates (Calvert, 2016; Guskey, 2009; Jaquith, Mindich, Wei, & Darling-Hammond, 2010; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). For example, New Jersey requires all teaching staff to complete 20 hours of professional development each year, which forces public schools to not only allow designated time for staff to engage in learning but also allocate resources and money to fulfill these demands.

As the digital, fast-paced world continues to grow, the available types of professional development are constantly evolving. For example, states and school districts now offer live or pre-recorded webinars, conferences that are presented by organizations, social media outlets, and out-of-district workshops. Other professional development methods that need more arranging and planning but are still readily available to teachers include professional learning communities (PLCs), in-service trainings, and job-embedded professional development. Today, teachers have an unprecedented level of access to professional development at their preferred time and location. As staff development opportunities become more easily accessible, it is important to critically evaluate these opportunities and determine how, if at all, they improve teacher quality.

Problem Statement

For years, public school districts have been spending billions of dollars on various professional development activities (Borko, 2004; Corcoran, 1995; Guskey 2009; Guskey & Yoon, 2009; Jaquith et al., 2007; Kedzior, 2004; Kelly 2012; Little, 1993; Valli, Cooper, & Frankes, 2016). With laws such as NCLB and ESSA, districts have funneled money into programs to help remediate student learning with the hope of increasing student academic performance to meet federal and state demands. The provision of professional development is more likely to improve a program than setting up "band-aid" solutions, such as remedial programs, support teachers, interventionists, and content specialists (Kelly, 2012). When districts allocate money for professional development, they need to ensure that they are receiving services that will have the strongest impact on student learning.

Scholars such as Guskey (2003, 2009), Rebora (2004), Rotermund, DeRoche, and Otterm (2017), and Villegas-Reimers (2003) have found that professional development is a necessary component to improve student learning. Research has identified effective professional development methods through pre-post studies, classroom observations, and teacher surveys to connect changes in teacher practices to student academic performance. Current research has also outlined the most frequently used types of professional development in districts; however, few studies have linked these types to student academic performance.

Before districts expend more time, resources, and funds for different professional development methods, it is vital to understand the impact of these methods on academic performance. Further research is necessary to identify the professional development methods

with the greatest potential influence on student academic performance as well as any observable patterns between professional development methods and student academic performance.

Purpose of the Study

The purpose of this study is to determine if there is a relationship between student academic performance and the type of professional development that is provided to staff who teach elementary mathematics. The study focuses on the most commonly reviewed types of professional development in the literature and research, which include in-service trainings, out-of-district workshops, online learning, job-embedded professional development, PLCS, and site-based coaching. Based on the findings, district administrators can obtain more information about target areas for professional development efforts, such as content and planning, to support teaching and learning within their elementary school classrooms.

Significance of the Study

This research presents strengths that include the opportunity to gather information on how districts have implemented professional development across the state of New Jersey. As a cross-sectional study, it provides an understanding of professional development methods that are currently applied in public elementary schools. Furthermore, the data that were collected built upon the findings of previous research and can support administrators in decision-making concerning the implementation of professional development.

This study could benefit students in multiple ways. First, it can provide school administrators and policymakers with a deeper understanding of the influence of various professional development methods on student academic performance. The research also raises

awareness of the importance of strategically planning the content that is delivered in professional development programs to promote student learning. Additionally, it reviews the difference in the relationship between professional development and student performance based on who makes the decisions about district professional development plans and programs. Overall, the study offers information that can guide school personnel to make decisions about professional learning that will have the greatest impact on students.

Theoretical Framework

The National Staff Development Council (NSDC, 2001) has developed 12 standards for staff development to support improvements in student learning. These standards are split into three categories that mirror the model of Guskey and Sparks (2002) for the relationship between professional development and improvements in student learning. The theoretical framework of this model illustrates that many elements are involved in improving student academic performance.

Guskey and Sparks (2002) and the NSDC (2001) have identified three parts of quality professional development: content, process, and context. These three aspects together help administrators plan for high-quality professional development with the goal of impacting the knowledge and practice of teachers, which could in turn improve student learning and academic performance (Guskey & Sparks, 2002). This theory also connects to the model by the Institute of Education Science on “How Professional Development Affects Student Achievement,” which links professional development to teacher knowledge, skills, and pedagogy and, subsequently, to its effects on student learning (Desimone, 2009; Yoon et al., 2007). Although professional development may not have a direct effect on student academic performance, “the relationship

between professional development and improvements in student learning is complex and multifaceted, it is not random or chaotic" (Guskey & Sparks, 2002, p. 5), and it should be planned thoroughly, purposefully, and with extensive thought (Desimone, 2009; NSDC, 2001; Yoon et al., 2007).

Content: The content characteristic describes the goals and objectives of professional development. Strategically planning the content in professional development "improves the learning of all students deepens educators' content knowledge, provides them with research-based instructional strategies to assist students in meeting rigorous academic standards" (NSDC, 2001). Professional development content can vary from content-area-specific programs and resources to student learning standards and practices, pedagogy, instructional strategies, and lesson design.

Process: While content is important, the process of professional development is a valuable facet of the model that directly connects to this study. The process characteristics describe the method and activities within the professional development program (Guskey & Sparks, 2002). According to the NSDC (2001), when considering the process of professional development, standards to evaluate consist of data-driven, evaluative (multiple sources of information), research-based, design, learning (understanding of human development), and collaborative aspects (p. 2).

Context: The context encompasses the educators who are involved as well as their students, the environment, the organization, and the culture of the professional development (Guskey & Sparks, 2002). The NSDC (2001) has also connected the context to resources for supporting professional learning. Some context resources are technology, substitutes to cover

classes, and materials. With regard to students, aspects of the context may include student subgroups and demographics that are identified within a class, school, or district.

Content, process, and context all work together as characteristics of quality performance development. When these three characteristics are evaluated, administrators can plan for high-quality and meaningful professional development that impacts the knowledge and practice of teachers. Guskey and Sparks's (2002) model for the relationship between professional development and improvements in student learning dictates that such impacts to the knowledge of teachers have a direct effect on student learning outcomes. In this research, these three characteristics were incorporated into the survey to collect data that could address the research questions of this study.

Research Design

This research was conducted in the form of a quantitative study by creating a survey to administer to public school district administrators. The survey collected information about the methods of professional development that the districts offer, the content that they delivered, and the decision maker. The survey was utilized to gather information from districts and did not target perceptions or pose questions about evaluating the effectiveness. The basic constructs of interest in this study were the content, process, and context of professional development, which define the professional development methods, the delivered content, and the planning process of professional development.

These main themes were used to develop a survey that helped to answer the research questions of this study. The items from this survey were modified from those of a previous survey that was employed by the researcher Dr. Christine Scheffert Lowden to evaluate the

effectiveness of professional development (Scheffert Lowden, 2003) as well as a survey by the National Center for Education Statistics (NCES) called the Schools and Staffing Survey - Teacher Questionnaire (2011–2012). Both of these surveys have been used to gather information on professional development implementation in various capacities. Although the surveys were designed for different research purposes, a modification of their items supported the collection of relevant data for addressing the research questions of the present study.

After the respondents submitted the survey, student academic performance data, including subgroup achievement data, were collected from New Jersey Department of Education (NJDOE) public district performance reports. Demographic and student subgroup information was gathered from the National Center for Education Statistics Common Core of Data. These data were utilized to run multiple regression models to determine the existence of a relationship between the method of professional development and students who met or exceeded expectations in the district performance reports. Regression models were also run to identify the influence of the content of the professional development and the decision maker behind the professional development on student academic performance.

Research Questions

Previous research has studied teachers' perceptions of professional development, classroom observations of changing pedagogy, and pre/post-test research on specific professional development methods. However, there is limited research on the link between professional development methods and student academic performance. The present quantitative research explores the following questions:

- How does the method of professional development influence student academic performance?
- How does the content of professional development influence student academic performance?
- How does the professional development decision maker influence the relationship between the method of professional development and student academic performance?

Limitations and Delimitations

Despite the strengths of this survey, some delimitations should be highlighted. While a cross-sectional study may provide an understanding of the type of professional development that occurs in schools, it is not able to establish a causal relationship, as it does not make any observations over time. Furthermore, convenience sampling was performed to collect responses in the easiest way for the researcher, which limits the ability to generalize the results. Based on the convenience sample and the respondents, the variety of districts with diverse demographics was somewhat limited, which influenced the results of this study.

Other limitations may have influenced the relationship between districts' academic performance and professional development that cannot be captured by the data. Since this study focuses on math performance, one factor was the district's professional development plan and goals for the school year. While the survey defined the type of professional development, the quality of certain professional development methods, such as job-embedded learning, PLCs, and coaching, can present differently across districts and schools. There may also be unforeseen

factors that could impact the relationship, such as financial changes and budget cuts, district restructuring, and drastic changes in enrollment or staffing.

Definition of Terms

The following terms are defined to clarify key words that are used throughout the study:

- Professional development, which is also referred to as staff development or professional learning, consists of educational learning that impacts an individual's professional career and growth. The NJDOE has defined professional development as "professional learning opportunities aligned with student learning and educator development needs and school, school district, and/or state improvement goals" (NJDOE, 2013).
- Effective professional development has been described by Mizell (2010) as a way to "enable educators to develop the knowledge and skills they need to address students' learning challenges" and requires thoughtful planning, implementation, and feedback. "Professional development is not effective unless it causes teachers to improve their instruction" (p. 10).
- A professional development method, which may also be known as a model or type, identifies the kind of professional development that is offered. Such methods include coaching, observations, webinars, workshops, and conferences, and they may be referenced as professional development types, delivery, or modes.
- Professional development content refers to the information that is presented during a professional development session or, alternatively, content delivered in professional development. This study discusses professional development content in the area of elementary mathematics.

- Student academic performance is defined by an evaluation of a student's level of understanding of learning standards and objectives. Synonyms include student learning outcomes and student proficiency. For this research, student academic performance was measured through an analysis of district performance reports that are available in a public database of the NJDOE. These reports review data that are connected to student performance on statewide assessments.
- In-service training is a professional development method that is hosted by the district as a stand-alone, one-time activity. In-service trainings are presented in a large group setting by an outsourced presenter or in-district staff.
- An out-of-district workshop refers to a professional development workshop that staff may attend as a stand-alone, one-time activity. An out-of-district workshop is presented in a large group setting by an out-of-district presenter and focuses on a specific topic.
- Online learning refers to online courses or virtual learning experiences that teachers may undergo as part of their professional development.
- Job-embedded professional development is, according to the National Comprehensive Center for Teacher Quality, "a shared, ongoing process that is locally rooted and makes a direct connection between learning and application in daily practice…and is designed to enhance teachers' content specific instruction practices" (Croft, Coggshall, Dolan, Powers, & Killion, 2010). This method is presented in a small group setting and may be led by a district staff developer or out-of-district consultant.
- A professional learning community (PLC) has been defined by Learning Forward, a professional learning association, as a community of educators in a department, team, school, or district who "convene regularly and frequently during the workday to engage

in collaborative professional learning to strengthen their practice and increase student results" (Learning Forward, n.d.).

- Site-based coaching is part of the site-based professional learning approach, which allows staff to connect with specialists who support teaching and learning (Polly, 2012). This model also provides sustainable opportunities for teacher growth by permitting time for feedback (Yoon et al., 2007).

Organization of the Study

This research report is organized into five chapters. The present chapter has introduced the research topic and the significance of investigating a relationship between professional development and student academic performance. It has also defined the research questions and important terms that are discussed throughout the study. Next, Chapter 2 outlines the historical context and purpose of professional development before discussing various methods of professional development design. Additionally, it describes the link between professional development and student academic performance.

Chapter 3 then presents the research design and methodology and explains the independent, dependent, and control variables. Subsequently, Chapter 4 analyzes the results of the study in order to address the research questions. Chapter 5 concludes with the findings and implications of the study as well as recommendations for future research.

Chapter II

Review of Literature

This chapter reviews the existing literature on professional development within public school districts and how it defines student academic performance. It begins with a history of professional development with a focus on how politics have shaped professional development and student academic performance. Then, it considers the purpose of professional development, its connection to student academic performance, and how professional development is designed before analyzing the most frequently researched methods of professional development. Finally, the chapter reviews the literature to identify stakeholders who are involved in planning professional development as well as barriers to implementation.

History of Professional Development in School Districts

Providing students with high-quality instruction has been a consideration of policymakers for decades. However, it has taken many years and multiple presidents and laws to clarify how school districts can deliver excellent teaching. As education reform has evolved, the role of professional development for teachers has progressed to its current state.

In 1965, President Lyndon B. Johnson signed ESEA as a promise to deliver a quality education to all students. This law introduced Title I funding, which allocates federal resources to districts with high-risk students. Such resources include federal funding to improve the quality of education for students in low socio-economic areas (U.S. Department of Education, n.d.). This law holds public school districts responsible for their student achievement.

Shortly after, during President Ronald Reagan's administration, "A Nation at Risk" was released, which discusses the nation's failing school systems in comparison to the rest of the

world. The report highlights that students in the US were falling behind those of other nations in the areas of mathematics and science. The commission shared recommendations for education that included devoting more time to the core subjects of English, mathematics, science, social studies, and computer science, setting higher expectations, and spending time and resources on teacher preparation programs to retain excellent teachers, particularly in the fields of math and science (Goldberg & Harvey, 1983). This report was alarming, and policymakers further reformed education and added to ESEA for years.

Later, President George W. Bush reauthorized ESEA by signing NCLB in 2001 to continue improvements in education for all students. The act requires school districts to hire highly qualified teachers (Robelen, 2005) and provide high-quality professional development (Borko, 2004) that demands scientifically supported activities. Moreover, it requires districts to dedicate more time to professional development beyond the short workshops or day-long conferences that districts were previously offering (Blank, de las Alas, & Smith, 2007; Corcoran, 1995; Rebora, 2011). While NCLB imposes higher teaching expectations, it does not precisely define high-quality professional development (Borko, 2004). Since a major task of NCLB was to close the achievement gap, it devised strict guidelines that hold local districts even more accountable for student achievement rates (Robelen, 2005), thus linking high-quality instruction to student academic performance.

Furthermore, NCLB specifically allocates funds for cultivating excellence in teachers and delivering quality instruction to students by extending professional development to all subject areas, requiring ongoing activities for collaboration, and developing teacher leader initiatives (ASCD, n.d.; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). These funds, which are known as Title II Part A, equip schools with over $3 billion annually to improve teacher quality through

professional learning (Guskey, 2009; Jaquith et al., 2010). In 2015, President Barack Obama signed ESSA, which continues the mission of NCLB: to provide quality education to all students. However, ESSA obligates districts to assign more emphasis and resources to improving teacher quality and targeting student subgroups, including economically disadvantaged students, students with disabilities, and English learners.

Under ESSA, the U.S. Department of Education (2016) identifies strategies to provide high-quality professional development that meets the following criteria: "sustained (not stand-alone, 1-day, or short-term workshops), intensive, collaborative, job-embedded, data-driven, and classroom focused" (p. 11). These characteristics outline the expectations for districts to continue receiving federal funding for professional development, but they are also connected to the factors that researchers believe contribute to effective staff development (Borko, 2004; Garet et al 2001; Guskey & Yoon, 2009; Stachler, Young, & Borr, 2013). In addition, ESSA holds districts accountable to student subgroups, such as minority groups, students in poverty, students with disabilities, and English learners (NJDOE, 2018). As policymakers have changed the landscape of education, researchers have evaluated the effects of professional development on student learning and achievement.

While federal mandates and funding work under ESSA regulations, states have developed their own administrative codes and statutes regarding professional development. In New Jersey, the code "N.J.A.C. 6A:9C, Professional Development" outlines the purpose, components, and requirements for public school districts as established in 2017 by the New Jersey State Board of Education and Commissioner of Education. To comply with the state's code, districts must provide a cycle of professional development that improves practice and evaluates data to determine student needs. Such professional development should employ "coherent, sustained,

and evidence-based strategies that improve educator effectiveness and student achievement" (NJDOE, 2017b), which is similar to the definition set forth by federal policies and researchers. The state has highlighted some professional development methods that are reviewed in this study, including job-embedded professional development, coaching, and PLCS. With 590 operating public school districts in New Jersey in 2016–2017, the state's administrative code on professional development can be interpreted and implemented in numerous ways across the state.

Purpose of Professional Development

Both policymakers and school leaders have recognized the importance of high-quality professional development in view of its link to student learning (NSDC, 2001). In studying professional development, researchers such as Guskey (2003), Kelly (2012), Villegas-Reimers (2003), and Yoon et al. (2007) have found that the key to improving classroom instruction is adequate professional development for staff. In fact, Guskey and Yoon (2009) have reported that "no improvement effort has ever succeeded in the absence of thoughtfully planned and well implemented professional development" (p. 497), which illustrates that professional development has a substantial role in improving teaching and student learning.

The purpose of professional development is to train teachers to provide high-quality instruction to students. Rotermund et al. (2017) have identified professional development as an opportunity for teachers to "update their knowledge, sharpen their skills, and acquire new teaching techniques, with the intent of enhancing the quality of teaching and learning" (p. 1). When teachers refine their skills, they can transfer them to the classroom, which in turn improves student learning (Rotermund et al., 2017). High-quality professional development has a "noticeable impact on teachers' work, both in and out of the classroom" (Villegas-Reimers,

2003, p. 19) and is "often seen as vital to school success and teacher satisfaction" (Rebora, 2004). By providing high-quality professional development, districts set their schools, classrooms, and teachers up for success, which can increase student academic performance.

Link to Student Academic Performance

Professional development has been found to be vital to improving student academic performance (Borko, 2004; Corcoran, 1995; Guskey, 1994; Kennedy, 2016; Yoon et al., 2007; Zambak et al., 2017). An analysis by the National Staff Development Council (2009) has revealed that professional development spread over 6 to 12 months yielded positive effects on student performance, whereas a limited amount of professional learning attained no statistical significance (Darling-Hammond et al., 2009). Similarly, Yoon et al. (2007) have indicated that professional development that lasted more than 14 hours had a statistically significant relationship to student performance. While research has proven that a connection between professional development and student achievement, it is imperative to understand how the two are linked.

Desimone (2009) and Yoon et al. (2007) have developed models for the effect of professional development on student achievement. Both models embody the same key concepts in the steps toward improving student learning (see Figure 1). These steps proceed from the provision of high-quality professional development for increasing teacher knowledge to an impact on classroom instruction, which subsequently leads to enhanced student learning.

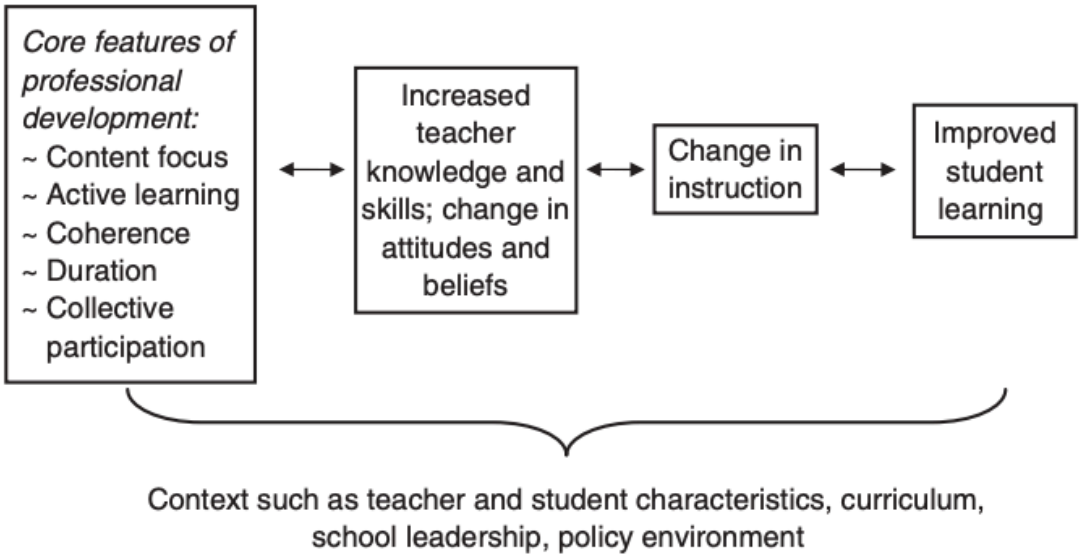

Figure 1. Framework for studying the effects of professional development on teachers and students (Desimone, 2009)

The entire purpose of professional development is to increase teacher quality and student learning for all pupils. With the implementation of ESSA and higher number of students in subgroups (Gibson, 2016), districts are now held accountable for those subgroups, which include economically disadvantaged students, those who receive special education services, and English learners (NJDOE, 2018). The academic achievement gap for students in these subgroups has been a frequent topic of interest for educational leaders and policymakers (Vance, 2016; Royle & Brown, 2014). The individuals in these subgroups are considered "at-risk" students, which is a way to "describe the inequitable conditions, challenging circumstances, or stressful situations that make it more likely for students, individually or collectively, to have poor or harmful school outcomes" (Zinskie & Rea, 2016). Through high-quality professional development, staff can expand their knowledge and introduce new and more effective strategies, pedagogy, and

practices to their students (Gibson, 2016; Sandoval, Challoo, & Kupczynski, 2011). Therefore, it is crucial to evaluate the approaches of schools to designing professional development for staff as well as the relationship between the method of professional development and student performance.

Designing Professional Development

Advances in research, knowledge, and technology have altered the ways in which districts deliver and design professional development for teachers. “Only in the past few years has the professional development of teachers been considered a long-term process that includes regular opportunities and experiences planned systematically” (Villegas-Reimers, 2003, p. 12). Garet et al. (2001), Guskey (1994), and Yoon et al. (2007) have agreed that districts should consider long-term learning goals and student outcomes when designing effective professional development to ensure that the professional learning will benefit students. However, districts often rush through the planning and design process to settle on staff development programs that can be easily organized, quickly executed, or cost effective (Corcoran, 1995; Garet et al., 2001; Guskey, 2009 ; Kelly, 2012) but are not necessarily aligned with student academic goals and needs.

Researchers have argued that many other factors are relevant to increasing student academic performance (Corcoran, 1995; Darling-Hammond, 2000; Desimone, 2009; Guskey, 2009; Silva, 2014; Yoon et al., 2007). However, three categories are the most influential for effective staff development, which subsequently affects student learning outcomes. According to Guskey and Sparks (2002), these categories are “content, process, [and] context,” as depicted by the model for the relationship between professional development and improvements in student

learning. This model has been used in many studies on this topic (Borko, 2004; Desimone, 2009; Green & Allen, 2015; Kedzoir, 2004; Yoon et al., 2007).

The model (see Figure 2) has been frequently referenced in evaluations of staff development programs, including by the National Staff Development Council in the National Standards for Staff Development (NSDC, 2001). The model supports a deeper understanding of the impact of quality professional development and student learning outcomes compared to the model by Yoon et al. (2007). Nevertheless, both models demonstrate the importance of designing high-quality professional development, as "no improvement effort has ever succeeded in the absence of thoughtfully planned and well-implemented professional development" (Guskey & Yoon, 2009, p. 497).

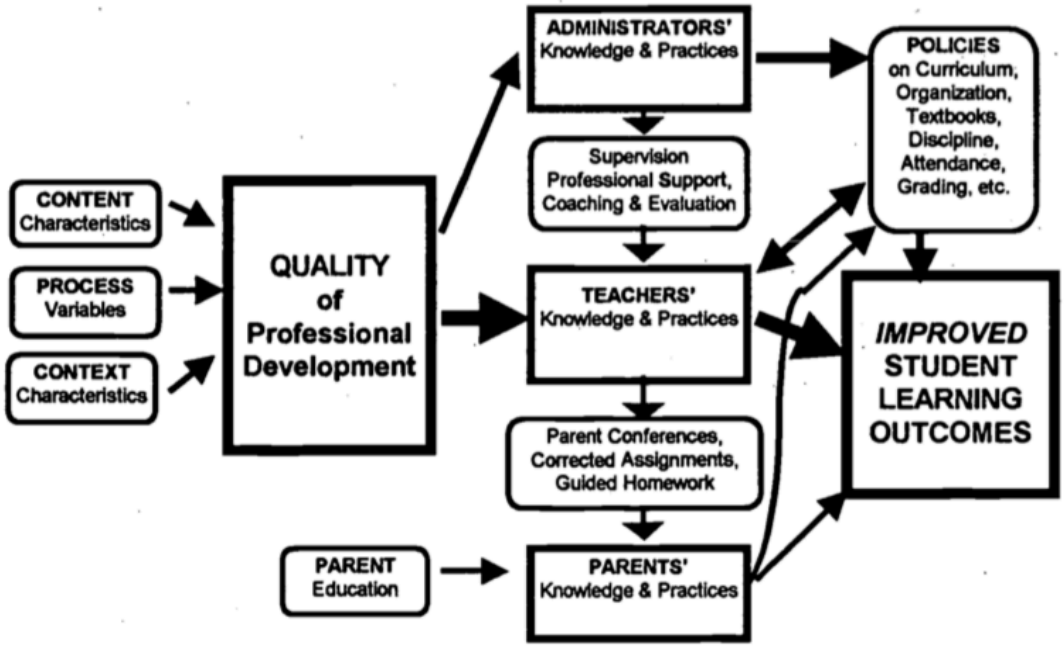

Figure 2. Model of the relationship between professional development and improvements in student learning (Guskey & Sparks, 2002).

Content: The content of a staff development experience is the most vital aspect of designing effective professional development (Boardman & Woodruff, 2004). Professional development that focuses directly on subject matter is viewed as the most influential type of professional learning because teachers have a direct connection to learning in the classroom (Kedzior, 2004; Griffin et al., 2018; Rotermund et al., 2017; Yoon et al., 2007). According to Stachler, Young, and Borr (2013), in order for professional development to be viable, "teachers expect new information that is content-specific, has practical applications, and is relevant to their program" (p. 15).

A nationwide study by the National Staff Development Council (Darling-Hammond et al., 2009) has found that 23% of teachers listed the content they teach as their top priority for professional learning (p. 6). When designing professional development, the content should be reviewed to meet teachers' needs and subjects but also align with the long-term goals for student outcomes (Garet et al., 2001; Guskey, 1994; Villegas-Reimers, 2003). However, content knowledge refers to the subject matter and knowledge of teaching standards rather than the knowledge of a curriculum package, textbook, or board-approved program (Kennedy, 2016; Walker, 2007).

Content knowledge can also encompass professional learning that is necessary to support student subgroup demographics. Research by Royle and Brown (2014) has evidenced that professional development in issues of social and emotional learning, such as mindset and perspective, were important for helping teachers connect and build relationships with students in various academic subgroups. Students in these subgroups often need different instructional strategies to meet their learning needs (Gibson, 2016; Wildschut, Moodley & Aronstam, 2016; Sandoval et al., 2011).

With regard to staff development in mathematics, teachers often encounter professional development experiences that deliver knowledge about programs or textbooks rather than content knowledge about pedagogy for teaching mathematics or standards (Polly, 2012; Walker 2007). Chval, Abell, Pareja, Musikul, and Ritzka (2007) have reported that "[m]ost U.S. school districts do not have the necessary resources to design, implement, and fund the PD that is required to improve the teaching and learning of science and mathematics" (p. 32). Furthermore, they have agreed that the content is a key aspect of professional development that districts are not properly implementing to support math instruction in the classroom. More research is needed to determine whether the difference in content has an effect on professional learning or student learning outcomes.

Process and Context: In designing effective professional development, the process variable is directly linked to the method and activities that are provided (Borko, 2004; Guskey & Sparks, 2002; Kedzoir, 2004). Meanwhile, the context characteristics refer to the staff, resources, and systems that are involved. These two categories are connected because the method, activities, staff, and resources are all intertwined in the design of effective professional development, and they should thus be considered together.

Researchers have found that the most effective professional developments included components of active learning and hands-on work in which teachers could engage (Darling-Hammond, 2009; Garet et al., 2001; Villegas-Reimers, 2003). Additionally, professional development methods granted time for collaboration among colleagues (Calvert, 2016; Corcoran, 1995; Darling-Hammond et al., 2009; Griffin et al., 2018; Kedzoir, 2004; Joyce et al., 2003; NSDC, 2001; Villegas-Reimers, 2003). Finally, all process variables and context characteristics

were connected back to data analysis and long-term goals (Borko 2004; Garet et al., 2001; NSDC, 2001; Rotermund et al., 2017).

Methods of Professional Development

In professional development, there is a wide variety of methods from which districts can choose, although not all of them meet the criteria for effective staff development. The following methods are the most frequently cited in current research and literature. More research should be conducted on the type of relationship, if any, between each individual method and student academic performance.

In-service training: This method of professional development may present differently across districts; however, the purpose of an in-service training is to train teachers who are currently employed by the district (Villegas-Reimers, 2003). These sessions are usually developed by the district and may not be relevant to teachers' current needs (Corcoran, 1995). Like other professional development methods, in-service trainings are only viewed as effective when they are part of a long-term plan, and follow-up sessions are provided (Darling-Hammond et al., 2009). However, there is usually minimal or no follow-up to in-service professional development (Corcoran, 1995).

Districts often bring in experts or consultants to lead these trainings. Guskey and Yoon (2009) have found that schools that used experts as presenters witnessed more improvements in student performance because of the experts' creditability and platform for reaching the staff. In-service trainings are frequently perceived as ineffective (Corcoran, 1995); however, Guskey and Yoon (2009) have disagreed, stating, "[n]one of the successful efforts used a train-the-trainer

approach, peer coaching, collaborative problem solving, or other forms of school-based professional learning" (p. 496).

Out-of-district workshops: When implementing effective professional development, sustainable learning with a follow-up aspect is essential to the learning process. Workshops are often viewed as "disconnected from practice" (Darling-Hammond et al., 2009, p. 9), "single-shot, one-day workshops that often make teacher professional development 'intellectually superficial'" (Yoon et al., 2007, p. 1), or an "ineffective 'drive-by'" approach (Darling-Hammond & Richardson, 2009, p. 1). Another study has claimed that 9 out of 10 teachers attended such single-shot workshops with no feedback or follow-up (Darling-Hammond et al., 2009). This method of professional development does not necessarily align with federal and state mandates and expectations that call for follow-up and goal-oriented professional learning.

Guskey and Yoon (2009) have analyzed various studies on professional development and improvement in student learning. In the nine studies that they incorporated into their analysis, the workshop method demonstrated a positive relationship (Guskey & Yoon, 2009). The analysis indicates that the workshops used "research-based instructional practices, involved active-learning experience for participants, and provided teachers with opportunities to adapt the practices" (Guskey & Yoon, 2009, p. 496), which proves that content is an important part of the planning process.

Online learning: As the 21st century progresses, online learning is becoming more common in schools. With an online learning method, professional development can be achieved anywhere and at any time through the use of technology (Rice, 2017). Everyday technology allows educators to create personalized learning goals and plans, connect with and learn from

educators around the world, take online courses, and conduct their own research (NSDC, n.d.). Through online learning, teachers can access content and classes as they choose (Rice, 2017).

As technology has advanced, researchers have identified some negative components of virtual learning, including the possibility that content is not relatable to a teacher's students or learning environment (Mizell, 2010). While the NSDC (n.d.) highlights the global connections that can be made through online learning, Mizell (2010) and Rice (2017) have found that online learning is a more isolated experience that lacks collaborative opportunities. Furthermore, according to Garet et al. (2001), Guskey (1994), and Yoon et al. (2007), effective professional development is planned with the school's learning goals in mind, but since online learning is vastly personalized, the individual learning goals align (Mizell, 2010). Finally, "[n]o one will know whether or how well an educator applies his or her learning to benefit students" (Mizell, 2010, p. 9), which does not impact the broader community or growth for students.

Job-embedded professional development: Based on previously mentioned findings and government mandates, job-embedded professional development meets the criteria for an effective professional development method. This method provides teachers with formal and informal collaborative opportunities with colleagues without the need to leave their buildings (Calvert, 2016; Croft et al., 2010; Darling-Hammond et al., 2009; Darling-Hammond & Richardson, 2009). Unlike in other models, teachers can receive immediate feedback and coaching and engage in self-driven learning, which is critical as they implement new practices (Croft et al., 2010; Guskey & Yoon, 2009).

Although this method has positive effects for improving classroom teaching and student performance, studies have suggested that this method is not common in current school practices (Hammond et al., 2009). Job-embedded professional development requires a strong system and

structure that can ensure the necessary time and space for such collaborative learning. This method is more frequently used in elementary school settings since the teachers work across content areas (Darling-Hammond et al., 2009).

Professional learning community: Like job-embedded professional development, PLCs are utilized to form collaborative learning opportunities for educators. Specifically, they "redress teacher isolation, create shared teacher responsibility for all students and expose teachers to instructional strategies or knowledge they did not have access to previously" (Croft et al., 2010). These professional communities grant teachers the autonomy to facilitate their own learning while also promoting teamwork (Green & Allen, 2015; Kennedy, 2016). The NJDOE requires PLCs to be part of the professional learning process in public schools to promote collaborative learning environments across the state (Jaquith et al., 2010). This site-based method is heavily collaborative and team oriented, though research has found limited evidence to promote reflection on personal practices and experiences (Blankenship & Ruona, 2007).

Site-based coaching: Another site-based professional development method that is linked to enhancing teacher performance is coaching (Linder, 2011; Polly, 2012). Coaching offers a unique opportunity for staff developers to tailor professional learning to teachers' needs and abilities. This method promotes robust collaboration and trust while allowing teachers to voice their learning needs (Hill et al., 2016; K-12 Education Team, 2015; Linder, 2011). Schools prefer professional development with coaches because it allows for a stronger focus on their individual needs, which makes them more likely to implement new teaching practices compared to traditional professional development participants (Corcoran, 1995; Darling-Hammond et al., 2009). However, a national survey has revealed that most teachers favored content experts in

coaching roles, as opposed to district personnel, and expected constructive feedback throughout (K-12 Education team, 2015), which is similar to job-embedded professional development.

A study by Polly (2012) has reported that "the largest adoption of instructional practices occurred with teachers who requested and received extensive classroom-based support" (p. 89). However, teachers who are resistant to change are often lost or forgotten in coaching models. In the study, these teachers seemed to avoid the instructional coach and restricted their work together to avoid the pressures and challenges of implementing new practices (Polly, 2012), which impacted the school's long-term goals for increasing student performance. In another study, which was cited by Darling-Hammond et al. (2009), "teachers who had been coached felt more confident in their teaching, [but] they were not rated as more effective than teachers who had not been coached" (p. 12). Although instructional coaches seemingly meet the criteria for effective professional development, there is scant evidence to conclude which coaching model is optimal (K-12 Education Team, 2015).

Stakeholders and Decision Making

Designing professional development takes a significant amount of time and effort from whoever is responsible for making the impactful decisions. In more recent years, research has suggested that staff development is more effective when teachers are in control of their learning. According to a study by Darling-Hammond et al. (2009), "[w]hile a scant majority of teachers across the nation feel that they have some influence over curriculum and setting performance standards for students, fewer than half perceived that they had some influence over the content of their in-service professional development" (p. 6).

In study that was conducted in 2014 by the Bill & Melinda Gates Foundation, researchers evaluated teachers' perceptions of professional development and found that "[m]uch of what systems consider professional developments, teachers perceive as wasted time" (K-12 Education Team, 2015, p. 11). The study discovered that when teachers were limited in choice, professional development was completed for compliance rather than for professional growth. Teachers who chose their professional development were more satisfied with their staff development experience (K-12 Education Team, 2015, p. 10).

Kelly (2012) has argued that a successful professional development program may be unprofitable for teachers simply because someone else has made the decision. In addition, teachers who play an active role in the professional development decision-making process are driven in their professional learning to grow and contribute to the growth of others (Calvert, 2016; Darling-Hammond et al., 2009; Strachler et al., 2013; Wieczorek, 2017). Allowing teachers to make these decisions instills a sense of ownership over their professional learning, which promotes active participation and learning (Kedzior, 2004).

Researchers have recognized the importance of school administrators as instructional leaders and their collaborative role in teachers' professional learning (Bredeson, 2006; Guskey, 2009; Pont, Nusche, & Moorman, 2008; Villegas-Reimers, 2003; Wieczorek, 2017). Although professional development should be based on teachers' needs, the planning and design of these professional development experiences should be determined by the administrator. Teachers are able to identify needs, but they struggle to interpret and articulate ways in which to meet them (Guskey, 2003). More research should be conducted to explore if there is a relationship between the professional development decision-making process and student academic performance.

Professional Development in Mathematics

While professional development in all content is important for student success, mathematics have recently become a focus in school districts in New Jersey and across the country (Akkus, 2016; Brendefur, Thiede, Strother, Jesse, & Sutton, 2016; Loewenberg Ball, Hill, & Bass, 2005; Polly et al., 2017; Walker, 2007). Since the implementation of the New Jersey state-wide assessment (PARCC), math scores have decreased across the state. Less than 50% of students in New Jersey pass the PARCC math assessment, and this rate continues to decline each year (Clark, 2018).

The purpose of professional development in mathematics should be to increase knowledge of math pedagogy and instructional strategies to improve student learning (Darling-Hammond & Richardson, 2009; Hill, Bicer, & Capraro, 2017; Walker, 2007). While curriculum standards and expectations are changing, math teachers' pedagogy and instructional practices are not, as professional development often focuses more heavily on program implementation than on strategies (Norman & Nordine, 2016; Walker, 2007).

When states adopted the Common Core State Standards, stakeholders were forced to adopt a new pedagogical view of math. Teachers are responsible for understanding the instructional shifts as well as teaching these standards and promoting mathematical practices for all learners (Akkus, 2016, Martin, Polly, Mraz, & Algozzine, 2018). Research has found that many professional development workshops for teachers do not actually take into account the needs, knowledge, and backgrounds of the teachers in attendance, which makes it difficult for those teachers to connect and engage with the workshop (Chval, et al., 2007).

Particularly in math professional development, educators learn about subject matter or programs when they should be acquiring instructional practices to promote 21st-century

mathematical thinking. Teachers need to have a deep understanding and ability to reason in their own mathematical thinking before they can make positive impacts on student learning (Hill et al., 2005; Loewenberg et al., 2005). A study by Brendeufur et al. (2016) has confirmed this assertion in reporting that professional development that focused on conceptual understanding and reasoning corresponded with increases in student achievement on state assessments.

Factors for Designing Effective Professional Development

Professional development is key to improving student learning outcomes, but some factors complicate the implementation of effective staff development. These barriers are significant obstacles that prevent districts from designing high-quality professional development. Further research could clarify how such hurdles impact the relationship between staff development and student learning outcomes.

Time: Guskey and Yoon (2009) have claimed that "[e]ffective professional development requires considerable time, and that time must be well organized, carefully structured, purposefully directed, and focused on content or pedagogy or both" (p. 499). Adequate time is required in multiple regards—not only for the staff who plan and participate to design and execute professional development but also for teachers to fully grasp concepts, ideas, and implementation strategies. However, "simply adding more [time] for professional learning does not invariably make things better. What matters most is how that time is used" (Guskey, 2009, p. 230). A study by the K-12 Education Team (2015) has found that time was the most frequently cited barrier to effective professional development among both teachers and administrators. Therefore, designating time to sufficiently plan professional development can increase its effectiveness.

Cost: The cost of effective professional development can vary based on the methods, but high-quality learning can be expensive and pose a challenge for districts (Garet et al., 2001). Districts could spend more than twice the amount they would allot per teacher or even up to $2,000 per participant (Kedzior, 2004; Little, 1993). Federal grants, such as Title II, provide some funding for professional learning; nevertheless, districts reserve the majority of the budgetary responsibility for professional development. The issue of equity highlights differences in access to professional development between districts. Through ESSA, federal mandates create more of an emphasis on subgroups and equity for all learners, but much of the burden still lies on school districts (Corcoran, 1995; Valli, et al., 2016; Villegas-Reimers, 2003). Minimal research has been performed to assess how funding affects professional development methods.

Professional development methods range in costs depending on the activity, time, and presenter. “Most states and districts have no idea what they are actually spending on professional development” (Corcoran, 1995, p. 3). Professional development expenditures can involve planning, resources, materials, presenter fees, admissions to workshops, and wages for daily substitutes to cover teachers who attend sessions (Little, 1993; Mizell, 2010). Kelly (2012) has also depicted the cost of special remedial programs as an expenditure, as expensive remedial programs will no longer be necessary once teachers receive effective professional development (p. 106). Limited research has addressed whether funding has a direct relationship with professional development and student academic performance.

Administrative and Board Support: Effective professional development requires that all stakeholders have a common vision and long-term goals for the district. In addition, it is important for school board members to have a shared vision of long-term goals as well as effective professional development and its relationship to student academic performance. Often,

school boards are not necessarily aware of the capacity of professional development, and during budget cuts, professional development is one of the first areas for reduction (Korelich & Maxwell, 2015; Villegas-Reimers, 2003).

In addition to creating a common vision, designing professional development that meets the needs of all teachers can be a difficult undertaking. Although school leaders may promote teacher input in professional development design, teachers often resist the opportunity to contribute their input and opinions (Kedzior, 2004). On the other hand, balancing all teachers' needs with school-wide goals and objectives can present another obstacle (Corcoran, 1995). Either way, devising content for effective professional development can hinder the process.

Gaps in the Literature

Research has established the importance of highly effective professional development for improving teacher quality and identified positive and negatives aspects of various professional learning methods. However, minimal research has examined whether there is a relationship between the method and improvement in teacher quality, which in turn affect student performance. The literature has also failed to identify any links between different types of professional development, the content of professional learning, and student academic performance.

This dissertation has contributed knowledge of the relationship between the method of professional learning and student performance. Additionally, it has clarified the impact of the content on student performance and examined the influence of the decision maker in the professional development planning process. This study has also established patterns between

professional development, student academic performance, and the specific student subgroups that are established by ESSA.

Chapter III

Methodology

This chapter describes the methodology of this study. First, it explains the research design as well as the population, sample, and data sources. Then, it review the steps that were taken to ensure the validity and reliability of this study. Finally, it discusses the data collection process and methods of analysis.

Introduction

Former presidents, such as Lyndon B. Johnson, Ronald Reagan, and George W. Bush, have engaged in education reform and changed the mandates for the provision of professional development to staff. Under the most recent law, namely ESSA, the U.S. Department of Education (2016) identifies strategies to provide high-quality professional development that meets the criteria of being "sustained (not stand-alone, 1-day, or short term workshops), intensive, collaborative, job-embedded, data-driven, and classroom focused" (p. 11). These characteristics outline expectations for districts to continue receiving federal funding for professional development. To continue the work of federal policymakers, New Jersey has created its own administrative code and statute (N.J.A.C. 6A:9C, Professional Development) on professional development, which presents the state's expectations for professional learning in its public school districts (NJDOE, 2017b). As policymakers have changed the landscape of education, researchers have evaluated the effects of professional development on student learning and achievement (Guskey, 2003; Guskey, 2009; Rebora, 2004; Rotermund et al., 2017; Villegas-Reimers, 2003).

Research has identified the need for professional development as a means to educate teachers on how to deliver high-quality instruction to students (Guskey, 2003; Kelly, 2012; Villegas-Reimers, 2003; Yoon et al., 2007). By providing effective professional development, districts set their schools, classrooms, and teachers up for academic success. Researchers have agreed that adequate professional development for staff is key to improving classroom instruction (Calvert, 2016; Darling-Hammond et al., 2009; Guskey, 2003; Kelly, 2012; Villegas-Reimers, 2003; Yoon, 2007; Zambak et al., 2017).

The previous chapter has explained that professional development is a necessary component to enhance student learning (Guskey, 2003; Guskey, 2009; Rebora, 2004; Rotermund et al., 2017). Previous research has identified effective professional development methods through various quasi-experiments or qualitative methods. Such studies have, for example, collected pre- and post-data, analyzed teacher surveys, and connected perceptions of changes in teacher practice to student academic performance. Recent research has also independently examined professional development methods and content through experimental approaches; however, few studies have linked these methods to student academic performance. The present study contributes knowledge of the relationship between professional development methods and student academic performance, identifies the influence of the content that is delivered, determines the impact of the decision maker, and recognizes any patterns that may exist between the professional development and student academic performance.

The following research questions guide this quantitative study to determine if there is a relationship between professional development and student academic performance.

- How does the method of professional development influence student academic performance?

- How does the content that is delivered in professional development influence student academic performance?
- How does the professional development decision maker influence the relationship between the method of professional development and student academic performance?

Research Design

This research entails a quantitative study to determine if there is a relationship between professional development methods and student academic performance. For this research, a survey was used to collect data on the methods of professional development that districts offer to teachers. The survey development was based on the theoretical framework of Guskey and Sparks (2002) and the NSDC (2001). The survey responses were analyzed to determine which district performance reports to review.

Population: Based on the findings of the literature review, the population of this study consists of New Jersey public school districts. This population was chosen after the literature review revealed the importance of high-quality professional development in K-12 public schools. According to the most recent public database, namely the New Jersey Public Schools Fact Sheet from 2016–2017 (NJDOE, n.d.), there are 590 operating public school districts, 2,005 elementary schools, and 116,351 classroom teachers across the state. Of the 590 public school districts, 28 are regional high school districts, and 562 service elementary students. Data were collected and analyzed specifically from school districts that include grades three through six within the New Jersey public school system.

According to the NJDOE Administrative Code and Statute 6.A:9B-9.2, teachers with an elementary school endorsement are qualified to teach kindergarten through sixth grade (NJDOE., 2017a). The population of this study remained consistent with the state certification codes to ensure that the data that were collected by the survey would reflect professional development information for elementary school teachers. Since the district performance reports include academic performance from students starting with the third grade, data were collected from districts that service grades three through six in elementary schools.

Sampling: The sampling frame included district- and school-level administrators who plan professional development for their public schools. The New Jersey administrative code N.J.A.C. 6A:9C-4.1 requires public school districts to develop their own professional development plan and holds district boards of education accountable for the completion of these plans (NJDOE, 2017b). Such district professional development plans should be created, implemented, and reviewed by the chief school administrator, district administrator, or school-level administrator.

Since New Jersey mandates the creation of such plans, the present study surveyed this population by collecting a sample from New Jersey elementary public school district administrators. Professional development planning can be achieved in a variety of ways depending on the size and structure of the district; therefore, the sample included multiple respondents from a few districts. This list of district administrators can be obtained from professional organizations or the New Jersey State Directory. Based on this contact list, the survey was sent to the 562 public school districts that include elementary grades in the state of New Jersey. After reviewing the locations of the survey respondents, the geographical locations

of the school districts in the study were analyzed to determine their potential effects on the findings.

From the list of contacts, two to three respondents were expected to respond from each public school district, which presents an opportunity for conflicting responses within a district. Depending on the nature of the context, the differences were reconciled among the responses. If the differences were irreconcilable, then the district was removed from the sample. After reviewing the responses, the differences between them mostly concerned the content that was delivered in the professional development.

After analyzing the content chosen in each response, I reviewed the position of the respondents from the district. I noticed the respondents in most districts that had conflicting responses on content were building principals. Since districts are required to plan professional development based on student needs, it is common to have differences in the content delivered at the different school buildings. Some districts submitted respondents from a district level administrator and another from a building based administrator.

To reconcile these differences, the survey response options were grouped into three categories: instructional tools (response options: programs, resources), standards (response options: NJSLS, Standards for Mathematical Practices), and lesson design (response options: strategies, design, pedagogy). While the responses may have varied by district, they were within the same group of content. Therefore, no districts were irreconcilable in this study.

Survey Questions and Main Themes: Each research question informed the main themes that were developed and the types of questions that were asked in the survey. The questions in the survey were formulated to collect information on how districts implement professional development for teachers. A sample of this survey can be found in Appendix A. Recent research

has collected data regarding perceptions and understandings of professional development; therefore, this survey could further researchers' understandings of the benefits of various professional development methods that are offered by districts.

The basic constructs of interest in this study are the methods of professional development, content delivery, and planning of professional development, which respectively correspond to the three categories of high-quality professional development in the theoretical framework of Guskey and Sparks (2002) and the NSDC (2001). These three main themes were used to formulate questions that help answer the research questions of this study. The items from the survey were modified from those in a survey by Dr. Christine Scheffert Lowden for evaluating the effectiveness of professional development (Scheffert Lowden 2003) as well as a survey by the National Center for Education Statistics (NCES, 2012) called the Schools and Staffing Survey - Teacher Questionnaire (2011–2012). Both of these surveys have been employed to collect data about professional development implementation in various capacities. The questions in both surveys are similar to the types of questions and information that the survey in the present research must gather to answer the research questions.

***Professional Development Method*:** For this theme, information was collected through multiple-choice questions for which respondents could select either one or multiple answer options. This construct offered insight into the relationship between the method of processional development and student academic performance. The items in the survey, which were modified from the NCES Schools and Staffing Survey – Teacher Questionnaire (NCES, 2012), prompted respondents to identify the activities that the district provided for teachers. Such activities included in-service training, out-of-district workshops, online learning, job-embedded professional development, PLCs, and coaching. These types were featured in the survey because

they frequently appeared in the literature. There was also an opportunity to choose "other" as a response to these questions in case districts offered options besides those in the list.

Numeric items were used to signify the frequency of these activities and whether the activities were provided by the district or an out-of-district vendor. There was also an option for respondents to write in any activities that were not listed in the survey. Questions did not specifically ask about student achievement, as after the surveys were collected, the data were linked to achievement by connecting the results to the public district performance reports from the NJDOE and National Center for Education Statistics Common Core of Data.

Content Delivery: The information that was collected through these questions addresses the second research question, which concerns the influence of the content of professional development on student academic performance. Survey respondents answered the method questions and, on the basis of their responses, were posed a question about content. These questions were multiple choice with ability to choose multiple answers. Respondents chose from professional development content that is based on curriculum programs, district resources, learning standards, or instructional strategies. These options derived from the reviewed literature on professional development in mathematics (Brendeufur et al., 2016; Hill et al., 2005; Loewenberg et al., 2005; Norman & Nordine, 2016; Walker, 2007).

***Planning Professional Development*:** The main information that was collected with this set of items regarded how professional development is planned and who plans it. These inquiries connect to the context category in the theoretical framework and answer the question of how the identity of the professional development decision maker influences the relationship between the method of professional development and student academic performance. As with those for the previous constructs, these items were multiple choice and numeric. Questions about how support

is extended to teachers throughout the school year were included in the survey to determine the role of administrators in professional development implementation. The answer choices for this question were developed from the reviewed literature, which revealed gaps in the research in regard to who makes decisions about professional development (Darling-Hammond et al., 2009; Guskey, 2003; K-12 Education Team, 2015; Kelly, 2012).

District Information: Survey questions were formulated according to the three main constructs to answer the research questions. The analysis of survey data and district performance reports afforded opportunities to observe patterns between professional development planning and student academic performance. As part of ESSA requirements, these profiles are posted on the NJDOE website for each public district and school in New Jersey. The profiles include the following indicators: academic achievement through proficiency rates on statewide assessments, academic progress through student growth percentile, progress toward achieving English language proficiency, and school quality through chronic absenteeism (NJDOE, 2018). The indicators are available for all students in the district or school and are disaggregated for student subgroups, such as race, economically disadvantaged students, special education students, English learners, homeless students, and migrant students.

Control Variables: According to federal mandates, districts are required to report student performance data and desegregate them into subgroups, including major racial and ethnic groups, students who have disabilities, English learners, and economically disadvantaged students. For the purposes of this study, the three subgroups of students with disabilities, English learners, and economically disadvantaged students were considered the control variables in view of their effect on student performance. Zinskie and Rea (2016) have noted that students in these subgroups are considered at risk and need additional support to meet academic expectations.

At-risk students affect district performance on mathematics assessments, which is the dependent variable. As Chapter 2 has discussed, research indicates that at-risk students need different instructional strategies to support their learning (Gibson, 2016; Wildschut, Moodley & Aronstam, 2016; Zinskie et al., 2016; Sandoval et al., 2011). Therefore, teachers who work with these groups of students require professional development that supplies them with the skillset to promote student success. Districts and schools with a high proportion of at-risk students may consider different types of professional development and content, which would impact the independent variable in this study.

Validity and Reliability

To support validity and reliability, certain procedures were put in place to ensure the credibility of this study. Since the survey used items from other surveys, the previous studies were reviewed to determine their validity and reliability. To promote the external validity of participants, the sample of administrators was sufficiently broad to include a variety of schools from multiple district factor groups. A range of districts and demographics can support generalization of the results of this study and prove external validity.

Since the survey tool was modified from two other surveys, the reliability and validity of the previous studies were reviewed. The NCES (n.d.) questionnaire did not list any detailed information about the reliability or validity of the survey, but the teacher questionnaire was found to be reliable at the national, regional, and state levels. In the survey by Scheffert Lowden (2003), no information was presented regarding reliability, but face and content validity were met by a committee of experts in the field (p. 41), which included college professors, teachers, committee members, and administrators. This group examined the survey instrument to connect

to the main constructs and remove “ambiguous and/or redundant questions” (Scheffert Lowden, p. 41).

To establish validity of the modified survey, a similar group of experts was convened to confirm the face and content validity prior to administering the survey. This group of experts consisted of school administrators who were not eligible to participate in the study as well as university professors. The survey was also piloted with school leaders before its distribution to check whether the pilot group understood the questions in a similar fashion. Furthermore, gathering multiple respondents per district established inter-rater reliability by capturing the extent to which multiple people per district selected similar answers in the survey. Based on the respondents in this study, districts with multiple respondents largely agreed about the method of professional development that was offered and the party that planned the professional development. However, responses regarding the content that was delivered reflected some differences.

Data Collection

This confidential survey was administered through the online platform Qualtrics. An online method was the easiest for busy school administrators to complete within the given timeframe. Since administrators are inundated with surveys, I needed to be very precise and strategic about the introduction to the survey and the questions I was asking, to avoid survey fatigue and guarantee as many completed responses as possible.

The survey included an introduction to highlight the purpose of the study. Respondents were able to access the survey from July until October of the current year (2019) and could save their progress during the survey to return to it later, which was intended to increase the

probability that they would thoughtfully complete the survey. A survey reminder was sent out once a month throughout the survey window. The survey was linked to respondents' district email accounts, which allowed the researcher to access their county and district codes once they had submitted the survey. The district code was used to link the survey to the NJDOE's district performance reports and National Center for Education Statistics (NCES) Common Core of Data.

The item formats were multiple choice (single answer option and multiple answer options) and numeric. The survey was completed once by each respondent and required an estimated 10 to 15 minutes to complete. Based on discussions with K-12 administrations who had completed dissertations, it was decided not to offer a monetary incentive for the survey.

Once the survey was complete, district performance reports were sourced from the NJDOE public database for districts that participated in the survey. The 2017–2018 district performance reports were used because they were the most recent public reports that were available on the NJDOE website. The district performance reports include student academic performance data that were developed from student scores on the statewide assessment, which are vital pieces of information for running tests. These district performance reports were analyzed in view of the answers to the survey questions to address the research questions. The NCES Common Core of Data was utilized for demographic data.

Data Analysis

In an effort to answer the research questions, the data were subject to a quantitative analysis. A method of analysis was applied to answer each of the research questions by using the

survey data, NJDOE district performance reports from 2017–2018, and the NCES Common Core of Data for demographic information.

Research Question 1: To understand the influence of the method of professional development on student academic performance, the data were analyzed with two multiple regression models. The first used professional development methods as the independent variable, and the dependent variable was the "percent of tester that met/exceeded expectations on the mathematics assessment." This percentage derived from one score in the district performance reports. In the second model, the same independent and dependent variables were used, but control variables were added, including the percentages of economically disadvantaged students, students in special education, and students who were considered English learners.

Research Question 2: As with the first research question, two multiple regression models were employed for data analysis to understand the influence of the content of professional development on student academic performance. For the first model, the independent variable was the content that was delivered in professional development, and the dependent variable was the "percent of tester that met/exceeded expectations on the mathematics assessment." The second model, which included the same independent and dependent variables, also incorporated the control variables of the percentages of economically disadvantaged students, students in special education, and students who were considered English learners.

Research Question 3: To determine the role of the decision maker in the professional development planning process, the data were analyzed through four regression models. The responses were split into two groups—administrators and mixed stakeholders—and selection variables were created.

The first model used the method of professional development planning as the independent variable, and the dependent variable was the "percent of tester that met/exceeded expectations on the mathematics assessment." The second model had the same independent and dependent variables and controlled for the percentages of economically disadvantaged students, students in special education, and students who were considered English learners. For both models, the administrator group was the selection variable.

The third model also applied the method of professional development as the independent variable and the "percent of tester that met/exceeded expectations on the mathematics assessment" as the dependent variable. The final model included the same independent and dependent variables but controlled for the demographic variables of the percentages of economically disadvantaged students, students in special education, and students who were considered English learners. For these two models, the mixed stakeholder group was the selection variable for analyzing how a mixed group of decision makers influences student performance.

The regression models and analyses from the three research questions revealed patterns between professional development and student academic performance in terms of the type of professional development, its content, and the decision maker. The analyses also yielded information about the student subgroups that served as control variables, namely students in special education programs, English learners, and economically disadvantaged students.

Limitations and Delimitations

Despite the strengths of this survey, a few delimitations should be addressed. The survey was cross-sectional to support an understanding of the type of professional development that

occurs in schools. It did not identify a causal relationship, as it did not make any observations over time. Furthermore, a convenience sampling method was applied to collect responses in the easiest way for the researcher, which presents limitations regarding the ability to generalize the results and gather diverse demographics across the districts. Although an analysis of district demographics was conducted for the districts that responded to the survey, a larger sample would permit a broader analysis of this study as well as more generalized results, especially for school districts with larger economically disadvantaged populations.

Certain limitations within school districts could have influenced the relationship between their academic performance and professional development that cannot be captured by the collected data. Since this study focuses on math professional development and performance on state math assessments, one factor is the district's or school's professional development plan and goals for the school year. According to NJDOE policy, a district's professional development plan should be aligned with the district's goals and objectives as well as student and educator needs (NJDOE, 2013). Therefore, in the year in which this study and the data collection were conducted, some districts may not have been focusing their professional development efforts on math instruction, which could cause issues with completing the survey in its entirety.

Since the NJDOE publishes the district performance reports for the public in March of the following school year, the reports from 2017–2018 were used as a proxy for this study. Based on the descriptive statistics in Table 1, the mean difference between 2015–16 and 2016–17 was 2.94% decrease in student performance, and the difference between 2016–17 and 2017–18 was 2.13%. These average changes between the school years are consistent with the NJDOE statewide assessment trend results (Appendix B), which reflect an average change of one to three points across school years (NJDOE, 2019). Therefore, the data that were collected from the

2017–2018 district performance reports on student math performance can be used as a substitute for the 2018–2019 results while still adequately representing the district academic performance on state assessments.

Table 1.

Descriptive Statistics for State Mathematics Performance Trends

	Mean	Median	Standard Deviation	Min	Max
Difference A*	-2.94	-3	5.27	-13.8	9.9
Difference B**	2.13	2	3.74	-6.5	14.1

Note. Data for New Jersey state mathematics performance trends results found on NJDOE (2019).

*Difference between district performance reports from 2015–16 and 2016–17.

**Difference between district performance reports from 2016–17 and 2017–18.

While the types of professional development that are studied in this research were defined by the survey questions, the quality of certain professional development methods, such as job-embedded learning, PLCS, and site-based coaching, can differ across districts and schools, which could be a limitation of the study. Depending on who leads these professional development methods, outcomes could diverge significantly. Some districts use internal personnel, while others employ math consultants who plan and execute professional development uniquely. District standards and expectations for these types of professional development vary from district to district.

In addition, external and unforeseen elements could influence the relationship between professional development and student performance and contribute to the limitations of this study. One notable factor could be major financial changes, such as budgetary cuts to professional

development funds and Title IIA funding. Often, when a board is presented with a budget cut, one of the first programs to be eliminated is professional development. District restructuring, administrative turnover, dramatic changes in student enrollment, and involuntary drastic changes to teachers and staff could also influence professional development and student performance in a given school year. These factors alter the learning environment and climate of the building, which can affect attendance and engagement in professional development and, in turn, student academic performance.

This chapter has presented the methodology for this study. It has reviewed the population, sample, data sources, collection, and methods of analysis for answering the study's research questions. Furthermore, it has detailed potential limitations and delimitations that may have affected the outcome of this research. The next chapter analyzes the results of the research that was described above.

Chapter IV

Results

This chapter shares the results of the survey. The analysis is presented in five sections. The chapter begins with an introduction and an overview of the data that were collected from the survey. Then, the final three sections provide a data analysis based on the research questions.

Introduction

The purpose of this study is to determine if there is a relationship between the type of professional development that is provided to staff who teach elementary mathematics and student academic performance. The study focuses on the most frequently used types of professional development: in-service training, out-of-district workshops, online learning, job-embedded professional development, PLCs, and coaching.

After conducting a review of the literature, the following research questions were formulated to assess whether there is a link between professional development methods and student academic performance. This quantitative research explores the following questions:

- How does the method of professional development influence student academic performance?
- How does the content of professional development influence student academic performance?
- How does the professional development decision maker influence the relationship between the method of professional development and student academic performance?

Overview of Data

Data were collected through an online survey that was sent through Qualtrics to 1,882 recipients. These recipients were administrators from the 562 public school districts in New Jersey that serve elementary students. Of these recipients, 78 completed surveys, which translated to a 4.1% response rate. The completed surveys collected data from 64 public school districts out of the 562 districts, which represents 11.4% of the public elementary school districts in New Jersey. Districts with more than one submission were analyzed and reconciled to ensure consistency across the district. There were no irreconcilable responses from districts with multiple respondents. A reminder email was sent to recipients once a month to encourage survey completion; a total of four reminder emails were sent.

Based on the geographical locations of the responses, 41.2% of respondents worked in a northern New Jersey public school district, 35.3% worked in a central New Jersey district, and 23.5% were from a southern school district. Bergen County, which is located in northern New Jersey, produced the highest percentage of respondents (30.8%), while Gloucester, Hunterdon, and Salem counties had the lowest percentage of respondents (1.28%). Gloucester and Salem counties are both in southern New Jersey, while Hunterdon County is in central New Jersey. The three geographic regions that were used to group responses are based on the regional boundary map from New Jersey's Geographic Information System (State of New Jersey, 2018).

Table 2 contains descriptive statistics for the demographics in the school districts that were surveyed, including the percentage of students who qualified for free or reduced lunch (known as economically disadvantaged in ESSA and denoted as Eco Dis in data tables), the percentage of students in special education programs (referred to as IEP in data tables), and the percentage of students who were considered English learners. These three demographic

subgroups were selected because of their potential effect on student learning. They were also identified in the district accountability reports for ESSA. This descriptive table was created to evaluate the diversity of school districts in this study; however, the table also contains the descriptive statistics for the same demographics across all school districts in the state that meet the population criteria.

Based on Table 2, the districts that participated in this study presented means of 17.30% for students with IEPs, 3.08% for English learners, and 16.34% for economically disadvantaged students. The means for statewide school districts for students with IEPs (mean = 18.29%) and English learners (mean = 3.40%) were within two percentage points of each other, but the mean for economically disadvantaged students was 10.2% lower than the statewide mean (26.54%). These figures reflect that the averages for students with IEPs and English learners were similar between the sample and the state; therefore, generalizations can be made on the basis of the sample for these two demographics.

The descriptive statistics table also displays the median for each subgroup (Table 2). For districts in this study, the median percentages were 17.42% for students with IEPs, 1.92% for English learners, and 9.59% for economically disadvantaged students. As in the mean comparisons, the median percentages of students with IEPs (median = 17.82%) and English learners (median = 1.87%) for the districts in this sample were comparable to those for elementary school districts statewide. The statewide median for economically disadvantaged students was 20.45%, which reflects a 10.86% difference from the districts in this sample.

Since this survey was sent to both building- and district-level administrators, Table 3 outlines the positions of the respondents in the district. Of the 78 respondents, five participants (6.3%) chose not answer the question that asked about their position in the district. Respondents

were able to skip this question to remain unidentifiable, which encouraged honesty when answering the survey questions. Building-level administrators, including principals and vice principals, comprised the highest percentage of the respondents with 57.7%. District-level administrators and assistant superintendents were a combined 18% of the sample, while 15.4% of respondents held superintendent positions at the time.

Table 2.

Descriptive Statistics for Control Variables in Sample and all Statewide Elementary School Districts

	N	Mean (percent)	Median (percent)	Std. Deviation	Minimum	Maximum
In Sample: Percent of Students with IEPs	78	17.30	17.42	3.81	7.48	27.91
Statewide: Percent of Students with IEPs	562	18.29	17.82	5.00	6.00	91.00
In Sample: Percent of English Learners	78	3.08	1.92	3.77	0.00	18.14
Statewide: Percent of English Learners	562	3.40	1.87	5.00	0.00	32.00
In Sample: Percent of Eco Dis	78	16.34	9.59	16.65	0.00	67.71

Statewide: Percent of Eco						
Dis	562	26.54	20.45	23.00	0.00	96.00
District performance	78	56.67	62.20	17.67	11.00	86.00

Table 3.

Administrative Positions of Respondents in Sample

	Frequency (N=78)	Percent of Sample
Superintendent	12	15.4%
Assistant Superintendent	6	7.7%
District-level administrator	8	10.3%
Building-level administrator	45	57.7%
Content area administrator	1	1.3%
Other	1	1.3%
No response	5	6.3%

Research Question 1

For research question 1, the survey asked about the type of professional development that districts provide for staff. Respondents indicated which of the following methods of professional development their staff experienced in the previous school year: in-service trainings, out-of-district workshops, online learning, job-embedded professional development, PLCs, and coaching. Based on the resulting data, two regression models were run. The first (model 1a) used the data as the independent variable and the percentage of students who met expectations on state

testing as the dependent variable. The second model (model 1b) included the same independent and dependent variables while also controlling for the percentages of students with IEP, English learners, and economically disadvantaged students within the district.

Table 4 specifies the means for models 1a and 1b for the types of professional development that were offered, which average between 36% and 69%. The professional development methods with the highest means were PLCs with an average of 69% and in-service training with a mean of 68%. Online learning had the lowest mean of 36%.

Model 1a: Based on the R-square in results in Table 5, there was a 4% variation in students meeting or exceeding expectations on state math assessments that can be explained by the type of professional development that was offered. The p-values in Table 5 evidence that there was no statistical significance between student performance and the types of professional development. While the model reveals no statistically significant correlation, Table 5 also highlights some positive correlations between the variables. On average, districts that provided job-embedded professional development had 4.50% higher student proficiency than districts that did not. According to the unstandardized coefficient of PLCs, districts that provided staff with opportunities for PLCs had a 4.33% lower average in student proficiency compared to districts that did not.

Model 1b: Table 5 conveys a 79% variation in student performance that can be explained by the type of professional development when controlling for the percentages of students in special education programs, English learners, and economically disadvantaged students within the district. Based on the p-values in Table 5, the type of professional development did not exhibit a strong correlation to student performance even when controlling for specific variables that could affect student performance. Out-of-district workshops had the highest p-value in this

model (0.15). While this value is not statistically significant, it implies that districts that provided staff with out-of-district workshops had a 3.19% higher average in student academic performance. In both models, when districts provided PLCs and site-based coaching, they generated a lower average in the percentage of students who met or exceeded expectations on state assessments.

Table 4.

Means for Methods of Professional Development Provided

	Mean
Provide in-service training	68%
Provide out-of-district workshop	54%
Provide online learning	36%
Provide job-embedded professional development	59%
Provide PLCs	69%
Provide site-based coaching	40%
District Performance	56.67

Table 5.

Regression Model for Methods of Professional Development Provided

	Model 1a B	Model 1b B
Constant	55.99 (5.05)	81.38 (5.48)
Provide in-service training	0.51 (4.87)	-0.41 (2.39)
Provide out-of-district workshop	2.55 (4.43)	3.19 (2.19)
Provide online learning	2.61 (4.55)	1.35 (2.24)
Provide job-embedded professional development	4.50 (4.82)	0.45 (2.36)
Provide PLCs	-4.33 (4.70)	-0.68 (2.32)
Provide site-based coaching	-4.10 (4.27)	-0.35 (2.09)
Percent of Students with IEPs		0.46 (0.36)**
Percent of English Learners		-0.70 (0.28)
Percent of Students Eco Dis.		-0.95 (0.08)
Sample Size	78	78
R-squared	0.04	0.79

Note: ***p<0.01, **p<0.05, *p<0.10. Standard errors are shown in the parentheses.

The dependent variable is the percentage of students who met expectations on the state math assessment.

Research Question 2

After respondents chose the type of professional development that they offered, they were asked to indicate which content was delivered during the professional development

sessions. Respondents selected from professional development in a specific math program, math resources, New Jersey Student Learning Standards, Standards of Mathematical Practices, instructional strategies, instructional design, and math pedagogy. Two regression models were run with the collected data. The first (model 2a) used the data as the independent variable and the percentage of students who met expectations on state testing as the dependent variable. The second model (model 2b) included the same independent and dependent variables but also controlled for the percentages of students with IEPs, English learners, and economically disadvantaged students.

Table 6 displays the means for the content of professional development. Content on instructional strategies had the highest mean of 82%. This figure is 17 percentage points above the second-highest mean in this table, which was calculated for instructional lesson design (mean = 65%). Pedagogy had a mean of 45%, which was the lowest mean. Math program (mean = 62%) and lesson design (mean = 65%) exhibited a difference of three percentage points in their means, while the means for math resources (50%) and mathematical practices (51%) differed by one percentage point.

Model 2a: The model in Table 7 demonstrates a 15% variation in student math performance that can be explained by the content of any professional development workshop. An analysis of the coefficients reveals a statistical significance between professional development content on math programs and instructional strategies and the district math performance.

Of the two statistically significant content types, namely mathematics programs and instructional strategies, one displays a positive relationship with district performance, while the other suggests a negative relationship. On average, districts that provided professional development on mathematical programs had a 10.50% lower student academic performance

compared to districts that did not provide this content. However, districts that provided professional development on instructional strategies had 13.1% higher student proficiency rates compared to districts that did not and obtained the highest coefficient across the model. While not statistically significant, districts that provided professional development on standards for mathematical practices and pedagogy also identified positive correlations to student performance. Professional development content on mathematical resources, New Jersey student learning standards, and lesson design presented negative correlations to student performance but were also not statistically significant in this model.

Model 2b: Model 2b included the same independent and dependent variables as model 2a but controlled for the percentages of students with IEPs, English learners, and economically disadvantaged students. The model identified a 79% variation in student math performance that can be explained by the content of any professional development workshop when controlling for those specific subgroup variables (Table 7). Based on an analysis of the regression model, there were no statistically significant relationships for content when the control variables were added.

In regard to the statistically significant independent variables in model 2a, namely content on mathematical programs and instructional strategies, both coefficients decreased in effect. On average, districts that provided content on mathematical programs during professional development had 2.79% lower student proficiency rates than districts that did not, which represents a 7.71% decrease when controlling for the subgroup variables. On the other hand, delivering content on instructional strategies was associated with 3.71% higher student proficiency compared to districts that did not provide this content, which reflects a 9.39% decrease from model 2a. However, both of these variables were not considered statistically significant.

Table 6.

Means for Content Delivered in Professional Development

	Mean
District Performance	56.67
Content on Mathematics Programs	62%
Content on Mathematics Resources	50%
Content on NJ Student Learning Standards - Mathematics	58%
Content on Standards for Mathematical Practices	51%
Content on Mathematics Instructional Strategies	82%
Content on Mathematics Instructional Lesson Design	65%
Content on Mathematics Pedagogy	45%

Table 7.

Regression Model for Content Delivered in Professional Development

	Model 2a	Model 2b
	B	B
Constant	56.02 (4.91)	81.67 (5.46)
Content on Mathematics Programs	-10.50 (4.59)**	-2.79 (2.42)
Content on Mathematics Resources	-2.32 (4.61)	-0.51 (2.36)
Content on NJ Student Learning Standards - Mathematics	-3.68 (4.95)	-0.30 (2.60)
Content on Standards for Mathematical Practices	1.25 (5.09)	-0.74 (2.65)
Content on Mathematics Instructional Strategies	13.1 (6.66)**	3.71 (3.46)
Content on Mathematics Instructional Lesson Design	-3.15 (5.27)	0.79 (2.71)
Content on Mathematics Pedagogy	2.35 (4.23)	0.41 (2.16)
Percent of Students with IEPs		-0.71 (0.28)
Percent of English Learners		0.26 (0.35)
Percent of Students Eco Dis		-0.90 (0.08)
Sample Size	78	78
R-squared	0.15	0.79

Note: ***p<0.01, **p<0.05, *p<0.10. Standard errors are shown in the parentheses.

The dependent variable is the percentage of students who met expectations on the state math assessment.

Research Question 3

For the third research question, respondents were asked to specify the party that is responsible for planning math professional development for the district. Respondents chose from the options of superintendent, district-level administrator, principal, vice principal, grade level/department chair, professional development committee, staff development personnel, teachers, or a collaborative group. Since the question was a multiple-choice question, groups were created according to the results to be used as the selection variables. An analysis of the selected answers was conducted and found two groups that categorize the responses. Group one was defined as the "Administrators Group," and group two was named the "Mixed Stakeholders Group."

Participants who chose superintendent, district-level administrator, principal, or vice principal were assigned to the administrator group, while the mixed stakeholders group included respondents who selected any of the options but included at least two of the following choices: grade level/department chair, professional development committee, staff development personnel, teachers, or collaborative group. A total of 42 responses were categorized into the administrator group, while 36 were placed in the mixed stakeholder group. Three districts mostly selected answers from the administrator criteria and one answer from the mixed stakeholder criteria. These three districts were placed in the administrator group since their responses implied more of an emphasis on administrative decision making.

The data were employed to run four regression models. Two models used administrators as the selection variable, while the other two applied mixed stakeholders as the selection variable. Model 3a used the percentage of students who met or exceeded expectations on state testing as the dependent variable, the type of professional development as the independent

variable, and the administrator group for planning professional development as the selection variable. Model 3b employed the same dependent, independent, and selection variables while also controlling for the percentages of students in special education, English learners, and economically disadvantaged students. Model 3c used the same dependent variable, the type of professional development as the independent variable, and the mixed stakeholder group for planning professional development as the selection variable. Finally, model 3d included the same dependent independent and selection variable but controlled for the percentages of students in special education, English learners, and economically disadvantaged students.

Table 9 presents the R-squared values for the four models. Model 3a (administrator group) and model 3c (mixed stakeholder group) display a lower variance compared to model 3b (administrator group with control variables) and model 3d (mixed stakeholder group with control variables). When the control variables were added to the models, variance was higher regardless of who was responsible for planning the professional development.

Model 3a: Forty-two respondents chose administrators as the main planners of professional development. The mean for the administrator group models 3a and 3b ranged from 81% to 33% (Table 8). The highest mean was 81% for PLC professional development, while the lowest was online learning at 33%, which is consistent with the means in the first research question (Table 4).

The administrator group model indicates a 26.7% variation in student math performance that can be explained by administrators planning professional development workshops (Table 9). An analysis of the table of coefficients (Table 9) reveals statistical significance when administrators planned out-of-district workshops (p-value = .01) and PLC meetings (p-value = .08). The out-of-district workshops had a stronger correlation compared to the other professional

development types. On average, having an out-of-district workshop planned by administrators was associated with a 14.69% higher score for students who met or exceeded expectations on the math state assessment. However, when administrators planned PLC meetings, there was a 11.28% lower proficiency rate on the assessment. While the other professional development types were not statistically significant, the provision of in-service and online learning also yielded lower scores for proficiency when planned by administrators. In addition, districts that provided administrator-planned job-embedded coaching produced 7.43% higher student proficiency scores.

Model 3b: Table 9 indicates that controlling for the percentages of students in special education, English learners, and economically disadvantaged students led to an 80% variance in the percentage of students who met or exceeded expectations on the math assessment that can be explained by administrators planning professional development. When controlling for the above-mentioned variables, out-of-district workshops (p-value = 0.06) and PLC meetings (p-value = 0.04) again obtained statistical significance (Table 9). On average, when administrators planned out-of-district workshops, there was 5.94% higher student proficiency in student performance and 7.60% lower student proficiency when administrators planned PLC meetings.

Model 3c: Thirty-six respondents indicated that multiple parties planned professional development, including administrators, teachers, and staff development personnel. For this mixed stakeholder group, the means for models 3c and 3d ranged from 33% to 72% (Table 9). Job-embedded professional development had a mean of 72%, which was the highest mean, while out-of-district workshops had a mean of 53%, and PLCs had a mean of 56%.

Based on the R-square in Table 9, there was a 14% variation in students who met or exceeded expectations on state math assessments that can be explained by mixed stakeholders

planning professional development. The p-values in Table 9 evidence no statistical significance between student performance and professional development planned by mixed stakeholders. While the model indicates no significant correlation, Table 9 also suggests some positive correlations between the variables.

Compared to the significant variables in models 3a and 3b, out-of-district workshops and PLC meetings present lower averages in student performance when planned by a mixed group. Having out-of-district workshops planned by mixed stakeholders was associated with 8.99% lower student performance rates, and having PLC meetings planned by mixed stakeholders resulted in 2.59% lower student proficiency; however, neither professional development method was found to be statistically significant. Although in-service trainings had a negative unstandardized coefficient B in the previous model, in-service trainings that were planned by mixed stakeholders had 10.15% higher proficiency rates on the state math assessment in this model.

Model 3d: When controlling for the percentages of students in special education, English learners, and economically disadvantaged students, there was an 86% variance in the percentage of students who met or exceeded expectations on the math assessment that can be explained by mixed stakeholders planning professional development (Table 9). There were no statistically significant p-values when controlling for the specific variables (Table 9). While out-of-district workshops were not statistically significant in this model, this type of professional development exhibited strong correlations across the other models. In this model, out-of-district workshops yielded 4.32% higher proficiency rates on average when planned by mixed stakeholders. Job-embedded professional development indicated the strongest correlation in this model with a p-value of 0.15 but was still not considered statistically significant. Districts that provided job-

embedded professional development that was planned by mixed stakeholders had 7.62% higher student performance compared to districts that did not. As in models 3a, 3b, and 3c, PLC meetings registered a lower average in student math performance regardless of who planned the professional development.

Table 8.

Means for the Planner of Professional Development: Administrators or Mixed Stakeholders

	Model 3a*	Model 3c**
District performance	57.13	56.13
Provide in-service training	69%	67%
Provide out-of-district workshop	55%	53%
Provide online learning	33%	39%
Provide job-embedded professional development	48%	72%
Provide PLCs	81%	56%
Provide site-based coaching	45%	33%

*Reflects only cases in which professional development was planned by administrators

**Reflects only cases in which professional development was planned by mixed stakeholders

Table 9.

Regression Model for the Planner of Professional Development

	Model 3a	Model 3b	Model 3c	Model 3d
	B	B	B	B
Constant	61.88 (6.601)	80.28 (7.89)	53.52 (7.72)	84.59 (7.87)
Provide in-service training	-9.10 (5.69)	-1.86 (3.25)	10.15 (7.97)	-2.96 (3.75)
Provide out-of-district workshop	14.69 (5.14)***	5.94 (3.09)*	-8.99 (7.76)	4.32 (3.64)
Provide online learning	-2.94 (5.59)	0.61 (3.15)	6.42 (7.27)	4.22 (3.28)
Provide job-embedded professional development	7.43 (5.66)	-2.03 (3.28)	3.16 (10.98)	7.62 (5.11)
Provide PLCs	-11.28 (6.35)*	-7.60 (3.55)**	-2.59 (9.88)	-0.37 (4.51)
Provide site-based coaching	0.13 (4.64)	2.13 (2.60)	-8.25 (8.39)	-2.93 (3.71)
Percent of Students with IEPs		0.17 (0.48)		1.29 (0.58)
Percent of English Learners		-0.35 (0.38)		-1.21 (0.44)
Percent of Students Eco Dis.		-0.85 (0.11)***		-1.11 (0.13)
Sample Size	42	42	36	36
R-Squared	0.27	0.80	0.14	0.86

Note: ***p<0.01, **p<0.05, *p<0.10. Standard errors are shown in the parentheses.

The dependent variable is the percentage of students who met expectations on the state math assessment.

This chapter has presented the quantitative results from the models that were run for the research questions. It has also provided an overview of the data that were collected from the survey and offered a data analysis for each of the three research questions. The next chapter discusses the findings and conclusions of the research and specifies implications for practice and policy as well as recommendations for future research.

Chapter V

Conclusions and Recommendations

This final chapter of the dissertation discusses the conclusions and recommendations of the present research. The first section contains an introduction and a summary of the study, while the second section presents an overview of the findings and conclusions of the research. The third section reviews the implications for practice and policy, and the fourth section concludes with recommendations for future research.

Introduction

The NJDOE mandates that public school districts provide professional development with "coherent, sustained, and evidence-based strategies that improves educator effectiveness and student achievement" (NJDOE, 2017b). School districts across the state (and country) spend billions of local, state, and federal dollars on developing these coherent, sustained, and evidence-based professional development programs for their staff. Yet, they do not fully understand how they influence their students' learning. The purpose of this study is to examine the relationship between professional development methods that are provided to elementary math teachers and student academic performance.

A review of the literature and previous research has been conducted to develop the theoretical framework and research questions for this study. The theoretical framework was adapted from previous research by Guskey and Sparks (2002) and the NSDC (2001). Researchers have identified three aspects of quality professional learning that should be guiding forces in the planning of professional development programs: the content that is delivered (goals and objectives), the process (methods and activities), and the context (educators who are

involved in the planning). When these three characteristics are taken into account in planning, professional development can offer a high-quality and meaningful experience for teachers that allows them to apply their learning in the classroom.

This dissertation has evaluated six methods of professional development and the relationship of each method to student success on state assessments. The professional development methods were identified through a review of the literature and previous research and consist of in-service training, out-of-district workshops, online learning, job-embedded professional development, PLCs, and site-based coaching. In view of the declining math scores in the state of New Jersey, the study has focused solely on elementary math professional development to clarify how district administrators can support their math teachers and learners. Based on the ESSA accountability profiles for subgroups, the study considered three subgroups as control variables: students in special education programs, English learners, and economically disadvantaged students. These three variables were chosen because of their influence on student learning and performance.

The following research questions were formulated for this quantitative study on the basis of the literature review:

- How does the method of professional development influence student academic performance?
- How does the content of professional development influence student academic performance?
- How does the professional development decision maker influence the relationship between the method of professional development and student academic performance?

An online survey was sent to school administrators in New Jersey public school districts that serve elementary students to collect data about professional development methods, content, and planning within districts. The respondents represented 11.4% of the public school districts across the state, and the subgroup areas that were examined featured diverse demographics. Most districts in this study (41.2%) were located in northern New Jersey public school districts, which implies that the responses to the survey were more reflective of the professional development policies and procedures in districts in northern New Jersey compared to those in other regions.

Two regression models were run for the first research question, which concerned the method of professional development. One model used the control variables, and the other did not. Two regression models were run for the second research question as well, which explored the content of professional development. Again, one model used the control variables, and one did not. Finally, four regression models were run for the third research question, which pertained to the decision makers. For the last research question, two selection variables were created based on the survey responses: one for administrators and one for mixed stakeholders. Two regression models were run for each of these selection variables; one model used the control variables, and the other did not.

Summary of Findings

This section summarizes the findings from the data analysis in Chapter 4. The findings and conclusions are presented in relation to the professional development method that was evaluated in order to clarify the results for each of the six methods that were analyzed in this research. The study collected data regarding the type of professional development that districts provide to their staff (research question 1), the content of each session (research question 2), and

the district decision makers for professional development programs (research question 3). The control variables for all of the research questions were the percentages of students in special education programs, English learners, and economically disadvantaged students.

The final two parts of this section discuss the findings and trends that are specific to the second and third research questions. These sections review the content that was delivered to staff during the various professional development methods and the role of the decision maker in planning of professional development process.

In-service trainings: This type of professional development yielded one of the highest means in each regression model run, which indicates that it is one of the most commonly used types across districts. While not statistically significant, model 1a indicated a positive coefficient of 0.51 between in-service trainings and student performance. However, when the control variables were added to the model, there was a negative 0.41 unstandardized beta coefficient. Districts that used in-service trainings registered only 0.51% higher student proficiency than districts without in-service training opportunities; however, this model did not identify a statistically significant relationship for in-service trainings.

Even without a significant relationship, there was only a 0.51% higher rate for student performance, which is low in comparison to the other variables in this study. According to model 1b, when controlling for subgroups, districts that used in-service trainings had 0.41% lower student proficiency than districts that did not, which could be because in-service trainings are intended for a broad audience and are usually a one-size-fits-all type of learning experience. Teachers who work with students in subgroups need professional development that teaches staff to more effectively support a variety of learners; therefore, a one-size-fits-all staff development experience does not support these learners.

Out-of-district workshops: Professional development via out-of-district workshops has often been ridiculed for its unsustainable, one-shot style (Darling-Hammond et al., 2009). Although studies suggest that this approach does not match federal and state criteria for professional learning, researchers have noted positive relationships between student performance and out-of-district workshops (Guskey & Yoon, 2009). When controlling for the subgroup variables, out-of-district workshops produced the highest positive unstandardized coefficient (3.19) with a p-value of 0.15, which is not statistically significant. This result conveys an average of 2.55% higher proficiency for districts that provided out-of-district workshops and 3.19% higher proficiency when controlling for subgroup variables.

Out-of-district workshops obtained statistical significance in models 3a and 3b when administrators made the decisions about professional development. In model 3a, out-of-district workshops had a p-value of 0.01, which indicates that districts that offered this type of professional development had 14.69% higher student academic performance on average. When the control variables were added in model 3b, out-of-district workshops remained significant with a p-value of .06 and an unstandardized coefficient of 5.94. When the mixed stakeholders group was run for out-of-district workshops, the table displayed a negative coefficient and no statistical significance. This finding contradicts previous findings that teachers should be involved in the planning of professional development to promote positive staff development experiences (K-12 Education Team, 2015). Nevertheless, further research should be conducted to clarify these findings.

Online learning: Throughout the regression models in this study, online learning consistently generated the lowest means across all of the tables. No statistically significant relationships were found for online learning in any of the regression models in this study. Some

of the coefficient tables across the models contained a negative unstandardized beta, which indicates an average lower percentage for student academic performance when teachers participated in online learning as professional development. However, some models evidenced positive relationships.

Therefore, it is uncertain how online learning can influence student performance. The underlying aim of online learning is to equip teachers with access to professional development at any time (Rice, 2017). However, this study encountered a lack of information and too many inconsistencies in the data to establish conclusions about the influence of online learning on student academic performance.

Job-embedded professional development: One of the least common professional development methods is job-embedded coaching, as it requires stronger professional development structures and systems to be effective. However, this method was included in the study because it is considered a frequently used type of professional development in elementary school settings (Darling-Hammond et al., 2009). This method had the third-highest mean (59%) in model 1a. Job-embedded professional development did not exhibit any statistically significant relationships to student academic performance; however, there were positive coefficients across the regression models. This study did not find any significant data to contribute to previous research on the influence of job-embedded professional development on student academic performance.

Professional learning communities: Theoretically, PLCs fit the state and federal model for professional learning to such a degree that the NJDOE requires PLCs to be part of district and school professional development plans. Besides the state mandate for PLCs, districts implement PLCs because of the leadership opportunities, teamwork, and autonomy that such professional

development extends to teachers (Green & Allen, 2015; Kennedy, 2016). However, based on the analysis in this study, there are no data to evidence that PLCs have a positive influence on student academic performance. In models 1a and 1b, PLCs had the highest mean but no statistical significance and generated a lower rate of student proficiency when they were used as the method of professional development.

For the third research question, which concerned the decision maker of professional development, PLCs attained statistical significance when the administrator group was the selection variable, but they had lower student proficiency rates compared to districts without PLCs for both the administrator and mixed stakeholder groups. Model 3a supports that the use of PLC meetings as professional development was associated with an 11.28% lower student academic performance rate, which is the lowest rate for any professional development method planned by either group. After adding the control variables, PLC meetings had a 7.60% lower student academic performance rate. While stakeholders obtained a lesser value in the unstandardized beta coefficients, the model still indicated a lower proficiency rate in the relationship between PLCs, district performance, and decision makers. More research should be conducted to explore how the role of school administrators in the PLC process affects teacher learning and student outcomes.

Site-based coaching: This method of professional development meets the coherent, sustained, and evidence-based criteria that have been set forth by the Department of Education; however, there is scarce evidence to determine which implementation of the coaching model is most effective for improving student learning (K-12 Education Team, 2015). The data from this study concur with this statement. Coaching did not achieve statistical significance in any of the models. It was also found that districts that used site-based coaching had an average of 4.10%

lower student proficiency rate than districts that did not use site-based coaching. The student proficiency rate was 0.35% lower by the same comparison when the control variables were added to the model.

For the third research question, when the mixed stakeholder group was used as the selection variable, districts that used site-based coaching corresponded to a lower student performance rate than districts that did not use such coaching. When the administrator group was added, districts that utilized coaching witnessed a higher student proficiency rate compared to districts that did not use coaches. However, for both of these models, site-based coaching did not establish a statistically significant relationship with student performance. This information diverges from the findings of researchers (Kelly, 2012; Kedzior, 2004) who believe that teachers should assume an active role in planning and making decisions about professional development.

Content delivered: Seven types of content were analyzed to find statistically significant relationships between the content of professional development and student academic performance. In models 2a and 2b, mathematics instructional strategies had the highest mean of all of the content options in this study. Thus, among the districts in this sample, strategies on instructional practices were delivered most frequently in math professional development.

Instructional strategies and mathematical practices exhibited statistically significant relationships to student academic performance. Districts that provided professional development on instructional strategies had 13.1% higher student proficiency rates than districts that did not and thus obtained the highest coefficient in model 2a. This rate was 3.71% when the control variables were added to the regression. The highest coefficient occurred in model 2b but was not statistically significant. Based on this analysis, districts should consider providing professional development on mathematics instructional strategies and best practices to better assist their

teachers in understanding how to teach mathematics to their class, including with specific strategies that support students in subgroups.

On the other hand, content on mathematical programs evidenced lower statistically significant relationships to student academic performance. Districts that delivered professional development on mathematical programs had 10.5% lower student proficiency rates in model 2a and 2.79% lower proficiency when the control variables were added. No statically significant relationship was found in model 2b. This outcome highlights the importance of providing professional development on instructional strategies rather than conveying more information about the mathematical programs that districts currently or may eventually use.

Districts that provided professional development on standards for mathematical practices and pedagogy also identified higher correlations to student performance, though this finding was not statistically significant. Professional development content on mathematical resources, New Jersey student learning standards, and lesson design presented lower correlations to student performance but were not statistically significant in either regression model. With appropriate professional development content, districts can support teachers in improving student learning and performance.

Professional development decision makers: Recent research has urged school districts to include teachers in the professional development planning and decision-making process. However, based on the data analysis in the regression models, the use of a mixed stakeholder group may not be the most effective method for planning professional development.

In models 3a and 3b, out-of-district workshops registered a statistically significant p-value with a strong correlation in model 3a. This model suggests that, on average, districts that provided out-of-district workshops that were planned by an administrator had 14.69% higher

student academic performance and 5.94% higher performance when control variables were added to the model. Out-of-district workshops that were planned by administrators exhibited the highest positive effect on student academic performance in models 3a and 3b.

Like out-of-district workshops, PLCs also presented a statistically significant relationship when administrators planned the professional development. On average, districts with administrators planning PLCs registered 11.28% lower student proficiency. When the control variables were added to the model, the planning of professional development by administrators was associated with 7.60% lower student proficiency on average.

Models 3c and 3d identified the coefficients when the mixed stakeholder group was used as the selection variable. Having mixed stakeholders plan out-of-district workshops resulted in no statistical relationship and an average of 8.99% lower student proficiency. Likewise, PLCs, which were statistically significant in models 3a and 3b, were not statistically significant in models 3c or 3d and corresponded to an average of 2.59% lower student academic performance in districts that used mixed stakeholders to plan professional development. This result affirms the suggestion of Guskey (2003) that teachers may be able to identify improvement areas yet struggle to determine which kinds of support they need to advance in their professional learning.

Implications for Practice and Policy

As professional development becomes increasingly imperative for school districts, it is vital that school administrators continue to review current research on staff development to improve teaching practices in their districts. School districts with math classes in grades three through six and policymakers who evaluate professional development codes and statutes should

consider the following implications to ensure that teachers receive high-quality professional development that supports student academic growth.

Implications for practice: The practical implications below are organized according to the research questions of this study.

Research question 1: Based on the collected data, PLCs and in-service trainings are the most heavily used professional development methods among the districts in the sample. District administrators should consider planning other methods of professional development in which staff can engage. Other methods of professional development yielded more positive coefficients compared to PLCs and in-service trainings, though they were not statistically significant; therefore, other methods might be more beneficial for teacher learning. While this study did not find statistically significant relationships between the methods of professional development and student academic performance, it does reveal the importance of strategically selecting the content of workshops as well as the decision maker in the planning process.

Research question 2: Administrators should continuously review the content that is delivered in various professional development programs. Sessions that facilitate professional learning on instructional strategies in math presented strong positive relationships throughout this study. The content of professional development exhibited statistically significant relationships to student academic performance; therefore, administrators should encourage professional development that informs staff about content-area-specific teaching methods and best practices to support student academic growth. School districts that seek to increase their math performance on state assessments should analyze their professional development sessions to determine the type of content that was provided to teachers during their professional development activities.

Research question 3: Overall, administrators should assume a strong leadership role as the professional development decision maker. In this study, professional development methods that were planned by administrators, especially in the case of out-of-district workshops, had a positive relationship to student academic performance. No significant data suggest that using a group of mixed stakeholders to make decisions about professional development had an influence on student academic performance. This information is valuable for districts with staff development personnel, committees, or certificated staff that focus solely on planning professional development, as it emphasizes the importance of the role of district- or school-level administrators in the decision-making process. As instructional leaders, administrators have the opportunity to apply their knowledge to conclude effective decisions about professional development.

Implications for policy: According to the U.S. Department of Education (2016) criteria, to comply with the federal definition of high-quality professional development, districts must provide professional development that is "sustained (not stand-alone, 1-day, or short-term workshops), intensive, collaborative, job-embedded, data-driven, and classroom focused" (p. 11). The state of New Jersey has developed its own administrative code (N.J.A.C. 6A:9C, Professional Development) to further define the federal mandates. Based on the findings of this research, policymakers should reconsider the definition and requirements that are linked to high-quality professional development.

The literature review has defined an in-service training or out-of-district workshop as a one-day workshop that is not necessarily job embedded or classroom focused. Thus, these forms of professional development do not meet the criteria in the federal mandate. This research demonstrates that both in-service trainings and out-of-district workshops had positive

relationships with student academic performance, though these relationships were not statistically significant. Out-of-district workshops exhibited a positive relationship with academic performance when student subgroup variables were included in the model. Therefore, while in-service trainings and out-of-district workshops do not meet the federal criteria for professional development, policymakers should review research on these methods to refine federal and state criteria. Since there are no criteria for the content that is delivered, policymakers should consider identifying criteria for the content of professional development rather than defining the structure or method of the professional development that is used.

The analyzed data reflect differences in the relationships between professional development and student academic performance when controlling for the subgroup variables of students with disabilities, English learners, and economically disadvantaged students. In the models that incorporated the subgroup variables, there was a lower (positive or negative) coefficient, with the exception of out-of-district workshops. Policymakers should review these data to establish criteria and expectations for professional development that promotes academic growth for students within these particular subgroups. This information can allow decision makers to predict the type of professional development that would be most beneficial for their students.

Since the average demographics of the research sample are similar to those of all state elementary schools, the results can be used to support decisions regarding students with disabilities and English learners. More research should be conducted to investigate professional development for school districts with high rates of economically disadvantaged students. If policymakers establish professional development standards for students in subgroups, then districts can offer more suitable support to teachers who work with these groups of students.

Recommendations for Future Research

Based on the findings and conclusions, the following recommendations are made for future research in the area of professional development.

1. More research should explore the influence of online professional development on student learning. Based on the analysis, few responses identified online learning as a model that is used by districts. However, the increasing access to technology reveals more opportunities for online learning. Research on online learning would be beneficial for administrators, policymakers, and professional development providers because it can yield a deeper understanding of the benefits of online learning. Accordingly, it could help determine whether districts, policies, and providers should include additional online professional development opportunities.
2. Strategies for implementing effective site-based coaching models warrant further exploration. These strategies include implementation approaches for coaches, administrators, and teachers. While the coaching model offers certain advantages, further research should clarify how to implement an effective coaching model and identify strategies for effective coaching that have a positive influence on student academic performance. Such research would be valuable for districts that employ site-based coaching or are considering its implementation.
3. Since this study was limited in its sample size and results, further research should examine how the decision maker behind professional development influences student academic performance. Specifically, studies should review school districts with high rates of economically disadvantaged students to gather more insight into the optimal ways to

support this specific subgroup and promote positive academic performance. With such additional research, scholars and school administrators could be more informed about the stakeholders who are involved in professional development planning. These studies could also equip policymakers with research findings to consider when defining expectations for professional development policies.

4. More in-depth research should be performed on the influence of the content of professional development meetings. Such research should examine the different types of content that are delivered in professional development and how they connect to student performance within the subgroup variables. These studies would assist districts in appropriately planning their professional development programs and could provide researchers with more information about best practices for planning professional development. Furthermore, districts with high subgroup populations could engage with these data to devise professional development opportunities that would support students in subgroups.
5. Since this study focused only on elementary math, similar research can be conducted in other content areas and grade ranges. Researchers should analyze the results to identify trends between content areas, grade levels, subgroups, and demographics. Such analyses would support administrators in creating professional development that benefits a larger population while also producing information with which researchers could further recognize best practices for professional development. Policymakers could also review these data to understand how professional development affects student performance at a universal level.

6. Additional research and data collection should be conducted to evaluate the effectiveness of PLCs. The NJDOE promotes PLCs, which obligates districts to spend money, time, and resources on implementing this method; therefore, it is imperative that researchers, administrators, and policymakers gain a deeper comprehension of the effects of this method of professional development. Data from this research would be useful for all stakeholders to consider when planning or supporting this professional development method.
7. Researchers should evaluate strategies for effective implementation of job-embedded professional development to equip districts with more knowledge about using this model. Studies should investigate the structures and systems that are needed to facilitate a smooth transition to this type of professional development. Such research would allow administrators to create and implement job-embedded professional development plans that maximize opportunities for teacher growth and, in turn, support student academic performance.
8. Since this study surveyed administrators in 2019 but analyzed 2017–2018 district performance reports as a proxy, a further analysis should utilize the survey results alongside the 2018–2019 district performance reports once they are available to the public. Through such analysis, researchers could examine the performance results in the year in which the professional development was conducted. Moreover, it would allow researchers to identify further trends between the data on professional development and student performance.

Conclusion

This dissertation has been organized into five chapters to clarify the relationship between professional development and student academic performance. Chapters 1 and 2 have established the context of the research, which led to the research design that has been outlined in Chapter 3. Chapter 4 has analyzed the data that were collected through the survey tool, which was created to answer the research questions of this study.

This final chapter has introduced and summarized the dissertation. It has discussed the findings and conclusions from the analysis, including a summary of the six types of professional development that were reviewed (in-service training, out-of-district workshops, online learning, job-embedded professional development, PLCs, site-based coaching), the content that was delivered, and the influence of the decision maker. Finally, the chapter has specified implications for practice and policy as well as a list of recommendations for future researchers to gain further insight into the influence of professional development on student academic performance.

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Appendix A

Data Collection Tool

Influence of Professional Development Methods in Mathematics on Student Academic Performance

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Start of Block: Default Question Block

Informed Consent Form Dear Educator, Xanthy Karamanos is doctoral student at Seton Hall University in the Department of Education, Leadership, Management and Policy. Under the mentorship of Dr. David Reid, Xanthy (the researcher) endeavors to investigate the influence of the type of professional development offered to staff who teach elementary mathematics on student academic performance. The purpose of this study is to provide more information on where to focus professional development efforts to support teaching and improve student learning. The research participant will complete one survey. This survey should take approximately 10 minutes to complete. After the participant submits the survey, their participation in this study is complete. An online survey instrument created by the researcher will be used to gather data for the research. The survey instrument has 28 questions in total. There are nine main questions that all participants will see, then there are three to four sub questions. The questions in this survey are multiple choice (single or multi option) and one open ended for participants to include any additional information. Questions ask participants to identify the professional development methods used in their district, the frequency of the method, the content taught in the sessions, and who plans professional development method. Participation in this study is completely voluntary and the participant may withdraw his or her consent to participate at any time. Refusal to participate or discontinuing participation at any time will involve no penalty or loss of benefits to which the participant is otherwise entitled. The privacy of the research participant and his/her school will be protected throughout the entire research study. Participants survey answers will be sent through Qualtrics where data will be stored in a password protected electronic format. Participant responses will remain confidential and efforts will be made to protect any identifying information provided. The names of individual school districts will be coded to protect confidentiality and district names will not be used in the study. Results from this study may be used in reports, publications or presentations, but will not include the names of the participants or their associated school in any future work. The records from this survey will be kept confidential stored by the researcher in a password protected electronic format. Only the researcher and the researcher's faculty advisors will have access to these records. There are no foreseeable risks or discomforts involved in participating in this study. The participant will not have any direct benefit from being in their research study. This study is designed to learn more about the influence of professional development methods on student academic performance. The study results may be used to help others in the future. There will be no compensation or remuneration for participating in this study. There will be no alternative procedures or courses of treatment used in this study. If you have any questions at any time about the study or the procedures, you may contact Ms. Xanthy Karamanos by email at

xanthy.karamanos@student.shu.edu. If you have any questions about the research or researcher, you may contact Dr. David Reid, the researcher's faculty advisor by email at david.reid@shu.edu or by phone at (973) 961-9668. If you have any questions about your rights as a human research subject, you may contact Dr. May Ruzicka, director of Seton Hall University Institutional Review Board (IRB) for Human Subjects Research by email by irb@shu.edu or by phone at (973) 313-6314. There will be no video or audio-tape recordings used in this study. **By participating in this study, the participant agrees that he/she has read the above information and voluntarily agrees to participate in this study.**

- ○ Yes, I consent. (6)
- ○ No, I do not consent. (7)

Skip To: End of Survey If Informed Consent Form Dear Educator, Xanthy Karamanos is doctoral student at Seton Hall Unive... = No, I do not consent.

1 What is your position in the district?

- ○ Superintendent (1)
- ○ Assistant Superintendent/Director (2)
- ○ District level administrator (3)
- ○ Building administrator (4)
- ○ Content area administrator (5)
- ○ Other (6)

2 Which district staff members are responsible for planning professional development for staff members who teach elementary school math? (Select all that may apply)

- ☐ District Level Administrators (1)
- ☐ School Principal (2)
- ☐ School Vice Principal (Assistant Principal) (3)
- ☐ Grade Level/Department Chairperson (4)
- ☐ Professional Development Committee (5)
- ☐ Staff Development Personnel (6)
- ☐ Teachers (7)
- ☐ Collaborative Group (please indicate who is involved): (8) _____
- ☐ Other: (9) _____
- ☐ None (10)

3 In the recent school year, did the school district provide teachers with in-service training (training in a large group setting) as a method of professional development for teaching elementary math?

- ○ Yes (1)
- ○ No (2)
- ○ Other: (3) _____

Skip To: 7 If In the recent school year, did the school district provide teachers with in-service training (tra... = No

4 How frequently is this type of professional development provided?

- ○ Once (1)
- ○ 2-3 times (2)
- ○ 4-5 times (3)
- ○ 6-7 times (4)
- ○ 8 times or more (5)

5 What month(s) during the school year did this professional development occur? (Select all that apply)

- ☐ September-October (1)
- ☐ November-December (2)
- ☐ January-February (3)
- ☐ March-April (4)
- ☐ May-June (5)

6 What type of content was delivered at this professional development? (Select all that apply)

- ☐ Content on a specific Math program (1)
- ☐ Content on a specific Math resource (2)
- ☐ NJ Student Learning Standards (3)
- ☐ Standards for Mathematical Practices (4)
- ☐ Instructional Strategies and Practices (strategies to promote student learning) (5)
- ☐ Instructional Design (designing lessons to meet student needs) (6)
- ☐ Pedagogy (7)
- ☐ Other (8) _____

7 In the recent school year, did the school district provide teachers out-of-district workshops (training in a large group setting by an out-of-district presenter) as a method of professional development for teaching elementary math?

- ○ Yes (1)
- ○ No (2)
- ○ Other: (3) _____

Skip To: 11 If In the recent school year, did the school district provide teachers out-of-district workshops (tr... = No

8 How frequently is this type of professional development provided?

- ○ Once (1)
- ○ 2-3 times (2)
- ○ 4-5 times (3)
- ○ 6-7 times (4)
- ○ 8 times or more (5)

9 What month(s) during the school year did this professional development occur? (Select all that apply)

- ☐ September-October (1)
- ☐ November-December (2)
- ☐ January-February (3)
- ☐ March-April (4)
- ☐ May-June (5)

10 What type of content was delivered at this professional development? (Select all that apply)

- ☐ Content on a specific Math program (1)
- ☐ Content on a specific Math resource (2)
- ☐ NJ Student Learning Standards (3)
- ☐ Standards for Mathematical Practices (4)
- ☐ Instructional Strategies and Practices (strategies to promote student learning) (5)
- ☐ Instructional Design (designing lessons to meet student needs) (6)
- ☐ Pedagogy (7)
- ☐ Other (8) _____

11 In the recent school year, did the school district provide teachers with opportunities for online learning (e.g. webinars, virtual courses) as a method of professional development for teaching elementary math?

- ○ Yes (1)
- ○ No (2)
- ○ Other: (3) _____

Skip To: 15 If In the recent school year, did the school district provide teachers with opportunities for online... = No

12 How frequently is this type of professional development provided?

- ○ Once (1)
- ○ 2-3 times (2)
- ○ 4-5 times (3)
- ○ 6-7 times (4)
- ○ 8 times or more (5)

13 What month(s) during the school year did this professional development occur? (Select all that apply)

- ☐ September-October (1)
- ☐ November-December (2)
- ☐ January-February (3)
- ☐ March-April (4)
- ☐ May-June (5)

14 What type of content was delivered at this professional development? (Select all that apply)

- ☐ Content on a specific Math program (1)
- ☐ Content on a specific Math resource (2)
- ☐ NJ Student Learning Standards (3)
- ☐ Standards for Mathematical Practices (4)
- ☐ Instructional Strategies and Practices (strategies to promote student learning) (5)
- ☐ Instructional Design (designing lessons to meet student needs) (6)
- ☐ Pedagogy (7)
- ☐ Other (8) _____

15 In the recent school year, did the school district provide teachers with job-embedded professional development (an on-going process directly connected to daily teacher practice, in a small group setting) as a method of professional development for teaching elementary math?

- ○ Yes (1)
- ○ No (2)
- ○ Other (3) _____

Skip To: 19 If In the recent school year, did the school district provide teachers with job-embedded professiona... = No

16 How frequently is this type of professional development provided?

- ○ Once (1)
- ○ 2-3 times (2)
- ○ 4-5 times (3)
- ○ 6-7 times (4)
- ○ 8 times or more (5)

17 What month(s) during the school year did this professional development occur? (Select all that apply)

- ☐ September-October (1)
- ☐ November-December (2)
- ☐ January-February (3)
- ☐ March-April (4)
- ☐ May-June (5)

18 What type of content was delivered at this professional development? (Select all that apply)

- ☐ Content on a specific Math program (1)
- ☐ Content on a specific Math resource (2)
- ☐ NJ Student Learning Standards (3)
- ☐ Standards for Mathematical Practices (4)
- ☐ Instructional Strategies and Practices (strategies to promote student learning) (5)
- ☐ Instructional Design (designing lessons to meet student needs) (6)
- ☐ Pedagogy (7)
- ☐ Other (8) _____

19 In the recent school year, did you provide teachers with opportunities to meet as Professional Learning Communities as a method of professional development for teaching elementary math?

- ○ Yes (1)
- ○ No (2)
- ○ Other (3) _____

Skip To: 23 If In the recent school year, did you provide teachers with opportunities to meet as Professional Le... = No

20 How frequently is this type of professional development provided?

- ○ Once (1)
- ○ 2-3 times (2)
- ○ 4-5 times (3)
- ○ 6-7 times (4)
- ○ 8 times or more (5)

21 What month(s) during the school year did this professional development occur? (Select all that apply)

- ☐ September-October (1)
- ☐ November-December (2)
- ☐ January-February (3)
- ☐ March-April (4)
- ☐ May-June (5)

22 What type of content was delivered at this professional development? (Select all that apply)

- ☐ Content on a specific Math program (1)
- ☐ Content on a specific Math resource (2)
- ☐ NJ Student Learning Standards (3)
- ☐ Standards for Mathematical Practices (4)
- ☐ Instructional Strategies and Practices (strategies to promote student learning) (5)
- ☐ Instructional Design (designing lessons to meet student needs) (6)
- ☐ Pedagogy (7)
- ☐ Other (8) _____

23 In the recent school year, did you provide teachers with site-based coaching as a method of professional development for teaching elementary math?

- ○ Yes (1)
- ○ No (2)
- ○ Other: (3) _____

Skip To: 28 If In the recent school year, did you provide teachers with site-based coaching as a method of profe... = No

24 Who provides the site-based coaching professional development for teaching elementary math? (Select all that apply)

- [ ] Content specialists (e.g. math coach) (1)
- [ ] Peer coaching (2)
- [ ] Administration (3)
- [ ] Consultants (4)
- [ ] Other: (5) _____

25 How frequently is this type of professional development provided?

- [ ] Once (1)
- [ ] 2-3 times (2)
- [ ] 4-5 times (3)
- [ ] 6-7 times (4)
- [ ] 8 times or more (5)

26 What month(s) during the school year did this professional development occur? (Select all that apply)

- [ ] September-October (1)
- [ ] November-December (2)
- [ ] January-February (3)
- [ ] March-April (4)
- [ ] May-June (5)

27 What type of content was delivered at this professional development? (Select all that apply)

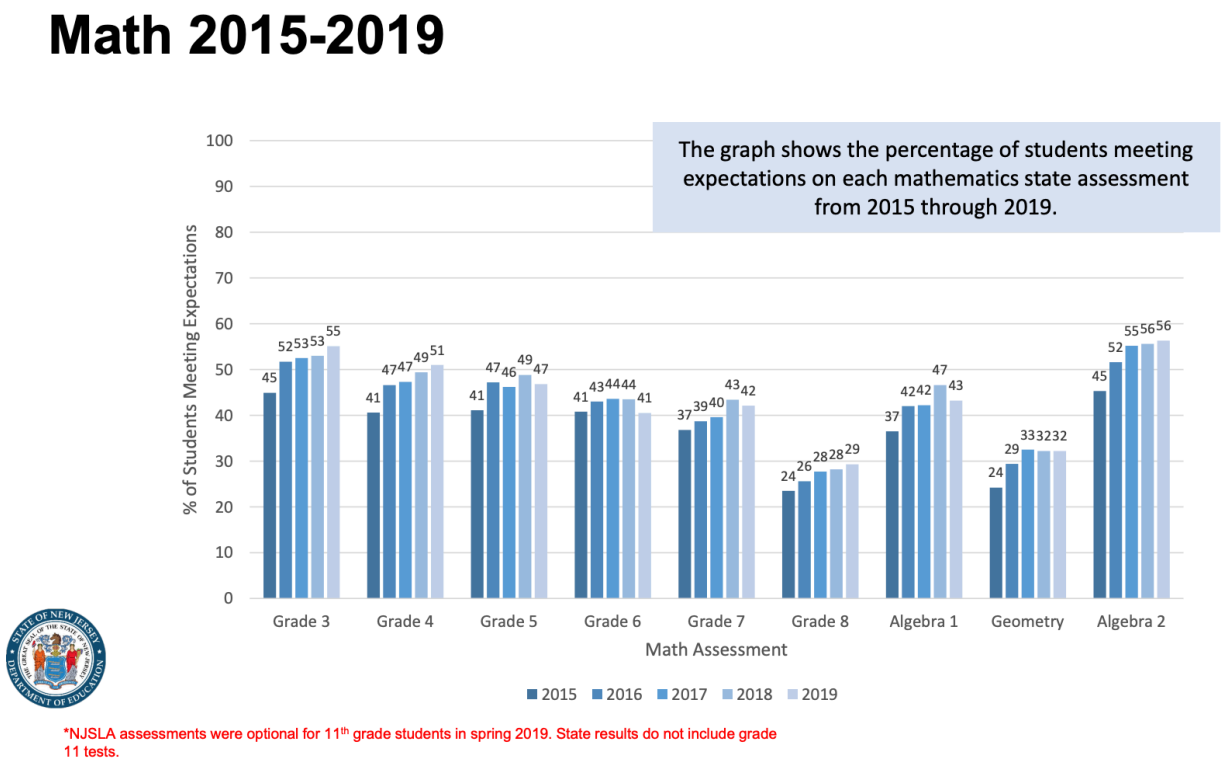
- [ ] Content on a specific Math program (1)
- [ ] Content on a specific Math resource (2)
- [ ] NJ Student Learning Standards (3)
- [ ] Standards for Mathematical Practices (4)
- [ ] Instructional Strategies and Practices (strategies to promote student learning) (5)
- [ ] Instructional Design (designing lessons to meet student needs) (6)
- [ ] Pedagogy (7)
- [ ] Other (8) _____

28 Please include any other professional development opportunities the district has provided teachers in regards to elementary math instruction.

_____

Appendix B

Direction of the New Jersey Assessment System and Spring 2019 Results (NJDOE, 2019)



*NJSLA assessments were optional for 11th grade students in spring 2019. State results do not include grade 11 tests.