8-2019

Is There a Relationship Between Participation in a Professional Learning Community and Student Achievement?

Brian Timm
St. John Fisher College, brian.timm01@gmail.com

Is There a Relationship Between Participation in a Professional Learning Community and Student Achievement?

Document Type
Dissertation

Degree Name
Doctor of Education (EdD)

Department
Executive Leadership

First Supervisor
Michael Muffs

Second Supervisor
Stephen Draper

Third Supervisor
Josephine Moffett

Comments

One educational reform strategy that a number of public schools across America have implemented in an effort to improve student achievement is professional learning communities (PLCs). As PLCs have become more popular in public schools across America, a question arose: Is there a relationship between participation in a PLC and student achievement? The purpose of this study was to examine the relationship between participation in a subject-specific PLC and student achievement in math and English Language Arts (ELA). The methodology involved a retrospective, archival study using a within-cases design. This study compared 3 years of student achievement scores prePLC as compared to 3 years of student achievement scores postPLC using both math and ELA student achievement data. The results of this study, assuming a large effect size (f = 0.40), suggested no statistically significant difference exists between student achievement scores prePLC as compared to postPLC in either math nor ELA. This study adds to the body of knowledge on PLCs through research around a subject-specific PLC team and its subject-specific assessment. The main recommendation from this study is to continue researching the relationship between the subject-specific PLC team, which is most responsible for the student learning, and student achievement on the subject-specific assessment.

Is There a Relationship Between Participation in a Professional Learning Community and Student Achievement?

By

Brian Timm

Submitted in partial fulfillment

of the requirements for the degree

Ed.D. in Executive Leadership

Supervised by

Dr. Michael Muffs

Committee Members

Dr. Stephen Draper

Dr. Josephine Moffett

Ralph C. Wilson, Jr. School of Education

St. John Fisher College

August 2019

Biographical Sketch

Brian Timm is currently the Director of Curriculum and Instruction for the Pine Plains Central School District. Mr. Timm attended SUNY New Paltz from 1992 to 1996 and graduated with a Bachelor of Science degree in 1996. He attended Mount Saint Mary College from 1996 to 2001 and graduated with a Master of Science degree in 2001. He came to St. John Fisher College in the summer of 2011 and began doctoral studies in the Ed.D. Program in Executive Leadership. Mr. Timm pursued his research in the relationship between participation in a professional learning community and student achievement under the direction of Dr. Michael Muffs, Dr. Stephen Draper, and Dr. Josephine Moffett and received the Ed.D. degree in 2019.

Abstract

One educational reform strategy that a number of public schools across America have implemented in an effort to improve student achievement is professional learning communities (PLCs). As PLCs have become more popular in public schools across America, a question arose: Is there a relationship between participation in a PLC and student achievement? The purpose of this study was to examine the relationship between participation in a subject-specific PLC and student achievement in math and English Language Arts (ELA). The methodology involved a retrospective, archival study using a within-cases design. This study compared 3 years of student achievement scores prePLC as compared to 3 years of student achievement scores postPLC using both math and ELA student achievement data. The results of this study, assuming a large effect size (f = 0.40), suggested no statistically significant difference exists between student achievement scores prePLC as compared to postPLC in either math nor ELA. This study adds to the body of knowledge on PLCs through research around a subject-specific PLC team and its subject-specific assessment. The main recommendation from this study is to continue researching the relationship between the subject-specific PLC team, which is most responsible for the student learning, and student achievement on the subject-specific assessment.

Table of Contents

List of Tables

Chapter 1: Introduction

After President Ronald Reagan was elected in 1980, he appointed Terrel H. Bell as the Secretary of Education. Secretary Bell created the National Commission on Excellence in Education to examine the United States school system. The Commission, composed of an 18-member panel, "was created as a result of the Secretary's concern about 'the widespread public perception that something is seriously remiss in our educational system'" (United States, 1983, p. 1). The Commission's charge included:

- assessing the quality of teaching and learning in our Nation's public and private schools, colleges, and universities;
- comparing American schools and colleges with those of other advanced nations;
- studying the relationship between college admissions requirements and student achievement in high school;
- identifying educational programs which result in notable student success in college;
- assessing the degree to which major social and educational changes in the last quarter century have affected student achievement; and
- defining problems which must be faced and overcome if we are successfully to pursue the course of excellence in education. (United States, 1983, pp. 1-2)

In April of 1983, the National Commission on Excellence in Education reported on the status of education in the United States. In this report, *A Nation at Risk,* the Commission wrote:

> Our Nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world. This report is concerned with only one of the many causes and dimensions of the problem, but it is the one that undergirds American prosperity, security, and civility. We report to the American people that while we can take justifiable pride in what our schools and colleges have historically accomplished and contributed to the United States and the well-being of its people, the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. What was unimaginable a generation ago has begun to occur – others are matching and surpassing our educational attainments. (p. 5)

The Commission concluded that the decline of education in the United States was due to inadequacies in the educational process itself (United States, 1983). The inadequacies of the educational process identified by the Commission included content, expectations, time, and teaching (United States, 1983).

The Commission's recommendation on content was for states to strengthen the graduation requirements for high school students. The Commission suggested that all high school graduates be required to complete the following course work in their 4 years of high school: 4 years of English, 3 years of mathematics, 3 years of science, 3 years of social studies, and a ½ year of computer science (United States, 1983).

The Commission's recommendation on expectations was for schools to adopt more rigorous standards and administer standardized assessments to measure a student's academic performance. Additionally, the Commission suggested more time be devoted to learning the suggested content in order to prepare students for success. The Commission also recommended that teachers be required to meet higher educational standards in preparation for teaching, such as competence in their academic content and their ability to teach (United States, 1983).

After *A Nation at Risk* was released, public schools began improvement initiatives across the United States, which became known as the Excellence Movement (DuFour & Eaker, 1998). During the Excellence Movement (1983-1987), schools raised student requirements and increased existing education regulations (Hurst, Tan, Meek, & Seller, 2003). Examples, as recommended by the Commission, included increases in high school graduation requirements, a longer school day, and a longer school year (Hurst et al., 2003).

The Restructuring Movement (1986-1995) followed the Excellence Movement (Hurst et al., 2003). The Restructuring Movement called for national goals and standards to address the Commission's recommendation to increase expectations of schools (DuFour & Eaker, 1998). The national goals developed as a result of the Restructuring Movement became known as Goals 2000. In the spring of 1994, President Clinton signed the Goals 2000: Educate America Act (U.S. Department of Education [USDOE], 1994). Goals 2000 listed eight national goals for education:

1. By the year 2000, all children in America will start school ready to learn.

2. By the year 2000, the high school graduation rate will increase to at least 90 %.
3. By the year 2000, all students will leave Grades 4, 8, and 12 having demonstrated competency over challenging subject matter including English, mathematics, science, foreign languages, civics and government, economics, history, and geography, and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our Nation's modern economy.
4. By the year 2000, the Nation's teaching force will have access to programs for continued improvement of their professional skills and the opportunity to acquire the knowledge and skills needed to instruct and prepare all American students for the next century.
5. By the year 2000, United States students will be the first in the world in mathematics and science achievement.
6. By the year 2000, every adult in America will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.
7. By the year 2000, every school in the United States will be free of drugs, violence, and the unauthorized presence of firearms and alcohol and will offer a disciplined environment conducive to learning.

8. By the year 2000, every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children. (USDOE, 1994, p. 5)

This act established a framework to identify academic standards, measure student performance, and provide support to students that may not have meet the standards (USDOE, 1994). This was the beginning of the standards movement in education (Hurst et al., 2003).

Following President Clinton's Goals 2000: Educate America Act came the Federal No Child Left Behind (NCLB) Act of 2001 signed by President George W. Bush in January 2002. The purpose of NCLB was to ensure that all children have the opportunity to obtain a high-quality education. The overall goal was for all students to reach proficiency on challenging state academic standards as demonstrated on state academic assessments, as the Commission recommended (USDOE, 2001). The Federal No Child Left Behind Act of 2001 had accountability measures embedded as a mechanism to hold states, districts, and schools accountable for improving academic achievement for all students (USDOEs, 2001).

The Federal No Child Left Behind Act required each state to develop a state accountability system to hold every public school accountable for demonstrating academic achievement for all students (USDOE, 2001). NCLB specifically required each state to measure a school's academic performance on standardized assessments in reading/ELA and math in each of Grades 3 through 8 and at least once during Grades 10 through 12 (USDOE, 2001).

The mechanism to measure schools' academic performance on standardized assessments, in reading/ELA and math, was known as Adequate Yearly Progress (AYP) (USDOE, 2001). The accountability system required each school to achieve AYP in each subgroup of the school district: economically disadvantaged students, minority groups, students with disabilities, and students with limited English proficiency (USDOE, 2001).

The Federal No Child Left Behind Act required schools that did not meet AYP for two consecutive years to be identified for school improvement (USDOE, 2001). Once a school was identified as a school in need of improvement, the school was required to develop a corrective action plan using research-based strategies to strengthen core academic subjects (USDOE, 2001). The purpose of the corrective action plan was to ensure that all students identified as not being proficient on the state assessments reached proficiency (USDOE, 2001).

With the increased pressure of accountability imposed by the Federal Government, public schools had to be more systematic in their approach to improving student achievement (Jerald, 2003; Lemons & Stevenson, 2015). In a study by the Mid-Continental Research for Education and Learning (MCREL) (2005), four key components with subcomponents were identified in higher preforming schools as opposed to lower performing schools. The four key components identified were: classroom instruction, school environment, professional community, and leadership (MCREL, 2005).

The study conducted by MCREL (2005) indicated that the core work of schools occurs through classroom instruction with a focus on three important subcomponents, which include: structure, individualization, and opportunity to learn. Effective schools

provided structure by making goals and expectations clear for students (MCREL, 2005). Although the classroom instruction was structured in high-performing schools, it can also be individualized. MCREL's (2005) study suggested that when teachers review student performance data, classroom instruction and learning opportunities could be individualized. Additionally, in high-performing schools students appear to have the opportunity to engage in more challenging classwork (MCREL, 2005).

The MCREL (2005) study investigated the component of school environment in high-performing schools and identified four subcomponents: orderly climate, assessment and monitoring, parent involvement, and academic press for achievement. High-performing schools have an orderly climate, which supports learning for all students by having clear behavioral expectations for students that minimizes disruptions (MCREL, 2005). MCREL's (2005) study noted that regular review of student performance at the building level, classroom level, and student level allows for monitoring of goals and the opportunity to make adjustments as needed (MCREL, 2005). The MCREL (2005) study stated that parent involvement was demonstrated through a positive and productive relationship between parents and school staff. Lastly, academic press for achievement in high-performing schools was demonstrated by the belief that all students will achieve high standards of achievement (MCREL, 2005).

The third component of high-performing schools identified in the MCREL (2005) study was the component of professional community. The component of professional community included these subcomponents: professional development, collaboration, and support for teacher influence (MCREL, 2005). The study conducted by MCREL (2005) suggested that professional development occurring within a community of learners

through collaboration was an effective method of improving the practice of teaching. Collaboration among educators encourages the sharing of experience and expertise and creates supportive conditions for teachers to influence each other (MCREL, 2005).

The MCREL (2005) study also investigated the component of leadership, which included the subcomponents: shared mission and goals, instructional guidance, and organizational change. The study indicated that effective school leaders promote shared mission and goals by framing a common vision for their school (MCREL, 2005). The research further suggested that effective leaders provide instructional guidance by ensuring alignment to effective classroom instruction by monitoring teachers in the classrooms (MCREL, 2005).

The MCREL (2005) study identified key components with subcomponents of high-performing schools and recommended, "school leaders should recognize the interconnection when planning and implementing school improvement efforts and take a systematic approach to helping their schools 'beat the odds'" (p. 9). One systematic educational reform strategy that a number of public schools across America have implemented in an attempt to improve student achievement is professional learning communities (DuFour & Eaker, 1998). Professional learning communities (PLCs) are described as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (DuFour, DuFour, Eaker, & Many, 2010, p. 11).

DuFour and Eaker (1998) described the structure of a PLC as a group of collaborative teams that share a common purpose. These collaborative teams are typically a group of teachers that teach the same curriculum (DuFour et al., 2010). During team

meetings, teachers work to collectively develop learning targets and develop common assessments aligned to the learning targets (DuFour et al., 2010). After the administration of the common assessment, the team of teachers collaboratively analyzes student achievement data. Once the team of teachers analyzes the student achievement data, they work together to develop intervention plans for students who did not reach proficiency. Additionally, the team of teachers work together to share best teaching practices related to the curriculum. Eaker and Keating (2012) suggested that the PLC model is one opportunity for public schools to improve student achievement.

Problem Statement

As PLCs became more popular in public schools across America, a question arose: Is there a relationship between participation in a PLC and student achievement? The review of the early literature suggests a positive relationship between PLCs and student achievement (Bolman, McMahon, Stoll, Thomas, & Wallace, 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003).

These studies looked at the relationship between a school's participation in PLCs and student achievement (Bolman et al., 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003). All of these studies suggested a positive relationship between a school's participation in PLCs and student achievement (Bolman et al., 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003).

In the research conducted by Phillips (2003), this positive relationship was highlighted. Phillips (2003) looked at the relationship between a school's PLC and student achievement. Phillips (2003) conducted a 3 year case study of a middle school

engaged in a PLC focused on supporting academically low achieving students. Phillips (2003) stated that the case study provided a model of school reform but could not be generalized to fit all educational settings. Phillips's (2003) research identified a middle school focused on teacher learning through the use of research-based literature to create a learning community. Phillips (2003) concluded that the learning community established allowed the opportunity for teachers to experiment with curriculum and instructional practices. "Collectively, they developed innovative programs that transformed student learning" (Phillips, 2003, p. 257). In the research conducted by Phillips (2003), student achievement improved dramatically over a 3 year period. In the first year of the study, 50 % of the students demonstrated proficiency in each subject area of reading, mathematics, writing, science, and social studies on the Texas Assessments of Academic Skills (Phillips, 2003). In the third year of the study, 90 % of the students demonstrated proficiency in each of the subject areas on the same State Assessments (Phillips, 2003).

Vescio, Ross, and Adams (2008) conducted meta-analysis research on PLCs. Meta-analysis research is a synthesis of individual research projects on a similar topic, in this case, PLCs (Vogt & Johnson, 2011). Vescio et al. (2008) suggested that further research be conducted on the impact of PLCs and student achievement through various methodologies. Vescio et al. (2008) stated:

> Although, the analysis of data about student achievement is time-consuming, it is essential in building the case that PLCs are powerful types of reform and with the current demands that schools collect and analyze evidence of student achievement; this analysis is less difficult than it once was. (p. 90)

In response to the Vescio et al. (2008) suggestion for further investigation, additional research continued to look at the relationship between a school's participation in PLCs and student achievement (Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Verano, 2010). Contrary to earlier research, these studies suggested little to no significant relationship between a school's participation in PLCs and student achievement (Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Verano, 2010).

The research conducted by Hamilton (2013) investigated whether the adoption of a school's PLC was related to higher student achievement. The quantitative research study included 533 elementary schools, 135 middle schools, and 124 high schools in the state of California (Hamilton, 2013). In Hamilton's (2013) research, the superintendent of the schools identified schools as either PLC, or non-PLC (NPLC) schools. Hamilton (2013) compared PLC and NPLC schools to California's Department of Education Academic Performance Index (API), which is a yearly state performance measure. Hamilton reported no statistically significant effect between PLC and NPLC schools on student achievement using an analysis of variance (ANOVA) methodology.

In general, the literature and research base that investigated the relationship between a school's participation in PLCs and student achievement was minimal and revealed inconsistent conclusions (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010; Vescio et al., 2008).

Furthermore, the review of literature revealed that the previous research focused on a school's PLC and student achievement as opposed to subject-specific PLC teams and their impact on student achievement on the same subject-specific assessments (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010).

Additionally, the review of literature did not reveal any studies using a research methodology to investigate student achievement data before participation in a PLC as compared to student achievement data after participation in a PLC (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010; Vescio et al., 2008).

This current study contributes a retrospective, archival within-cases approach to the body of literature on PLCs that looked at archival student achievement data before teachers participated in a PLC compared to after the teachers participated in a PLC.

A retrospective archival study makes use of publicly available data and provides an opportunity to study the past (Singleton & Straits, 2005). This retrospective archival study utilized the New York State Education Department (NYSED) Public Education Data Warehouse: New York State Education at a Glance (NYSED Data Site, 2018).

The within-cases methodology looked at student achievement from the same school, over time, and involved an interrupted time-series design. An interrupted time-series design uses multiple observations or scores before and after a point in time, which

represents when a treatment or intervention under investigation started (Singleton & Straits, 2005).

For this study, student achievement data on the New York State Mathematics A Regents Examination of the participating school were obtained for the 3 years before the PLC started and for the 3 years after the PLC started. Additionally, the student achievement data on the New York State Grade 11 English Language Arts Regents Examination were obtained for the 3 years before the PLC started and for the 3 years after the PLC started. This current study contributes to the literature by further investigating the question: Is there a relationship between participation in a PLC and student achievement?

Theoretical Rationale

After the report, *A Nation at Risk*, public schools across America began reform efforts to improve student achievement (Lemons & Stevenson, 2015). These reform efforts were directly related to the recommendations of the National Commission of Excellence in Education and subsequent federal acts. Both the Goals 2000: Educate America Act and the Federal No Child Left Behind Act provided a framework for schools to adhere to, but no direction from either the federal or individual state governments was given as to what reform efforts public schools should implement to improve student achievement (DuFour & Eaker, 1998). As a result, public schools approached the call for school reform with a pragmatist approach (DuFour & Eaker, 1998).

A pragmatist approach is one that is based in real-world practice and is problem centered (Creswell, 2009). Charles Sanders Peirce, an American philosopher and

scientist, was credited with first writing about pragmatism in an article entitled "How to Make Our Ideas Clear" in *Popular Science Monthly* in 1878 (Campbell, 2011). Peirce's explanation of pragmatism was formulated through the lens of science, intended to describe observations by using logic to clearly explain the principle being applied (Campbell, 2011). For example, as a scientist makes a series of observations, it suddenly occurs to the scientist that all of these observations can be explained by a scientific principle (Campbell, 2011). It is this scientific principle that, if true, would explain the observations (Campbell, 2011). While Peirce's description of pragmatism was intended to make clear observable events in science, William James and John Dewey argued that pragmatism could be applied to other areas (Campbell, 2011).

William James expanded on the concept of pragmatism by applying it to religion (Geyer, 1914). James took Peirce's concept of pragmatism, particularly the method for obtaining clearness of thinking, and used it as a foundation for his theory of truth (Geyer, 1914). James introduced the idea of value as a criterion for truth (Geyer, 1914). Geyer (1914) argued that scientists intend to put aside all desires (values) of reaching an outcome in the pursuit of pure scientific research. To introduce value as a criterion for truth was contradictory to the essence of pure scientific research, as Peirce discussed (Geyer, 1914). Additionally, by adding value as a criterion of truth, the truth will vary from person to person depending on what each person values (Geyer, 1914). James's contribution to the term pragmatism – to add value as a criterion for truth – was not well received by the scientific community (Geyer, 1914).

Both Peirce and James argued over the term pragmatism as they attempted to explain truth (Hookway, 2008). Peirce's explanation of truth was based on clarifying

thinking through scientific methods (Hookway, 2008). James's explanation of truth introduced value as having importance to truth; consequently, in James's interpretation, truth can have a different meaning depending on one's values (Hookway, 2008).

John Dewey advanced the term pragmatism by introducing the concept of inquiry and argued that truth was related to the fulfillment of expectation (Geyer, 1914; Hookway, 2008). Dewey's approach to pragmatism differed from Peirce and James by clarifying that when presented with a problem, it is the situation itself that one is unclear about (Hookway, 2008).

Dewey introduced the concept of inquiry as beginning with a problem (Hookway, 2008). Dewey described that when faced with a problem, one must first make understanding of the problem by defining its elements and recognizing the relationships between them (Hookway, 2008). Once the problem is understood, then a specific question can be posed as the basis for inquiry into the problem (Hookway, 2008). Dewey argued that inquiry into a problem is a series of logical actions that clearly defines the problem to assist in solving the problem (Hookway, 2008).

Creswell (2009) stated that a pragmatic approach is based in real-world practice that is problem centered. As a result of increases in school accountability, schools have been implementing reform strategies to improve student performance (Lemons & Stevenson, 2015). Schools across America have been addressing the real-world problem of improving student performance through a pragmatic lens (DuFour & Eaker, 1998). Pragmatists see thought as connected to action (Hookway, 2008). Pragmatists are in search of effective methods to reach desired outcomes (Hookway, 2008).

DuFour, DuFour, Eaker, and Many (2010) responded to the call for education reform with a pragmatic approach in their development of PLCs. DuFour et al. (2010) defined PLCs as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p. 11). DuFour et al. (2010) suggested that collaborative teams in PLC schools use the following four questions of learning to drive their collective inquiry and action research with the goal of improving student achievement:

1. What is it we want students to learn?,
2. How will we know if each student has learned it?,
3. How will we respond when some students do not learn it?, and
4. How can we extend and enrich the learning for students who have demonstrated proficiency? (p. 119)

The DuFour et al. (2010) questions of learning are the essence of Dewey's approach to pragmatism. Dewey believed that once the problem is understood, in this case improving student achievement, then specific questions could be posed as the basis for inquiry (Hookway, 2008). Dewey emphasized that inquiry into a problem is a series of logical actions that clearly defines the problem to assist in solving the problem (Hookway, 2008). DuFour et al. (2010) questions of learning used within a PLC are the guiding questions proposed to improving student achievement.

Statement of Purpose

The purpose of this retrospective, archival within-cases study was to investigate if there is a relationship between participation in a PLC and student achievement. This

study looked at the relationship between participation in a PLC and student achievement in math and ELA.

The Federal No Child Left Behind Act of 2001 specifically required each state to measure a school's academic performance on standardized assessments in reading/ELA and math in each of Grades 3 through 8 and at least once during Grades 10 through 12 (USDOE, 2001). As a result of this requirement, the New York State Grade 11 English Language Arts Regents Examination and the New York State Mathematics A Regents Examination are administered to all New York State public high school students, and they were used to measure student achievement in this study.

Research Questions

The following research questions guided this study:

1. Is there a relationship between participation in a PLC and student achievement on the New York State Mathematics A Regents Examination?
2. Is there a relationship between participation in a PLC and student achievement on the New York State Grade 11 English Language Arts Regents Examination?

Significance of the Study

The significance of this current retrospective, archival within-cases study was to contribute to the body of literature that investigated the relationship between participation in a PLC and student achievement. The literature that investigated the relationship between a school's PLC and student achievement is minimal and lacks in research using a retrospective, archival within-cases methodology (Bolman et al., 2005; Brucker, 2013;

Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Supovitz & Christman, 2003; Verano, 2010).

Additionally, the literature did not reveal any research investigating student achievement data before participation in a PLC as compared to student achievement data after participation in a PLC using a retrospective, archival within-cases design (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Supovitz & Christman, 2003; Verano, 2010).

Furthermore, the review of previous studies (Bolman, McMahon, Stoll, Thomas, & Wallace, 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010) focused on the relationship between a school's participation in PLCs and student achievement.

This current study looked at the relationship between participation in subject-specific PLC teams and their impact on student achievement on subject-specific assessments. This study compared 3 years of student achievement scores prePLC as compared to 3 years of student achievement data postPLC in both math and English.

This study contributes a retrospective, archival within-cases approach to the body of literature on PLCs by looking at archival student achievement data before and after participation in a PLC. Participating schools can gain insight into the relationship between their school's PLC teams and their student achievement outcomes. While this study cannot be generalized to those outside of this study, it will contribute additional

research that examines the question: Is there a relationship between participation in a PLC and student achievement?

Definitions of Terms

The following list of definitions are offered to provide clarification for concepts underlying the research study:

Meta-analysis – is defined as "using the results of individual research projects on the same topic (perhaps studies testing the same hypothesis) as data for a statistical study of the topic" (Vogt & Johnson, 2011, p. 229).

Pragmatism – is defined "as a worldview arising out of actions, situations, and consequences rather than antecedent conditions" (Creswell, 2009, p. 10).

Professional learning community (PLC) – is defined as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (DuFour, DuFour, Eaker, & Many, 2010, p. 11).

Proficiency – is defined as scoring 65 % or better on New York State Regents Examinations.

Retrospective Archival Study – is defined as one that allows researchers to make use of preexisting archival data that provides a source of available information (Gearing, Mian, Barber, & Ickowicz, 2006).

Student Achievement – is defined as student performance demonstrating proficiency, scoring 65 or greater, on the New York State Grade 11 English Language Arts Regents Examination and the New York State Mathematics A Regents Examination, which is administered to all New York State public high school students.

Chapter Summary

After the report, *A Nation at Risk*, public schools across America began reform efforts to improve student achievement (DuFour & Eaker, 1998; Lemons & Stevenson, 2015). These reform efforts were directly connected to the recommendations of the National Commission of Excellence in Education and subsequent federal acts. Both the Goals 2000: Educate America Act and the Federal No Child Left Behind Act specified a framework for schools to demonstrate improvement. However, there was no direction given from either the federal or individual state governments as to what reform efforts public schools should implement to improve student achievement (DuFour & Eaker, 1998).

One educational reform strategy that a number of public schools across America have implemented in an effort to improve student achievement is PLCs (DuFour & Eaker, 1998). As PLCs have become more popular in public schools across America, a question arose: Is there a relationship between participation in a PLC and student achievement?

The review of literature that investigated the impact of PLCs on student achievement revealed differing outcomes as related to the impact on student achievement. Additionally, the review of literature did not reveal any research investigating student achievement data before participation in a PLC and after participation in PLC using archival student achievement data using a within-cases design.

The purpose of this retrospective, archival within-cases study was to look at the relationship between participation in a PLC and student achievement. This study

investigated the relationship between participation in a PLC and student achievement in math and student achievement in ELA.

The following chapters explore the relationship between participation in PLCs and student achievement. Chapter 2 demonstrates an analysis of the research for the study. Chapter 3 explains in detail the research design and methodologies that were used for the study. Chapter 4 includes the results of the current study, and Chapter 5 provides a discussion of the implications of the findings, limitations, and recommendations for future research.

Chapter 2: Review of the Literature

Introduction and Purpose

The 1983 publication of *A Nation at Risk*, by the National Commission on Excellence in Education, started the reform efforts of public schools across America to improve student achievement (DuFour & Eaker, 1998; Lemons & Stevenson, 2015). These reform efforts were directly linked to the suggestions of the National Commission on Excellence in Education and subsequent federal acts. Both the Goals 2000: Educate America Act and the Federal No Child Left Behind Act stipulated a structure for schools to demonstrate improvement. However, there was no direction given from either the federal or individual state governments as to what reform efforts public schools should use to improve student achievement (DuFour & Eaker, 1998).

One educational reform strategy that a number of public schools across America implemented in an effort to improve student achievement is PLCs (DuFour & Eaker, 1998). As PLCs have become more popular in public schools across America, questions arose: Is there a relationship between participation in a PLC and student achievement? Therefore, this study answers the following research questions:

1. Is there a relationship between participation in a PLC and student achievement on the New York State Mathematics A Regents Examination?
2. Is there a relationship between participation in PLC and student achievement on the New York State Grade 11 English Language Arts Regents Examination?

Review of the Literature

This review of the literature includes the emergence of PLCs, characteristics of PLCs, implementation and sustainability of PLCs, PLC teams, the relationship between PLCs and student achievement, and the gap in the research.

Emergence of PLCs. Before the emergence of PLCs, Senge (1990) described the five disciplines required for the creation of learning organizations in the business sector. The five key components identified in creating learning organization are: (a) systems thinking, (b) personal mastery, (c) mental models, (d) shared vision, and (e) team learning (Senge, 1990). The interaction of these five components is the essence of learning organizations (Senge, 1990). Although Senge's (1990) model described the five components of a learning organization as observed in organizations of business, these characteristics are similar to the key components of PLCs that have been identified in the field of education (DuFour, DuFour, Eaker, & Many, 2010; Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008; Newmann & Wehlage, 1995; Rosenholtz, 1989; Warren-Little & McLaughlin, 1993).

Rosenholtz's (1989) study of 78 elementary schools introduced the term learning communities into the field of education. Rosenholtz (1989) analyzed survey data coupled with analysis of teacher interviews to begin to formulate the attributes and characteristics of learning communities. Rosenholtz's (1989) analysis of teacher interviews revealed that teaching is regarded as difficult when done in isolation, but it becomes more manageable with professional assistance. Rosenholtz (1989) concluded:

> This is exactly what occurs in instructionally successful schools, where, because of strong administrative or faculty leadership, teaching is considered a collective

> rather than individual enterprise; requests and offers of assistance among colleagues are frequent; and reasoned intentions, informed choices, and collective actions set the conditions under which teachers improve instructionally. (p. 430)

Warren-Little and McLaughlin (1993) affirmed and contributed to the work of Rosenholtz (1989) by further identifying characteristics of learning communities. Warren-Little and McLaughlin (1993) identified common characteristics of high preforming schools. These characteristics included: a culture of collaboration, sustained teacher inquiry and reflection, an agreed-upon vision and supporting beliefs, and collegial staff relations (Warren-Little & McLaughlin, 1993). Warren-Little and McLaughlin were among the first researchers to introduce the term professional communities into the literature related to schools.

The Newmann and Wehlage (1995) research corroborated the previous research (Rosenholtz, 1989; Warren-Little & McLaughlin, 1993) by identifying the characteristics of professional communities found common between high performing schools. Newmann and Wehlage (1995) reviewed and synthesized four large-scale data sources to identify characteristics of schools that were related to high levels of student achievement. The four data sources utilized in the analysis conducted by Newmann and Wehlage (1995) included: the School Restructuring Study (SRS), the National Educational Longitudinal Study of 1988 (NELS:88), the Study of Chicago School Reform, and the Longitudinal Study of School Restructuring.

The SRS investigated 24 schools, which included eight elementary schools, eight middle schools, and eight high schools (Newmann & Wehlage, 1995). The researchers studied each school from 1991 through 1994 through both quantitative and qualitative

methodologies. Quantitative data was collected on student achievement on teacher assigned assessment in both mathematics and social studies from a total of 130 classrooms containing approximately 2,000 students. Qualitative data was collected through researchers' narrative notes during site visits of corresponding classroom observations focused on instructional practices and surveys of students and staff (Newmann & Wehlage, 1995). Newmann and Wehlage's (1995) analysis of the SRS indicated that all schools included in the study demonstrated progress in organizational restructuring, but they varied in results on the standards of authentic pedagogy. Authentic pedagogy is the emphasis on teaching that requires students to think deeply and apply academic learning to realistic problems (Newmann & Wehlage, 1995). Classes that demonstrated high authentic pedagogy outperformed classes with low authentic pedagogy in both math and social studies class assessments (Newmann & Wehlage, 1995).

The NELS:88 included over 10,000 students followed from 1988 through 1992 in approximately 800 high schools across the nation (Newmann & Wehlage, 1995). The NELS:88 utilized student test data in mathematics, science, reading, and history at eighth Grade, 10th Grade, and 12th Grade from the National Assessment of Educational Progress (Newmann & Wehlage, 1995). The NELS:88 also included survey data from students, teachers, and school leaders with a focus on curriculum resources, classroom instruction, and school climate. Newmann and Wehlage's (1995) analysis of the NELS:88 indicated that 46 % of schools demonstrated at least three significant restructuring practices in place; another 43 % had traditional reform practices in place, and 11 % had no reform practices in place. Newmann and Wehlage indicated that schools with restructuring

practices in place outperformed both traditional and no reform practice schools in student achievement in mathematics, science, reading and history.

The Study of Chicago School Reform study included survey data from approximately 8,000 teachers and school leaders from 440 schools, which included both elementary and high schools (Newmann & Wehlage, 1995). The survey data included organizational features, classroom instruction, school climate, professional activities, parent-teacher partnerships, and school reform activities. Newmann and Wehlage's analysis of the Study of Chicago School Reform indicated that 40 % of schools demonstrated significant reform programs and that 25 % of schools demonstrated no reform programs.

The Longitudinal Study of School Restructuring included eight schools through a 4 year case study focused on school restructuring (Newmann & Wehlage, 1995). The Longitudinal Study of School Restructuring included two urban elementary schools, two urban middle schools, two urban high schools, one rural middle school, and one rural high school. During site visits, researchers made observations and conducted interviews focused on group interactions, teachers' work, and participation in both teacher decision-making processes and their participation in organizational learning (Newmann & Wehlage, 1995). Newmann and Wehlage's analysis of the Longitudinal Study of School Restructuring included aspects of organizational learning. Newmann and Wehlage indicated that teacher teams supported each other in developing rigorous and engaging curriculum for students. Newmann and Wehlage concluded that "the challenge is not just to adopt innovation, but to learn how to use new structures to enhance faculty and student concern for learning of high intellectual quality" (p. 36).

Newmann and Wehlage's analysis and synthesis of the four data sources concluded with recommendations that were found to be associated with higher levels of student performance. The recommendations identified as a result of Newmann and Wehlage's research included: (a) shared governance and leadership focused on advancing a school's mission, (b) structural considerations for improving staff collaboration, and (c) the school's professional community that focused on the teachers' collective responsibility for student learning.

Characteristics of PLCs. As PLCs began to emerge in the literature related to the field of education, two scholars became widely known for their work on PLCs: Shirley Hord and Richard DuFour. Shirley Hord was a researcher and scholar with the Southwest Educational Development Laboratory's School Improvement Program. Richard DuFour was a practitioner known for successfully implementing PLCs in K-12 educational organizations.

Hord's PLC model overview. As researchers began to identify attributes that existed in PLCs, Hord (1997) contributed to the emerging body of research by identifying five attributes of successful PLCs. Hord (1997) found schools that successfully implemented PLC had the following attributes: (a) supportive and shared leadership, (b) collective creativity, (c) shared values and vision, (d) supportive conditions, and (e) shared personal practice (Hord, 1997; Hord & Rutherford, 1998, Hord & Sommers, 2008).

Supportive and shared leadership. Any school change must be cultivated and supported by the principal (Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008). According to Lezotte (2005), the principal sets the culture for the school. If the

principal only communicates to the teachers about administrative and procedural issues, then the teachers are less likely to view quality instruction as the school's goal (Hord, 1997; Hord & Ruhtherford, 1998; Hord & Sommers, 2008). Hord and Sommers (2008) surmised that an effective principal models the behavior that they desire in their teachers. This concept of supportive and shared leadership occurs through the relationship between the principal and teachers as they learn collectively through the identification of problems and then seeking solutions to these problems in a collaborative approach (Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008).

Collective creativity. The implementation of PLCs is evident when PLC teams come together to work collaboratively and learn collectively (Hord, 1997; Hord & Sommers, 2008). Collective creativity is more than just collaboration; it is focused on collective learning that addresses the specific need that the learning community hopes to improve (Hord, 1997; Hord & Sommers, 2008). During the collective learning process, team members identify areas of student deficiencies, which suggest new or additional skills or strategies that team members need to learn (Hord, 1997; Hord & Sommers, 2008). After identifying new or additional skills or strategies to learn, team members explore professional development opportunities that meet their needs (Hord, 1997; Hord & Sommers, 2008). Hord and others indicated that PLC teams then incorporated these new skills or strategies into their planning and classroom instruction (Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008). Additional analysis of student performance allows the PLC team to determine if these new strategies should be continued (Hord, 1997; Hord & Sommers, 2008).

Shared values and vision. As stated by Hord (1997), "sharing a vision is not just agreeing with a good idea; it is a particular mental image of what is important to an individual and to the organization" (p. 19). According to Hord and Sommers (2008), the attribute of shared values and vision is directly related to the teacher's perception of the objective of the school and their part in achieving the objective. Hord and Sommers (2008) further discussed that learning teams develop over time and so does their common vision. Louis and Kruse (1995), as cited in Hord (1997), clarified that "a core characteristic of the PLC is an undeviating focus on student learning" (p. 19). Since team members are involved in creating the shared vision, they keep the goal in mind for their planning, decision-making, and instruction (Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008).

Supportive conditions. "Supportive conditions determine *when* and *where* and *how* the staff regularly come together as a unit to do the learning, decision making, problem solving, and creative work that characterizes a PLC" (Hord, 1997, p. 20). According to Hord and others, for PLCs to be successful, certain supportive conditions are necessary. These supportive conditions include physical and structural conditions and relational conditions (Hord, 1997; Hord & Rutherford, 1998, Hord & Sommers, 2008).

Physical and structural conditions include: the size of the school, physical proximity to staff members, modes of communication, and a structured time and location for meetings (Hord & Rutherfod, 1998; Louis & Kruse, 1995). Hord and Sommers (2008) suggested that time is the most difficult condition to manage. Hord (1997) identified time as a resource for organizations implementing PLCs. However, time is more often

considered a barrier to implementing PLCs (Dembosky, Pane, Barney, & Christina, 2006; Louis & Kruse, 1995).

Relational conditions characteristics of individuals in productive PLCs include their acceptance of feedback with the purpose of improving (Louis & Kruse, 1995). Trust among participants is essential to developing PLCs (Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008). Hord and others further suggested that collaboration in PLCs is unlikely if individuals do not trust each other (Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008).

Shared personal practice. Trust has also been identified as essential to the component of shared personal practice (Hord, 1997; Hord & Rutherford, 1998; Hord & Sommer, 2008). As part of the PLC process, teachers observe each others classroom lessons and discuss the observations with each other (Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008). As a result of this process, team members ensure the implementation of new strategies that can lead to student improvement (Hord & Sommers, 2008).

According to Hord and Sommers (2008), conducting classroom observations and providing feedback are learned skills requiring professional development in order to be successful. Despite the importance of the shared personal practice component in PLCs, Hord and Rutherford (1998) identified time as a limiting factor to the implementation and success of this component.

Hord (1997) concluded that the requirements necessary for an organization to be considered a successful PLC include:

- the collegial and facilitative participation of the principal who shares leadership – and thus, power and authority – through inviting staff in decision making
- a shared vision that is developed from an unswerving commitment on the part of staff to students' learning and that is consistently articulated and referenced for the staff's work
- collective learning among staff and application of learning solutions that address students' needs
- the visitation and review of each teacher's classroom behavior by peers as a feedback and assistance activity to support individual and community improvement
- physical conditions and human capacities that support such an operation. (p. 24)

Supporting the work of previous researchers, DuFour and Eaker (1998) wrote *Professional Learning Communities at Work: Best Practices for Enhancing Student Achievement* (Hord, 1997; Newmann & Wehlage, 1995; Rosenholtz, 1989; Senge, 1990; Warren-Little & McLaughlin, 1993). DuFour and Eaker (1998) suggested that PLCs should focus on developing the following characteristics: a shared mission and vision, examining and discussing best practices, and building and sustaining organizational capacity through shared knowledge with a focus on student learning. DuFour and Eaker's (1998) work differs from previous research in their ability to explain the *how* of PLCs as opposed to the *what* aspects of PLCs (Hord, 1997; Hord & Rutherford, 1998; Hord &

Sommers, 2008; Newmann & Wehlage, 1995; Rosenholtz, 1989; Senge, 1990; Warren-Little & McLaughlin, 1993).

DuFour, DuFour, Eaker, and Many (2006) provided a practical *how to* approach to developing a PLC model in their first edition of *Learning By Doing: A Handbook for Professional Learning Communities at Work.* A second edition of the handbook was released in 2010, which provided additional clarity and resources for practitioners to use in their schools (DuFour, DuFour, Eaker, & Many, 2010).

DuFour's PLC model overview. The PLC approach is based on the concept of using action research within a learning organization (DuFour, DuFour, Eaker, & Many, 2010). To create an environment to support this approach, DuFour et al. (2010) suggested focusing on (a) shared mission and vision, (b) collaborative teams focused on learning through collective inquiry, (c) action orientation and experimentation, and (d) a commitment to continuous improvement that is results oriented.

Shared mission and vision. One commonality with most mission statements in education is the focus on learning for all (Lezotte, 2005). Despite this, Lezotte (2005) argued that mission statements that focus on learning for all really mean a focus primarily on the learning for students. Lezotte (1991) suggested that school leaders should adjust the mission to continue to include students, but also include and focus on the teachers in their schools. DuFour and Eaker (1998) were mindful of this significant shift to a school's mission statement in their description of a shared mission and vision. The research of Marzano, Waters, and McNulty (2005) also suggested that leaders have a responsibility to focus on and clearly articulate the purpose and goals of the organization.

DuFour, DuFour, Eaker and Many (2010) defined the "mission as the Why? Why do we exist? And the vision as the What? What must our school become to accomplish our purpose?" (p. 31). Senge (1990) explained that an organization is composed of individuals that are working interdependently toward a common goal. The shared mission and vision are what staff members recognize as their corporate responsibility (Hord & Sommers, 2008). However, Senge (1990) described the factors that determine if the individuals internalize the mission and vision, which he described as the difference between compliance and commitment. Individuals working interdependently who are committed to the mission and vision rather than compliant to its cause is the essence of learning organizations (Senge, 1990).

DuFour et al. (2010) described the "values as the How? How must we behave to achieve our vision? And goals as How will we mark our progress?" (p. 31). Focusing on student learning, PLC members visualize the changes in student achievement they will realize as a result of their efforts (DuFour & Eaker, 1998). Hord and Sommers (2008) stated that the core focus of all PLC teams is a continuous focus on student outcomes. DuFour et al. (2010) defined a team as "a group of people working together interdependently to achieve a common goal" (p. 36).

Collaborative teams focused on learning through collective inquiry. The purpose of learning teams is to collectively work together to challenge the status quo (DuFour et al., 2005). Eason-Watkins (2005), who is known for transforming Chicago Public Schools, suggested, "teams frequently interact and plan quality instruction, draw on one another's expertise, look at students' work, and build common practices" (p. 195). As Eason-Watkins (2005) noted, these teams not only come together to work collaboratively

but also to learn collectively. In particular, this environment for learning is based on Vygotsky's (1978) work in social development.

Vygotsky's (1978) theories in social development consist of more knowledgeable other (MKO) and the zone of proximal development (ZPD). Vygotsky (1978) described the theory of MKO as an individual who has more knowledge or skill than the learner. MKO is an important concept as it relates to the ZPD. Vygotsky (1978) described the ZPD as the difference between what a learner can do without help as opposed to what the learner can do with help. Vygotsky (1978) suggested that an individual can achieve greater learning when guided, ZPD, by a more skilled partner, KMO. Vygotsky's (1978) theories were developed through studying children, however, these theories can also apply to adults.

Team meetings provide opportunities for teachers to discuss student achievement results and share best practices of their teaching methodology (DuFour & Eaker, 1989). In PLC team meetings, DuFour et al. (2010) recommended that the teams work through a repeating cycle of the following: (a) collectively developing learning targets, (b) creating common assessments aligned to the learning targets, and (c) administering the assessments. Next, DuFour et al. (2010) recommended: (d) analyzing the student achievement data and developing intervention plans for students who did not reach proficiency, (e) implementation of the plan, and to (f) re-assess the students. Additionally, DuFour et al. (2010) suggested that teachers work together to (g) share best teaching practices with the intention of learning from each another.

Vescio et al. (2008) indicated that individual teachers of the PLC team direct the learning as they focus on achieving their goals. In PLC teams, collective team learning is

undertaken by the entire team and is focused on improving instruction, which leads to better student outcomes (DuFour et al., 2010). During the process of collective team learning, the team members identify specific student deficiencies, which indicate specific skills or strategies that the team members need to improve to increase student achievement (DuFour et al., 2010).

Action orientated and experimentation. Senge (1990) summarized the components of being action orientated through experimentation simply as a relationship between vision and current reality. Senge (1990) described this relationship as two movable entities with emotional and creative tension between them. Senge (1990) further clarified that emotional tension is the personal feelings that people have around the current reality. Therefore, Senge (1990) argued that emotional tension is really part of current reality, and once this barrier is overcome, then only creative tension exists between vision and current reality. It is this creative tension that Senge (1990) suggested focusing on as the mechanism to move current reality closer to the vision. When vision and current reality are clearly defined with authenticity, then Senge (1990) suggested that there are only two ways for them to become closer. The vision can be lowered closer to current reality or current reality can be raised to move closer to the vision (Senge, 1990).

The mechanism to move current reality closer to the vision is accomplished through action research (DuFour, DuFour, Eaker, & Many, 2010; Pande, 2007; Senge, 1990; Stringer, 2007). DuFour et al. (2010) defined the work of PLCs as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p. 11). DuFour et al. (2010) suggested that collaborative teams in PLCs use the following four questions

of learning to drive their collective inquiry and action research with the goal of improving student achievement:

1. What is it we want students to learn?,
2. How will we know if each student has learned it?,
3. How will we respond when some students do not learn it?, and
4. How can we extend and enrich the learning for students who have demonstrated proficiency? (p. 119)

In PLC team meetings, DuFour et al. (2010) recommend that the team work through a repeating cycle of the following: (a) collectively developing learning targets to answer the question "what is it the we want our student to learn?" (p. 119), (b) creating common assessments aligned to the learning targets to answer the question "how will we know if each student has learned the material?" (p. 119), and (c) administering the assessments.

Next, DuFour et al. (2010) recommended analyzing the student achievement data and developing intervention plans for students who did not reach proficiency to answer the question "how will we respond when some students do not learn it?" (p. 119). Additionally, DuFour et al. (2010) suggested developing enrichment opportunities for students who did reach proficiency by answering the question "how can we extend and enrich the learning for students who have demonstrated proficiency" (p. 119).

During PLC team meetings, DuFour et al. (2010) further emphasized the importance of analyzing student achievement data from the administered common assessments. In analyzing the results, DuFour et al. (2010) maintained that the sharing and discussion of student results is critical to driving a team's discussion around best

practices to improve instruction and student performance. This is a significant distinction in the PLC model and is contrary to the traditional approach in education (Schmoker, 2006). Robert Eaker (as cited in Schmoker, 2006) summarized this point by stating "the traditional school often functions as a collection of independent contractors united by a common parking lot" (p. 23). This points to the concept of teacher isolation that Schmoker (2006) discussed in *Results Now.*

Schmoker (2006) identified teacher isolation as a barrier to overall school improvement. Schmoker (2006) further pointed to classroom instruction as the number one indicator of student success. The purpose of learning organizations is to create an environment that promotes learning for all people in the organization (Senge, 1990). Putting teachers together that teach the same content, administer common assessments, analyze student work, and most importantly, discuss teaching methods to improve instruction, are the goals of PLC work (DuFour & Eaker, 1998). Operating within the PLC model utilizes Vygotsky's (1978) theory of the ZPD, which is a form of professional development that can lead to improved student achievement (Schmoker, 2006).

Commitment to continuous improvement that is results oriented. Continuous learning is characterized as the practice of using every opportunity and experience to learn something new (Hord & Sommers, 2008). Additionally, DuFour and Eaker (1998) suggested that PLCs should challenge the status quo and search for better ways to improve student achievement.

Continuous improvement requires that each member of the organization is engaged in considering several key questions:

1. What is our fundamental purpose?

2. What do we hope to achieve?
3. What are our strategies for becoming better?
4. What criteria will we use to assess our improvement efforts? (DuFour & Eaker, 1998, p. 28)

Continuous improvement is evident in schools where innovation and experimentation are prioritized and become part of the day-to-day business of schools (DuFour & Eaker, 1998). Joyce (2004) further stated that school improvement happens when teachers are determined and proactive in purposeful dialogue with other teachers about their practice. PLCs must be focused on student learning with an emphasis on collaboration and evaluate their effectiveness by evaluating the results of meeting the needs of all students (Schmoker, 2006).

Implementation and sustainability of PLCs. After identifying the characteristics that constitute PLCs, it is important to discuss the implementation and sustainability process. The literature surrounding the implementation and sustainability of PLCs revealed two concepts. The first concept related to the implementation and sustainability of PLCs is the relationship between school culture and PLCs. The second concept related to implementation and sustainability of PLCs is the relationship of school leadership support and PLCs.

Vescio et al. (2008) conducted meta-analysis research on PLCs, which included 11 studies focused on teacher practices and student learning. Vescio et al. (2008) identified four areas that promoted changes in school culture: a focus on student learning, teacher collaboration, teacher authority, and continuous teacher learning.

The focus on student learning enhances changes in the culture of a school. Supovitz and Christman (as cited in Vescio et al., 2008) investigated the relationship between schools implementing communities of collaborative practices and student achievement. This research included two urban school districts, Cincinnati Public Schools in the state of Ohio and the School District of Philadelphia in the state of Pennsylvania. Both of these schools were focused on reform efforts. In doing so, teams of teachers that were focused on student learning reported changes in their classroom instructional practices. Vescio et al. (2008) found that teachers who did not use specific meeting times to focus on teaching practice and student learning did not report any changes in the instructional culture.

Teacher collaboration contributes to changing the culture of a school. Phillips (as cited in Vescio et al., 2008) conducted a 3 year case study of a middle school engaged in PLCs focused on supporting academically low achieving students. Phillips reported that middle school teachers were able to collaborate in various ways, which included: videotaping and reviewing lessons, engaging in literature studies, and collectively brainstorming new ideas for classroom instruction (Vescio et al., 2008).

Bolman, McMahon, Stoll, Thomas, and Wallace (as cited in Vescio et al., 2008) investigated the relationship between PLCs and student achievement. This mixed method case study included both elementary and secondary schools. In the analysis of the research of Bolman et al. (2005), Vescio et al. (2008) stated, “both survey and case study data suggest a positive impact on teaching practice and morale as a result of participation in collaborative activities” (p. 85).

Teacher authority contributes to changes in the school culture. Supovitz (as cited in Vescio et al., 2008) investigated teachers' perceptions of how participating in PLCs were impacting their work environment through survey data. Supovitz (as cited in Vescio et al., 2008) stated "that giving teachers the power to be decision makers in their own learning process was essential to improving students' learning" (p. 85).

Continuous teacher learning supports changes in the school culture (Bolman et al., 2005). Participation in PLCs enables teachers to identify specific areas of need for professional development as they work together to achieve their goals (Vescio et al., 2008). Bolman et al. (2005) (as cited in Vescio et al., 2008) stated "teachers saw a clear connection between their own professional learning opportunities within the PLC and changes in their practice and student learning" (p. 86).

Harris and Jones (2010) identified the culture of a school as an obstacle to innovation and change. Harris and Jones (2010) reported that the implementation of some PLCs were met with resistance from teachers who were not familiar with PLCs and not trusting of the group members. The researchers noted that supportive teacher leadership was a critical component for the implementation of PLCs (Harris & Jones, 2010).

Mullen and Schunk (2010) identified teacher isolation as a major obstacle to the implementation of PLCs. Mullen and Schunk (2010) emphasized the importance of teacher collaboration with a focus on student and teacher learning as the focus of PLCs. When PLCs commit to continuous inquiry and improvement for all students and teachers, a shift in school culture will follow (Mullen & Schunk, 2010). Mullen and Schunk (2010) highlighted the importance of celebrating the work of PLC teams by stating:

When teachers believe their actions matter, and when they experience a sense of

> consequentiality propelled by disciplined curiosity, deepened collegiality, and collective power, they tend to feel motivated to collaborate in their many roles as connected leaders, organizational members, cultural moderators, and active learners. (p. 199)

Rhoads (2011) identified similar obstacles to that of Harris and Jones (2010). Rhoads (2011) concluded that teachers' attitudes toward change is an obstacle. Furthermore, Rhoads (2011) determined that not all teachers viewed the PLC meeting as productive. Another obstacle identified by Rhoads (2011) was the emotional and relational aspect of school culture. "Teachers felt overwhelmed by the effort needed to complete the work" (Rhoads, 2011, p. 25). Teachers did not want to put in the time and energy to implement a new activity such as PLCs (Rhoads, 2011).

School culture is important to the sustainability of PLCs. When teachers understand the potential benefits for themselves and their students by working in PLC teams, the implementation process is met with less resistance (Harris & Jones, 2010; Mullen & Schunk, 2010; Vescio et al., 2008). In order for the implementation of PLCs to be successful, school leaders must be instrumental in creating the necessary conditions.

Mullen and Schunk (2010) concluded that in order for PLCs to be successfully implemented, the school leader must use nontraditional methods of thinking. Mullen and Schunk (2010) indicated that it is necessary for school leaders to create the conditions necessary to allow teachers to collaborate and continually improve collectively. By creating these conditions, school leaders will provide the opportunity for teachers to collaborate by working together to maximize student achievement (Mullen & Schunk, 2010).

Spanneut (2010), similar to Mullen and Schunk (2010), discussed the importance of school leaders establishing conditions that support the implementation of PLCs. Spanneut (2010) suggested that school leaders could support the implementation of PLCs by creating the time for teachers to meet and have discussions during PLC team meetings. The discussions that occur during PLC team meetings can promote trust among team members, which is essential for the successful implementation and sustainability of PLCs (Spanneut, 2010).

Spanneut (2010) recommended that school leaders model the use of effective communication and decision-making skills. Spanneut (2010) emphasized that by modeling these attributes for teachers, building leaders are supporting the conditions necessary for the successful implementation and sustainability of PLCs. "Providing opportunities for teachers to develop these key skills will promote and strengthen their abilities to work collaboratively within their PLCs" (Spanneut, 2010, p. 101). Additionally, school leaders should assist PLC team members in discovering specific instructional areas in need of improvement to promote student achievement (Spanneut, 2010). Spanneut (2010) stated, "by creating ways for PLCs to engage in and become skillful in the use of these techniques, principals clearly illustrate the differences between providing leadership for teachers and actively promoting the development of teachers as leaders" (p. 103). School leaders play a vital role in creating the conditions to promote the implementation and sustainability of PLCs by developing the skills of all teachers in their building.

Rhoads (2011), similar to Spanneut (2010), emphasized the importance of school leaders modeling the problem solving and discussion-making skills to promote PLCs.

Rhoads (2011) further highlighted the importance of school leaders promoting the focus of PLC team meeting to be centered on student outcomes. “With the meeting time now focused on student outcomes, teacher learning has a greater emphasis on successful teaching practices” (Rhoads, 2011, p. 25).

As school leaders defined, explained, and modeled a course of action regarding the implementation of PLCs in their schools, the culture within the school is more apt to change, and the collaborative PLC approach would have more potential to promote both teacher and student learning.

PLC teams. Teacher teams are the foundation of PLCs (DuFour & Eaker, 1998). DuFour and Eaker (1998) described the structure of a PLC as a group of collaborative teams of teachers that share a common purpose. These collaborative teams are typically a group of teachers that teach the same curriculum (DuFour, DuFour, Eaker, & Many, 2010). In PLC team meetings, the focus shifts from teaching to learning as a fundamental purpose (DuFour et al., 2010). DuFour, DuFour, Eaker and Many (2010) suggested that collaborative PLC teams use the following four questions of learning to drive their collective inquiry and action research with the goal of improving student achievement:

1. What is it we want students to learn?,
2. How will we know if each student has learned it?,
3. How will we respond when some students do not learn it?, and
4. How can we extend and enrich the learning for students who have demonstrated proficiency? (p. 119)

In PLC team meetings, DuFour et al. (2010) recommended that the team work through a repeating cycle of the following:

1. collectively developing learning targets to answer the question “what is it the we want our student to learn?” (p.119),

2. creating common assessments aligned to the learning targets to answer the question “how will we know if each student has learned the material?” (p.119),

3. administering the assessments, and

4. analyzing the student achievement data and developing intervention plans for students who did not reach proficiency to answer the question “how will we respond when some students do not learn it?” (p. 119) as well as developing enrichment opportunities for students who did reach proficiency by answering the question “how can we extend and enrich the learning for students who have demonstrated proficiency?” (p.119).

One identifying characteristic of a PLC team meeting that differs from other types of meetings is the focus. There is a shift from focusing on teaching to focusing on learning (DuFour et al., 2010). Teachers are meeting together to discuss what they expect students to know, how they will know when the students have learned it, how they will respond when students do not learn, and how they will respond when students already know it (DuFour et al., 2010). Hord and Sommers (2008) asserted that all members of PLC teams learn together and turn new knowledge into action, which creates effective PLC teams. The research of Vescio et al. (2008) supported the Hord and Sommers assertion by identifying the four attributes that exist in effective PLC teams: a focus on student learning, teacher collaboration, teacher authority, and continuous teacher learning.

The relationship between PLCs and student achievement. As PLCs gained in popularity, there were a number of studies that looked at the relationship between PLCs and student achievement (Bolman et al., 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003). All of the earlier research conducted suggested a positive relationship between PLCs and student achievement. However, what is not clear is if this positive relationship is always confirmed in English and math student performance.

Louis and Marks (1998) conducted one of the first studies focused on PLCs and student achievement. The researchers investigated 24 elementary, middle, and high schools' professional development communities and their impact on student achievement. The researchers controlled for ethnicity and grade level. Using both qualitative and quantitative methodologies, the researchers reported a statistically significant relationship in student achievement based on the strength of a school's PLC. This investigation led to additional research on the relationship between PLCs and student achievement.

Langer (2000) conducted a 5 year study of 25 schools analyzing teacher characteristics that accompanied increased student performance in the English Language Arts. Langer (2000) discovered 14 schools of the 25 schools included in the study demonstrated student achievement. Langer (2000) identified characteristics found in the 14 schools that demonstrated student achievement, which were not found in the other 11 schools. Langer (2000) concluded that the 14 schools that demonstrated increases in student achievement fostered a school culture that:

1. orchestrated coordinated efforts to improve student achievement,
2. fostered teacher participation in a variety of professional communities,

3. created structured improvement activities in ways that offered teachers a strong sense of agency,
4. valued commitment to the profession of teaching,
5. engendered a caring attitude to colleagues and students, and
6. fostered a deep respect for lifelong learning. (p. 397)

These attributes were evident in school leaders and teachers at all grade levels (Langer, 2000).

Supovitz and Christman (2003) investigated the relationship between schools implementing communities of collaborative practices and student achievement. This research included two urban school districts, Cincinnati Public Schools in the state of Ohio and the School District of Philadelphia in the state of Pennsylvania. Cincinnati Public Schools had 79 schools in the district and the School District of Philadelphia had 257 schools in the district. Survey data related to collaborative practices was collected from teachers districtwide. The researchers used quantitative methodologies to investigate the survey data and student achievement data. Supovitz and Christman (2003) reported a positive relationship between collaborative practices focused on instructional practices and student achievement. Supovitz and Christman (2003) concluded that two features of learning communities are essential for student learning. The two features identified in the study are that teams must be focused on instructional practices and that teams must be provided with structures and supports to connect instructional practices with student learning (Supovitz & Christman, 2003). From an analysis of the survey data, Supovitz and Christman (2003) concluded that teams failed to improve instructional

focus because the teams spent little time discussing teaching practices, and teams did not analyze teaching practices in relation to student work.

Adding to the research, Phillips (2003) conducted a 3 year case study of a middle school engaged in a PLC focused on supporting academically low achieving students. Phillips (2003) suggested that the case study provides a model of school reform but could not be generalized to fit all educational settings. Phillips's (2003) research identified a middle school focused on teacher learning through the use of research-based literature to create a learning community. Phillips (2003) indicated that school leaders focused on facilitating teacher learning, which would increase the learning for all students. Phillips (2003) identified five themes that assisted in the school's improvement. These included a focus on teacher learning, research-based literature, distributed leadership, teacher collaboration, and relevant programs (Phillips, 2003). Phillips (2003) concluded that the learning community established allowed the opportunity for teachers to experiment with curriculum and instructional practices. "Collectively, they developed innovative programs that transformed student learning" (Phillips, 2003, p. 257). In the research conducted by Phillips (2003), student achievement improved dramatically over a 3 year period. In the first year of the study, 50 % of the students demonstrated proficiency in each subject area of reading, mathematics, writing, science, and social studies on the Texas Assessments of Academic Skills (Phillips, 2003). In the third year of the study, 90 % of the students demonstrated proficiency in each of the subject areas on the same state assessments (Phillips, 2003).

Strahan (2003) conducted a 3 year study of three elementary schools that improved student achievement and identified that each school had focused on

collaborative processes to affect changes in instruction. Strahan (2003) noted that grade-level meetings became focused on identifying student needs, developing strategies to address those needs, and providing professional learning for teachers to improve their classroom practices, and assessed their efforts through formal and informal assessments. As a result of these efforts, student achievement scores in reading and math increased 24 to 36 % points at each school in the study (Stahan, 2003). Strahan (2003) concluded, "Teachers and administrators assessed their own success based on student learning, which, in turn, nurtured an upward spiral of school reform" (p. 135).

Bolman, McMahon, Stoll, Thomas, and Wallace (2005) investigated the relationship between PLCs and student achievement. This study included both elementary and secondary schools in the United Kingdom. The study utilized quantitative and qualitative methodologies. A survey questionnaire was administered to 393 elementary and secondary schools. This survey collected the schools' perception of professional practice related to the PLC framework. The researchers used quantitative methods to examine the relationship between the survey results and student achievement data. Additionally, the researchers conducted case studies at 16 school sites. Bolman et al. (2005) reported a statistically significant relationship between PLC attributes and student achievement data. Bolman et al. (2005) concluded, "pupil learning was the foremost concern of people working in PLCs and, the more developed a PLC appeared to be, the more positive was the association with two key measures of effectiveness – pupil achievement and professional learning" (p. 146).

Despite the positive outcomes of the previous studies on PLCs and student achievement, Vescio et al. (2008) called for further research to be conducted on the

impact of PLCs and student achievement. Vescio et al. (2008) suggested that this additional research be done to build a case for PLCs being a strong possibility for educational reform. Additionally, the researchers recommended using various methodologies to investigate the impact that PLCs have on student achievement (Vescio, Ross, & Adams, 2008).

In response to Vescio et al. (2008) suggestions, Johnson-Estes (2009) investigated the relationship between PLCs and student achievement. The study included 114 high schools in the state of Texas. The principals of the participating schools responded to the Organizational Structure Self-Assessment survey. The principal responses represented the perception of PLC implementation at their school. Student achievement data from the Exit Level Texas Assessment of Knowledge and Skills was the dependent variable. The researcher controlled for schools' instructional expenditures, language proficiency status, and socioeconomic status. Johnson-Estes (2009) reported no statistically significant relationship between student achievement and the schools' self-assessment of PLCs through a hierarchical linear regression analysis.

In a similar study, Verano (2010) investigated the relationship between PLCs and student achievement. The study included 115 high schools in the state of Pennsylvania. The principals of the participating schools responded to the Dimensions of the Learning Organization Questionnaire. The principals' responses represented the perception of PLC implementation at their school. The student achievement data utilized in the study was the Grade 11 Reading and Mathematics Pennsylvania System of School Assessment. The researcher investigated the relationship between the principals' responses about the implementation of PLCs at their school and student achievement on the Grade 11

Reading and Mathematics Pennsylvania System of School Assessment. Similar to Johnson-Estes (2009), Verano (2010) also reported no statistical significance between the perceived implementation of PLCs and student achievement on the Grade 11 Reading and Mathematics Pennsylvania System of School Assessment through linear regression analysis.

In another study, Lennon (2010) researched 549 schools in the state of Missouri. The researcher utilized a mixed-methods approach to investigate the Missouri Professional Learning Communities Project (MPLCP), which is a statewide school improvement initiative. The researcher established two groups of similar schools, one group that participated in the MPLCP and another group that did not participate in the project. The researcher created similar groups by using schools based on grade levels, student population of the schools, percentage of students receiving free and reduced lunches, and the percentage of non-White students. The researcher compared the two groups against their schools' student achievement on the Missouri Assessment Program (MAP). The MAPis the test used by Missouri to assess a student's math, communication arts, and science progress. Lennon (2010) reported no statistically significant relationship between schools that participated in the MPLCP and student achievement on the MAP assessment.

Hamilton (2013) conducted a similar study by quantitatively investigating whether the adoption of PLCs was related to higher student achievement. The study included 533 elementary schools, 135 middle schools, and 124 high schools in the state of California. Superintendents of the schools identified schools as either PLC or non-PLC (NPLC) schools. The researcher compared PLC and NPLC schools in California's

Department of Education Academic Performance Index (API), which is a yearly state performance measure in mathematics and English language arts/literacy (ELA). Hamilton (2013) reported no statistically significant effect between PLC and NPLC schools on student achievement using an analysis of variance (ANOVA) methodology.

Similarly, Hardinger (2013) quantitatively studied PLC implementation in high schools to determine whether or not it was a predictor of ELA and math student achievement and graduation rate. The study included 65 high schools in the state of Georgia. The principal of the participating schools responded to the *School as a PLC Survey*. The principal's total score on the survey represented the degree of implementation of PLCs in their school. The data from the survey was analyzed in combination with the participating schools' ELA and math student achievement and graduation rates. The researcher controlled for the effects of school size, ethnicity, and socioeconomic status. Hardinger (2013) reported no statistically significant relationship between math student achievement and PLC implementation using a multivariate analysis of covariance and univariate *F* tests. Hardinger (2013) also reported no statistically significant relationship between graduation rate and PLC implementation using the same methodology. Furthermore, Hardinger (2013) reported a statistically significant negative relationship between ELA student achievement and PLC implementation.

Brucker's (2013) research investigated the relationship between PLC implementation and teachers' perceived effectiveness in impacting student achievement. The population included 1,788 teachers from 44 elementary schools, 14 middle schools, and eight high schools in the Kanawha County School District in the state of West Virginia. A researcher-developed survey was used to collect teacher responses using a

one-shot, cross-sectional survey design. Brucker (2013) reported a Pearson product-moment correlation coefficient between .451 and .545, moderately positive, between the level of PLC implementation and the perceived effectiveness in impacting student achievement.

In another study, Burde (2016) quantitatively investigated the relationship between PLC implementation and student achievement. The study included 12 middle schools in the state of Michigan. Teachers in the participating schools responded to the PLC Assessments-Revised questionnaire. Student achievement data was obtained from the Michigan Educational Assessment Program. The researcher controlled for ethnicity, gender, socioeconomic status, and special education status. Burde (2016) reported no statistically significant between PLC implementation and student achievement on the Michigan Educational Assessment Program, which included reading, writing, English language arts, and math.

The literature surrounding the relationship between PLCs and student achievement is inconsistent. The initial wave of the literature suggests a positive relationship between PLCs and student achievement (Bolman et al., 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003). The more recent literature suggested little to no significant relationship between PLCs and student achievement (Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Verano, 2010).

Gap in the research. The review of literature looked at the characteristics of PLCs (DuFour & Eaker, 1998; DuFour, DuFour, Eaker, & Many, 2010; Hord, 1997; Hord & Rutherford, 1998; Hord & Sommers, 2008; Newmann & Wehlage, 1995;

Rosenholtz, 1989; Senge, 1990; Warren-Little & McLaughlin, 1993) and supports for implementation and sustainability of PLCs (Harris & Jones, 2010; Mullen & Schunk, 2010; Rhoads, 2011; Spanneut, 2010; Vescio et al., 2008). However, there have been few empirical studies conducted to assess the impact of PLCs on student achievement. Specifically, the subject areas of English and math student performance need further exploration (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010).

The review of literature revealed the methodology most commonly used, which consisted of a research approach that investigated a school's implementation of PLCs in relation to student achievement data. Lacking in the literature is research investigating the relationship between the subject-specific PLC team that is most responsible for the student learning and subject-specific student achievement. Instead, the previous research attempted to find a relationship between an entire school's implementation of PLCs as it related to student achievement, typically in the areas of ELA and math.

Additionally, the review of literature did not uncover any research investigating student achievement data before participation in a PLC and after participation in a PLC using archival student achievement data through a retrospective archival methodology using a within-cases design.

Chapter Summary

The review of literature contained in Chapter 2 included the emergence of PLCs, characteristics of PLCs, implementation and sustainability of PLCs, PLC teams, research

investigating the relationship between PLCs and student achievement, and a gap in the research.

The review of literature that investigated the relationship between PLCs and student achievement revealed a general approach of comparing a school's implementation of PLCs to student achievement, which produced inconsistent conclusions. Additionally, lacking in the literature is research investigating the relationship between the subject-specific PLC team that is most responsible for the student learning and subject-specific student achievement. Furthermore, the review of literature did not uncover any research investigating student achievement data before participation in a PLC and after participation in PLC using archival student achievement data.

The purpose of this study was to examine if a relationship between participation in PLC and improved student achievement in English and math exists. This study investigated the relationship between participation in a PLC and student achievement in math and student achievement in English.

Chapter 3 describes the methodologies used to answer the essential research questions of this study. The methodology chapter will reveal the research context and participants as well as explain the data collection and analysis processes.

Chapter 3: Research Design Methodology

Introduction

After the publication of *A Nation at Risk*, public schools across America began reform efforts to improve student achievement (DuFour & Eaker, 1998; Lemons & Stevenson, 2015). These reform efforts were directly connected to the recommendations of the National Commission of Excellence in Education and subsequent federal acts. Both the Goals 2000: Educate America Act and the Federal No Child Left Behind Act specified a framework for schools to demonstrate improvement.

One educational reform strategy that a number of public schools across America implemented in an effort to improve student achievement is PLCs (DuFour & Eaker, 1998). As PLCs became more popular in public schools across America, a question arose: Is there a relationship between participation in a PLC and student achievement?

The research investigating the relationship between PLCs and student achievement revealed inconsistent conclusions (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010). Additionally, the need for further research on the impact of PLCs and student achievement through various methodologies has been called for:

> Although, the analysis of data about student achievement is time-consuming, it is essential in building the case that PLCs are powerful types of reform and with the

> current demands that schools collect and analyze evidence of student achievement; this analysis is less difficult than it once was. (Vescio et al., 2008, p. 90)

The review of the literature conducted for this study revealed a gap in the research. The gap consists of a lack of studies that focused on subject-specific PLC teams and their impact on student achievement on subject-specific assessments.

This study addressed the gap in the literature by investigating the relationship between participation in a PLC and student achievement. The questions guiding this study are:

1. Is there a relationship between participation in a PLC and student achievement on the New York State Mathematics A Regents Examination?
2. Is there a relationship between participation in a PLC and student achievement on the New York State Grade 11 English Language Arts Regents Examination?

This study investigated student achievement data before participation in a PLC and after participation in a PLC using archival student achievement data.

Research Context

This study was conducted in New York State. The State of New York comprised 10 separate regions (McDonnell, n.d.). The regions of New York State are: New York City, Hudson Valley, Seaway, Central New York, Genesee, Long Island, Capital/Mohawk, Adirondacks, Finger Lakes, and Niagara Frontier (McDonnell, n.d.).

This study was conducted in the Hudson Valley region of New York State, which is where the researcher resides and works in a public school district. The Hudson Valley

region consists of seven counties (McDonnell, n.d.). The counties in the Hudson Valley are Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, and Westchester counties (McDonnell, n.d.). Dutchess County consists of 13 public school districts with a total of 14 high schools (New York Schools, n.d.). Orange County consists of 16 public school districts with a total of 16 high schools (New York Schools, n.d.). Putnam County consists of five public school districts with a total of five high schools (New York Schools, n.d.). Rockland County consists of eight public school districts with a total of 10 high schools (New York Schools, n.d.). Sullivan County consists of eight public school districts with a total of eight high schools (New York Schools, n.d.). Ulster County consists of nine public school districts and nine high schools (New York Schools, n.d.). Westchester County consists of 40 public school districts and 48 high schools (New York Schools, n.d.).

The New York State Education Department (NYSED) maintains a statewide public education data warehouse: New York State Education at a Glance (NYSED Data Site, 2018). This publicly available website provides student achievement data, which started in the year 2000 and going through the present. This study used the archival student achievement data contained within the New York State Education at a Glance website.

In order to make comparisons of student achievement data from one year to another year, the assessments should be similar and consistent (Huck, 2012). As a result of the Federal No Child Left Behind Act of 2001, each state was required to measure a school's academic performance on standardized assessments in reading/ELA and math in each of Grades 3 through 8 and at least once during Grades 10 through 12 (USDOE,

2001). In order to meet this requirement, New York State instituted the first administration of the Grades 3-8 Assessments in English Language Arts (ELA) and mathematics in 2006 (NYSED, 2018). Furthermore, it is important to recognize that New York State Grades 3-8 Assessments in ELA and mathematics changed in 2013 to be aligned with the Common Core Standards (NYSED, 2018). Therefore, student achievement in New York State for Grades 3 through 8 are only similar and consistent from the year of implementation, 2006, to the year they changed, 2013, providing only 7 years' worth of similar and consistent data. Due to the limitation of available student achievement data for Grades 3 through 8, these grade levels were not included in this study.

In New York State, the New York State Mathematics A Regents Examination was first offered in 1999 and was similar and consistent through the last year it was offered in 2009. Therefore, the archival student achievement data found on the New York State Education at a Glance website provided sufficient data for student achievement on the New York State Mathematics A Regents Examination to help answer the first research question.

In New York State, the New York State Grade 11 English Language Arts Regents Examination has been similar and consistent until the change in 2014 to be aligned with the Common Core Standards (NYSED, 2018). Therefore, the archival student achievement data found on the New York State Education at a Glance website provided sufficient data for student achievement on the New York State Grade 11 English Language Arts Regents Examination to help answer the second research question.

Research design. The purpose of this study was to look at the relationship between participation in a PLC and student achievement. The methodology used was a retrospective, archival study using a within-cases design.

A retrospective archival study makes use of publicly available data and provides an opportunity to study the past (Singleton & Straits, 2005). This retrospective archival study utilized the NYSED public education data warehouse: New York State Education at a Glance (NYSED Data Site, 2018). This study used the archival student achievement data contained within the New York State Education at a Glance website for participating schools.

One advantage of using archival data is that it is a nonreactive measurement as opposed to a reactive measurement (Singleton & Straits, 2005). A reactive measurement occurs when the subjects of a study have an awareness of the study, which can result in changes of behavior as a result of being studied or observed (Singleton & Straits, 2005). By using archival data, a nonreactive measurement, the subjects of the study are unaware of the study, which mitigates the threat of data being compromised (Singleton & Straits, 2005). Another advantage to using archival data is the ability to bypass the stage of data collection, which minimizes the length of time needed to gather data (Singleton & Straits, 2005).

A disadvantage to using archival data is the requirement to use the archival data as it is presented (Singleton & Straits, 2005). In this retrospective archival study, student achievement data were obtained from the New York State Education at a Glance website for participating schools. The New York State Education at a Glance website reports the percentage of students in a school that scored above 65% and below 65% on an

assessment. This form of data limits the potential approach to methodology and statistical tests to analyze the data.

This study used a within-cases design approach, which looked at student achievement from the same school over time. This within-cases methodology involved an interrupted time-series design (Singleton & Straits, 2005). An interrupted time-series design consists of multiple observations of the same or similar units over time (Singleton & Straits, 2005). An interrupted time-series design uses multiple observations before and after a point in time, which represents when a treatment or intervention under investigation started (Singleton & Straits, 2005). In this study, student achievement data on the New York State Mathematics A Regents Examination of the participating school were obtained for the 3 years before the PLC started and for the 3 years after the PLC started. Additionally, the student achievement data on the New York State Grade 11 English Language Arts Regents Examination were obtained for the 3 years before the PLC started and for the 3 years after the PLC started.

One advantage of using an interrupted time-series design is the comparison of the overall pattern of data before and after a point in time that the event, for this study – the starting of PLCs, was introduced (Singleton & Straits, 2005). However, historical changes are a threat to the consistency of the data and a disadvantage to using an interrupted time-series design (Singleton & Straits, 2005). For example, changes in teaching staff may contribute to changes in data as opposed to isolating changes in data to the single event of starting a PLC.

This study looked at the relationship between participation in a PLC and student achievement. The methodology consisted of a retrospective archival study using a within-

cases design, which was appropriate to answer the research questions being investigated. The questions guiding this study are:

1. Is there a relationship between participation in a PLC and student achievement on the New York State Mathematics A Regents Examination?
2. Is there a relationship between participation in a PLC and student achievement on the New York State Grade 11 English Language Arts Regents Examination?

Research Participants

A school screening survey (Appendix D) was emailed to the superintendent and high school principal of all public school districts in the Hudson Valley region of New York State, which includes 110 high schools and/or Junior/Senior high schools.

The school screening survey was input into the SurveyMonkey interface. SurveyMonkey is a web service that hosts surveys "in the cloud" – that is, on remote secure servers not identified to the user. SurveyMonkey generated a link that allowed distribution of the survey through email.

An introductory letter (Appendix A) was emailed to each school district's superintendent and high school principal. Two days following the initial introductory email, an invitation to participate in the study (Appendix B) was distributed through email, which contained a web link to the school screening survey in SurveyMonkey, to the same recipients as before. One week following the invitation to participate in the study email, a reminder invitation email (Appendix C) was distributed to the same recipients as before. The superintendent or principal was provided the opportunity to respond to the survey questions.

The author-created school screening survey was developed from the literature review on PLC teams. First, the school screening survey asked the superintendent or principal to state the name of their high school. Then the school screening survey had two parts: eight questions related to the school's English PLC team and eight identical questions related to the school's math PLC team. The first question of the English part of the school screening survey asked the superintendent or principal to indicate the year the English PLC team started to meet. The next question asked the superintendent or principal to identify all of the years the English PLC team met. The first question of the math part of the school screening survey asked the superintendent or principal to indicate the year the math PLC team started to meet. The next question asked the superintendent or principal to identify all of the years the math PLC team met.

To be eligible to participate in the study, a school's math PLC team must have started between the years 2003 and 2006, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the math section of the school screening survey. This ensured that student achievement data obtained from the New York State Education at a Glance website provided sufficient data on the New York State Mathematics A Regents Examination. Additionally, to be eligible to participate in the study, a school's English PLC team must have started between the years 2003 and 2010, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the English section of the school screening survey. This ensured that student achievement data obtained from the New York State Education at a Glance website provided sufficient data on the New York State Grade 11 English Language Arts Regents Examination.

Instruments Used in Data Collection

There were two sources of data for the study. First, a school screening survey was used to determine if the school qualified for the study based on the existence of a PLC team in the school. The school screening survey (Appendix D) was developed from the literature review on PLC teams. The school screening survey was an author-created survey designed to gather basic school-related information from potential participants. The school screening survey had three sections. The first section asked the superintendent or high school principal to identify the name of the high school. The following two sections of the school screening survey were composed of eight questions related to the school's English PLC team and eight identical questions related to the school's math PLC team.

The first question of the English part of the school screening survey asked the superintendent or principal to indicate the year the English PLC team started to meet. The second question asked the superintendent or principal to identify all of the years the English PLC team met. The first question of the math part of the school screening survey asked the superintendent or principal to indicate the year the math PLC team started to meet. The second question asked the superintendent or principal to identify all of the years the math PLC team met.

The remaining questions in both the math and English sections of the school screening survey contained six similar, close-ended questions with choices that had point values assigned. The close-ended questions and assigned point values are described next.

The third question in both the math and English part of the school screening survey asked the frequency of the PLC meetings. This close-ended question contained four choices. Each choice was assigned a point value. The following were the possible

choices with assigned point values: (a) one time per week, this was assigned a point value of two, (b) every other week, this was assigned a point value of one, (c) one time per month, this was assigned a point value of one, and (d) less than one time per month, this was assigned a point value of zero.

The fourth question in both the math and English portion asked for the approximate number of English and math teachers participating in the PLC team. This close-ended question contained four choices. Each choice was assigned a point value. The following were the possible choices with assigned point values: (a) all of the English teachers, this was assigned a point value of two, (b) more than half of the English teachers, this was assigned a point value of one, (c) less than half of the English teachers, this was assigned a point value of one, and (d) only a few English teachers, this was assigned a point value of zero. Equally, for the math portion of the survey, each choice was assigned a point value. The following were the possible choices with assigned point values: (a) all of the math teachers, this was assigned a point value of two, (b) more than half of the math teachers, this was assigned a point value of one, (c) less than half of the math teachers, this was assigned a point value of one, and (d) only a few math teachers, this was assigned a point value of zero.

Teacher teams are the foundation of PLCs (DuFour & Eaker, 1998). DuFour and Eaker (1998) described the structure of a PLC as a group of collaborative teams of teachers that share a common purpose. These collaborative teams are typically a group of teachers that teach the same curriculum (DuFour, DuFour, Eaker, & Many, 2010). In PLC team meetings, the focus shifts from teaching to learning as a fundamental purpose (DuFour et al., 2010).

DuFour, DuFour, Eaker and Many (2010) suggested that collaborative PLC teams use the following four questions of learning to drive their collective inquiry and action research with the goal of improving student achievement:

1. What is it we want students to learn?,
2. How will we know if each student has learned it?,
3. How will we respond when some students do not learn it?, and
4. How can we extend and enrich the learning for students who have demonstrated proficiency? (p. 119)

These four questions of learning are the basis of the remaining questions in the school screening survey.

Questions 6 and 14 of the school screening survey, did the PLC team collectively develop learning targets/student objectives, aligned to the first learning question: "What is it we want our students to learn?" (DuFour et al., 2010, p. 119). This close-ended question contained three choices. Each choice was assigned a point value. The following were the possible choices with assigned point values: (a) yes, this was assigned a point value of one, (b) no, this was assigned a point value of zero, and (c) I don't know, this was assigned a point value of zero.

Questions 7 and 15 of the school screening survey, did the PLC team develop and/or uses common assessments (i.e. quizzes, unit tests), aligned to the second learning question: "How will we know if each student learned it?" (DuFour et al., 2010, p. 119). This close-ended question contained three choices. Each choice was assigned a point value. The following were the possible choices with assigned point values: (a) yes, this

was assigned a point value of one, (b) no, this was assigned a point value of zero, and (c) I don't know, this was assigned a point value of zero.

Questions 8 and 16 of the school screening survey, did the PLC team analyze the student achievement data and develop intervention plans for students who did not reach proficiency, aligned to the third learning question: "How will we respond when some students do not learn it?" (DuFour et al., 2010, p. 119). This close-ended question contained three choices. Each choice was assigned a point value. The following were the possible choices with assigned point values: (a) yes, this was assigned a point value of one, (b) no, this was assigned a point value of zero, and (c) I don't know, this was assigned a point value of zero.

Questions 9 and 17 of the school screening survey, did the PLC team develop enrichment opportunities for students who did reach proficiency, aligned to the fourth learning question: "How can we extend and enrich the learning for students who have demonstrated proficiency?" (DuFour et al., 2010, p. 119). This close-ended question contained three choices. Each choice was assigned a point value. The following were the possible choices with assigned point values: (a) yes, this was assigned a point value of one, (b) no, this was assigned a point value of zero, and (c) I don't know, this was assigned a point value of zero.

The participants who responded to the school screening survey received an overall score between the minimum score of zero and a maximum score of eight for their responses to the English portion of the school screening survey. Likewise, the participants who responded to the school screening survey received an overall score between the minimum score of zero and a maximum score of eight for their responses to

the math portion of the school screening survey. To be eligible to participate in the study, a school's English PLC team responses must have totaled a minimum of four out of eight. Similarly, to be eligible to participate in the study, a school's math PLC team responses must have totaled a minimum of four out of eight.

The participants that responded to the school screening survey and meet the three inclusion criteria areas were included in the study. To be eligible to participate in the study, a school's math PLC team must have started between the years 2003 and 2006, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the math section of the school screening survey. Additionally, to be eligible to participate in the study, a school's English PLC team must have started between the years 2003 and 2010, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the English section of the school screening survey.

The second source of data was archival student achievement data obtained from the New York State Education at a Glance website. The student achievement data on the New York State Mathematics A Regents Examination of the participating school were obtained for the 3 years before the math PLC team started and for the 3 years after the math PLC team started. Additionally, the student achievement data on the New York State Grade 11 English Language Arts Regents Examination were obtained for the 3 years before the English PLC team started and for the 3 years after the English PLC team started. The student achievement data obtained from the New York State Education at a Glance website were the percentage of students in a participating school that scored above 65% and below 65% on the New York State Mathematics A Regents Examination and/or the percentage of students in a participating school that scored above 65% and

below 65% on the New York State Grade 11 English Language Arts Regents Examination.

Procedures for Data Collection and Analysis

A database was set up in the Statistical Package for the Social Sciences (SPSS) that included all schools that met the inclusion criteria. To be eligible to participate in the study, a school's math PLC team must have started between the years 2003 and 2006, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the school screening survey. Additionally, to be eligible to participate in the study, a school's English PLC team must have started between the years 2003 and 2010, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the school screening survey. Student achievement data were obtained for the participating schools from the New York State Education at a Glance website. This information was entered into the SPSS software.

Student achievement data were obtained from the New York State Education at a Glance website. Using descriptive statistics that include the minimum and maximum score, mean, standard deviation, skewness, and kurtosis the distribution of data were analyzed (Vogt & Johnson, 2011). The mean is the average or central tendency in a series of data points (Vogt & Johnson, 2011). The standard deviation is a measure of the scores that are distributed from the mean (Vogt & Johnson, 2011). Skewness is the degree to which scores are grouped around the mean with a value of zero suggesting normal distribution (Vogt & Johnson, 2011). Kurtosis is an indication of the extent to which distribution of data departs from the bell shape or normal distribution curve (Vogt & Johnson, 2011). Through the analysis of the descriptive statistics, the distribution of data

were determined which provided insight into choosing the best statistical test to answer the research questions (Vogt & Johnson, 2011).

If the data were normally distributed, the repeated measures Analysis of Variance (ANOVA) methodology would be used to analyze the data (Vogt & Johnson, 2011). A repeated measures ANOVA compares the means of data tested for change over time (Vogt & Johnson, 2011). The repeated measures ANOVA evaluates the data sets to determine the probability value (p-value), which is a measure of significance between the data being evaluated (Vogt & Johnson, 2011). If the *p*-value is less than 0.05 then a significant difference between the data exists.

If the data were not normally distributed, the Friedman test would be utilized to analyze the data (Vogt & Johnson, 2011). The Friedman test is used to compare three or more groups that are paired. For this current study, the paired data set was the student achievement data before the PLC team started, paired with the student achievement data after the PLC team started to determine if they were significantly different (Vogt & Johnson, 2011). The Friedman test evaluates the data sets to determine the p-value(Vogt & Johnson, 2011

Either the repeated measures ANOVA test or the Friedman test would be utilized to analyze the data and look for statistically significant relationships, the specific test used depended on how the dependent variables are distributed.

Summary

The purpose of the study was to look at the relationship between participation in PLCs and student achievement. The methodology for the study was a retrospective, archival study using a within-cases design. A school screening survey was emailed to

district superintendents and high school principals in six counties and was used to identify schools that meet the inclusion criteria for the study.

An introductory letter (Appendix A) was emailed to district superintendents and high school principals. Two days following this initial correspondence, an invitation to participate in the study (Appendix B) including a hyperlink to the school screening survey (Appendix D) was emailed to the same recipients. One week after the invitation to participate in the study was emailed, a letter of reminder invitation (Appendix C) was distributed through email to the same recipients.

A database was set up in SPSS that included all schools that met the inclusion criteria. Student achievement data of the participating schools were obtained from the New York State Education at a Glance website. The student achievement data on the New York State Mathematics A Regents Examination of the participating school were obtained for the 3 years before the PLC team started and for the 3 years after the PLC team started. Additionally, the student achievement data on the New York State Grade 11 English Language Arts Regents Examination were obtained for the 3 years before the PLC team started and for the 3 years after the PLC team started. Either the repeated measures ANOVA test or the Friedman test were utilized to answer the research questions. The specific test depended on how the dependent variables were distributed. The following chapter presents the findings from this current study.

Chapter 4: Results

Since the release of *A Nation at Risk*, public schools across America began reform efforts to improve student achievement (DuFour & Eaker, 1998; Lemons & Stevenson, 2015). These reform efforts were associated with the recommendations of the National Commission of Excellence in Education and subsequent federal acts. Both the Goals 2000: Educate America Act and the Federal No Child Left Behind Act specified a framework for schools to demonstrate improvement in student achievement.

A number of public schools across America have implemented PLCs as an educational reform strategy in an attempt to improve student achievement (DuFour & Eaker, 1998). As PLCs have become more prevalent in public schools across America, a question arose: Is there a relationship between participation in a PLC and student achievement?

All of the earlier research in the literature suggested a positive relationship between PLCs and student achievement (Bolman et al., 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003). However, what is not clear is if this positive relationship is always confirmed by English and math student achievement results.

The meta-analysis research conducted by Vescio et al. (2008), which included the synthesis of 11 studies on PLCs, suggested that further research be conducted on the impact of PLCs and student achievement through various methodologies. In response to Vescio et al. (2008) suggestions, additional researchers investigated the relationship

between PLCs and student achievement (Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Verano, 2010). Contrary to earlier research (Bolman et al., 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003), the more recent research (Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Verano, 2010) suggested little to no statistically significant relationship between PLCs and student achievement.

Additionally, the review of literature revealed the methodology most commonly used consisted of looking at a school's implementation of PLCs in relation to student achievement data. Lacking in the literature is research investigating the relationship between the subject-specific PLC team, which is most responsible for the student learning, and student achievement on the subject-specific assessment.

Furthermore, the review of literature did not uncover any research comparing student achievement data before and after participation in a PLC. The review of literature also did not uncover any research using archival student achievement data using a within-cases design methodology.

This current study addressed the gap in the literature by investigating the relationship between participation in subject-specific PLC teams and their impact on student achievement on subject-specific assessments. This was done by comparing 3 years of student achievement scores prePLC as compared to 3 years of student achievement scores postPLC using both math and English student achievement data.

One of the requirements of the Federal No Child Left Behind Act of 2001 was that each state measure a school's academic performance on standardized assessments in

reading/ELA and math at least once during Grades 10 through 12 (USDOE, 2001). To meet the requirement, both the New York State Grade 11 English Language Arts Regents Examination and the New York State Mathematics A Regents Examination were administered to all New York State public high school students and were used to measure student achievement in this study. Based on a review of the literature, this researcher hypothesized that participation in a PLC would not statistically impact student achievement on the New York State Mathematics A Regents Examination nor the New York State Grade 11 English Language Arts Regents Examination.

This chapter will present the research questions and the results of the analysis of the data gathered from the study investigating if there is a relationship between participation in a PLC and student achievement. A brief summary of the findings for each research question is provided here. This researcher used a school screening survey to gather information related to a school's math PLC team and English PLC team. Schools who met the inclusion criteria for math PLC team and English PLC team were included in the study to answer the research questions.

Research Questions

This chapter reports the results of the data analyses and findings for each research question. Two research questions guided this study:

1. Is there a relationship between participation in a PLC and student achievement on the New York State Mathematics A Regents Examination?
2. Is there a relationship between participation in a PLC and student achievement on the New York State Grade 11 English Language Arts Regents Examination?

Data Analysis and Findings

Participants. An invitation to participate in the study (Appendix B) including a hyperlink to the school screening survey (Appendix D) was emailed to the superintendent and high school principal of schools in the Hudson Valley region. One week after the invitation to participate in the study was emailed, a letter of reminder invitation (Appendix C) was distributed through email to the same recipients. Despite extending the timeline for responses and sending multiple emails requesting the need for additional schools to participate in order to meet the minimum threshold to use statistical tests to analyze the data, these efforts did not yield enough participants that met the inclusion criteria to test for a statistical significance.

As a result of the failed attempts to obtain additional participants from the Hudson Valley, this researcher expanded the study to include the following regions of New York State: Seaway, Central New York, Genesee, Long Island, Capital/Mohawk, Adirondacks, Finger Lakes, and Niagara Frontier (McDonnell, n.d.). An invitation to participate in the study (Appendix B) including a hyperlink to the school screening survey (Appendix D) was emailed to the superintendent and high school principal of schools in the Seaway, Central New York, Genesee, Long Island, Capital/Mohawk, Adirondacks, Finger Lakes, and Niagara Frontier regions of New York State. One week after the invitation to participate in the study was emailed, a letter of reminder invitation (Appendix C) was distributed through email to the same recipients. Again, additional emails expressing the need for more participants were needed to meet the minimum threshold to use statistical tests to analyze the data. These additional requests resulted in enough participants to meet the minimum threshold to use statistical tests to analyze the data.

Data collected from 20 respondents were analyzed to determine if a school's PLC team met the inclusion criteria for the study. Fourteen English PLC teams met the inclusion criteria and nine math PLC teams met the inclusion criteria.

Inclusion criteria. SurveyMonkey was used to collect data from schools related to their math PLC team and English PLC team. To be eligible to participate in the study, a school's math PLC team must have started between the years 2003 and 2006, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the math section of the school screening survey, as detailed in Chapter 3. The study included nine math PLC teams that met the inclusion criteria. Displayed in Table 4.1 are frequency, the number of times a math PLC team scored a particular value on the school screening survey, and percent statistics of math participants that started the PLC team between 2003 and 2006 and continued to meet for at least 3 years after starting.

Table 4.1

Frequency and Percent Statistics of Participants Math Inclusion Score

Math Inclusion	Frequency	Percent
Score of 4	2	22.2
Score of 5	1	11.1
Score of 6	2	22.2
Score of 7	3	33.3
Score of 8	1	11.1
Total	9	100.0

Data displayed in Table 4.1 were collected from nine math PLC teams that met the inclusion criteria, as detailed in Chapter 3. Specifically, 22.2% of math PLC teams received a score of 4 (n = 2), 11.1% of math PLC teams received a score of 5 (n = 1), 22.2% of math PLC teams received a score of 6 (n = 2), 33.3% of math PLC teams received a score of 7 (n = 3), and 11.1% of math PLC teams received a score of 8 (n = 1).

Additionally, to be eligible to participate in the study, a school's English PLC team must have started between the years 2003 and 2010, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the English section of the school screening survey, as detailed in Chapter 3. The study included 14 English PLC teams that met the inclusion criteria. Displayed in Table 4.2 are frequency, the number of times an English PLC team scored a specified value on the school screening survey, and percent statistics of English participants that started PLC teams between 2003 and 2010 and continued to meet for at least 3 years after starting.

Table 4.2

Frequency and Percent Statistics of Participants English Inclusion Score

English Inclusion	Frequency	Percent
Score of 4	2	14.3
Score of 5	5	35.7
Score of 6	4	28.6
Score of 7	2	14.3
Score of 8	1	7.1
Total	14	100.0

Data displayed in Table 4.2 were collected from 14 English PLC teams that met the inclusion criteria, as detailed in Chapter 3. Specifically, 14.3% of English PLC teams received a score of 4 (n = 2), 35.7% of English PLC teams received a score of 5 (n = 5), 28.6% of English PLC teams received a score of 6 (n = 4), 14.3% of English PLC teams received a score of 7 (n = 2), and 7.1% of English PLC teams received a score of 8 (n = 1).

Power analysis. Power analysis was conducted in the G*Power software (Faul, Erdfelder, Buchner, & Lang, 2019). G*Power is software used to compute statistical power analysis for statistical tests (Faul et al., 2019). The sample size required to use a repeated measures ANOVA with six dependent variables and the Friedman test with six dependent variables depends on the desired effect size. Effect size is the magnitude or size of an effect (Pett, 2016). For this study, effect size is the magnitude or size of impact that participating in a PLC team has on student achievement.

Faul, Erdfelder, Buchner, and Lang (2019) recommend using a power of 0.80, an alpha level of 0.05, and the desired effect size. Power can range from 0 to 1.0 (Huck, 2012). Using a power of 0.80 indicates that there is an 80 % chance of detecting differences in the analysis of data (Huck, 2012). Typically, in applied research, researchers use a power of 0.80 because higher power levels set unreasonable demands for the required sample size to use statistical test to analyze data (Huck, 2012). The alpha level sets the level of confidence (Huck, 2012). The alpha level of 0.05, indicates a 95 % confidence level (Huck, 2012). This means that the result of the statistical test can be considered accurate with 95 % confidence.

The recommended effect sizes consist of a small effect size ($f = 0.10$), a medium effect size ($f = 0.25$), and a large effect size ($f = 0.40$) to determine the required sample size for these tests (Faul et al., 2019). Running a power analysis using a power of 0.80, and alpha level of 0.05, and a small effect size ($f = 0.10$), the required sample size is 109. Running a power analysis using a power of 0.80, an alpha level of 0.05, and a medium effect size ($f = 0.25$), the required sample size is 19. Running a power analysis using a power of 0.80, an alpha level of 0.05, and a large effect size ($f = 0.40$), the required sample size is eight.

This current study included nine schools with a math PLC team that met the inclusion criteria and 14 schools with an English PLC team that met the inclusion criteria. As a result, the analysis of the data assumed a large effect size ($f = 0.40$). This means that the analysis of the data is assuming a large magnitude or size of effect that participating in a PLC will have on student achievement.

Findings of research question 1. Is there a relationship between participation in a PLC and student achievement on the New York State Mathematics A Regents Examination?

Archival student achievement data were obtained from the New York State Education at a Glance website on the New York State Mathematics A Regents Examination for each participating school. Specifically, student achievement scores were obtained for participating schools for the 3 years before the PLC started, as indicated in response to the survey, and for the 3 years after the PLC started.

Using SPSS, descriptive statistics were generated, which included the minimum and maximum score, mean, standard deviation, skewness, and kurtosis to analyze the

distribution of data. Mean is the average score of the data set and standard deviation is a measure of scores in a distribution that deviate from the mean (Vogt & Johnson, 2011).

Skewness is the degree to which scores are grouped around the mean with a value of zero suggesting normal distribution (Vogt & Johnson, 2011). Kurtosis is an indication of the extent to which distribution of data departs from the bell shape or normal distribution curve (Vogt & Johnson, 2011). Distribution of data sets are considered normally distributed when skewness and kurtosis values are between ± 1.0 (Huck, 2012).

Descriptive statistics of three prePLC math scores and the three postPLC math scores are displayed in Table 4.3. Table 4.3 includes sample size (*N*), minimum and maximum scores, mean (*M*), standard deviation (*SD*), and skewness and kurtosis statistics.

Table 4.3

Descriptive Statistics of Student Achievement Data on the Mathematics A Regents Examination

Math	*N*	Min	Max	*M*	*SD*	Skewness	Kurtosis
PrePLC 1	9	85	94	88.444	3.539	0.789	-0.591
PrePLC 2	9	82	96	88.777	5.286	0.304	-1.493
PrePLC 3	9	60	97	87.777	11.861	-1.884	3.797
PostPLC 1	9	82	99	90.444	6.405	0.039	-1.603
PostPLC 2	9	75	99	91.111	7.236	-1.459	2.608
PostPLC 3	9	85	100	90.778	4.918	0.860	-0.148

Data displayed in Table 4.3 revealed two groups of concern given the small sample size. The prePLC 3 group had a minimum score of 60 and a maximum score of 97 (M = 87.777, SD = 11.861) with a skewness of -1.884 and a kurtosis of 3.797. The postPLC 2 group had a minimum of 75 and a maximum of 99 (M = 91.111, SD = 7.236) with a skewness of -1.459 and a kurtosis of 2.608.

A boxplot (Appendix E) was used to determine whether the data contained outliers. A boxplot is a type of graph or pictorial representation of the degree of variability within a data set (Huck, 2012). The boxes and lines represent distribution, mean, and variability of data (Vogt & Johnson, 2011). Outliers are scores in a data set that lie far away from the rest of the scores in the data set (Huck, 2012). There were outliers in the data, as assessed by an inspection of a boxplot (Appendix E). The outliers are not a result of data entry errors and are actual scores reported on the New York State Education at a Glance website, necessitating that they remain in the data set as opposed to being removed. Thus, the distribution of data is not normally distributed and requires the Friedman test to analyze question 1.

The Friedman test examines the ranks of the data during each time period to determine whether the variables share the same underlying distribution (Pett, 2016). The Friedman test evaluates the data sets to determine the probability value (p-value), which is a measure of significance between the data being evaluated (Vogt & Johnson, 2011). The null hypothesis for the Friedman test is that there are no differences between the variables (Pett, 2016). If the probability value (p-value) is less than 0.05, the null hypothesis is rejected and it can be concluded that at least two of the variables are significantly different from each other.

A Friedman test was used, assuming a large effect size (f = 0.40), to determine if there were differences in the mean ranks of student assessment data on the New York State Mathematics A Regents Examination for three sets of scores prePLC and three sets of scores postPLC. The results of the Friedman test are displayed in Table 4.4. Table 4.4 includes the sample size (*N*), mean (*M*), standard deviation (*SD*), median (*Mdn*), the chi-squared value (χ^2), and probability value (*p*-value).

Median (*Mdn*) is the number that lies at the midpoint of a data set (Huck, 2012). The median represents the division of the data set into two equal parts (Huck, 2012). The chi-squared analysis, also referred to as goodness-of-fit test, determines if the data fits the model of the test (Huck, 2012). If the chi-squared calculated value is less than the chi-squared critical value, then the data are a good fit for the model of test (Huck, 2012). To look up the chi-squared critical value, the degrees of freedom need to be determined. The degrees of freedom are determined by subtracting one from the number of variables (Huck, 2012). For this analysis with three prePLC scores comparing to three postPLC scores, the total number of variables is six. Therefore, there are five degrees of freedom. The chi-squared critical value for a *p*-value of 0.05 with five degrees of freedom is 11.1 (Pett, 2016). As displayed in Table 4.4, the calculated chi-squared value is 6.026, which is less than the critical chi-squared value of 11.1, meaning, the data are a good fit for the Friedman test.

Table 4.4

Freidman Test Results for Math PLCs

					Friedman	
Math	*N*	*M*	*SD*	*Mdn*	χ^2	*p*

PrePLC 1	9	88.444	3.539	88.0		
PrePLC 2	9	88.777	5.286	88.0		
PrePLC 3	9	87.777	11.861	92.0	6.026	0.304
PostPLC 1	9	90.444	6.405	89.0		
PostPLC 2	9	91.111	7.236	93.0		
PostPLC 3	9	90.778	4.918	90.0		

Note. If the probability value (*p*-value) is less than 0.05, a significant difference between the data exists.

A Friedman test was used to determine if there were differences in student achievement scores on the New York State Mathematics A Regents Examination before the math PLC team began meeting compared to after the math PLC team started meeting. The median student achievement scores slightly increased from prePLC (*Mdn* = 88.0, *Mdn* = 88.0, *Mdn* = 92.0) to postPLC (*Mdn* = 89.0, *Mdn* = 93.0, *Mdn* = 90.0), but the differences were not statistically significant, $\chi^2(5) = 6.026$, $p = 0.304$. Thus, the Friedman test suggested that no statistically significant difference exists between student achievement scores prePLC math as compared to postPLC math on the New York State Mathematics A Regents Examination.

Findings of research question 2. Is there a relationship between participation in a PLC and student achievement on New York State Grade 11 English Language Arts Regents Examination?

Archival student achievement data were obtained from the New York State Education at a Glance website on the New York State Grade 11 English Regents Examination of the participating school for the 3 years before the PLC started, as identified by the responses to the survey, and for the 3 years after the PLC started.

Using the SPSS software, descriptive statistics were generated, which included the minimum and maximum score, mean, standard deviation, skewness, and kurtosis to analyze the distribution of data. The average score of the data set is the mean and the measure of scores in the distribution that deviate from the average is the standard deviation (Vogt & Johnson, 2011).

Skewness represents the degree to which scores are grouped around the average score with a value of zero suggesting normal distribution (Vogt & Johnson, 2011). Kurtosis represents the degree to which the distribution of data deviates from the bell shape or normal distribution curve (Vogt & Johnson, 2011). Data sets are considered normally distributed when the generated values of skewness and kurtosis are between ± 1.0 (Huck, 2012).

Descriptive statistics of three prePLC English scores and the three postPLC English scores are displayed in Table 4.5. Table 4.5 includes sample size (*N*), minimum and maximum scores, mean (*M*), standard deviation (*SD*), and skewness and kurtosis statistics.

Table 4.5

Descriptive Statistics of Student Achievement Data on the Grade 11 English Regents Examination

English	*N*	Min	Max	*M*	*SD*	Skewness	Kurtosis
PrePLC 1	14	82	93	88.214	3.067	-0.142	0.0
PrePLC 2	14	80	98	89.000	5.233	0.041	-0.785
PrePLC 3	14	83	97	89.928	3.668	0.165	0.127
PostPLC 1	14	73	99	89.785	7.526	-0.982	0.307

PostPLC 2	14	53	97	87.071	11.357	-2.392	6.366
PostPLC 3	14	77	98	91.214	6.154	-1.112	0.747

Data displayed in Table 4.5 revealed two groups of concern given the small sample size. The postPLC 2 group had a minimum score of 53 and a maximum score of 97 (*M* = 87.071, *SD* = 11.357) with a skewness of -2.392 and a kurtosis of 6.366. The postPLC 3 group had a minimum of 77 and a maximum of 98 (*M* = 91.214, *SD* = 6.154) with a skewness of -1.112 and a kurtosis of 0.747.

A boxplot (Appendix F) was used to determine whether the data contained outliers. A boxplot is a pictorial representation of the variability within a data set (Huck, 2012). The distribution, mean, and variability of data are represented by boxes and lines (Vogt & Johnson, 2011). Outliers are considered scores in a data set that deviate far away from the rest of the scores (Huck, 2012). There existed an outlier in the data, as evaluated by examination of a boxplot (Appendix F). The outlier was not a result of data entry errors and are actual scores reported on the New York State Education at a Glance website requiring that they remain in the data set as opposed to being eliminated. Therefore, the distribution of data is not normally distributed and requires the Friedman test to analyze Research Question 2.

The Friedman test examines the ranks of the data during each time period to determine if the variables share a similar fundamental distribution (Pett, 2016). The Friedman test analyzes the data sets to report the probability value (*p*-value), which is a measure of significance between the data being evaluated (Vogt & Johnson, 2011). The Friedman test assumes the null hypothesis, that there are no differences between the

variables (Pett, 2016). In order to reject the null hypothesis, the probability value (*p*-value) must be less than 0.05. If the Friedman test reports a probability value (*p*-value) less than 0.05, the null hypothesis is rejected and it can be concluded that at least two of the variables are significantly different from each other (Pett, 2016).

A Friedman test was used, assuming a large effect size ($f = 0.40$), to determine if there were differences in the mean ranks of student assessment data on the New York State Grade 11 English Regents Examination for three sets of scores prePLC and three sets of scores postPLC. The results of the Friedman test are displayed in Table 4.6. Table 4.6 includes the sample size (*N*), mean (*M*), standard deviation (*SD*), and median (*Mdn*). Additionally, Table 4.6 displays the chi-squared value (χ^2) and probability value (*p*-value).

Median (*Mdn*) is the score that lies at the center of a data set (Huck, 2012). The median represents the separation of the data set into two equivalent parts (Huck, 2012). This chi-squared analysis, also referred to as goodness-of-fit test, provides an indication if the data are a good fit for the model of test (Huck, 2012). If the chi-squared calculated value is less than the chi-squared critical value, the data are considered a good fit for the model of test (Huck, 2012). The degrees of freedom must be determined to look up the chi-squared critical value. To determine the degrees of freedom, subtract one from the number of variables (Huck, 2012). For this analysis, a total of six variables were present, three prePLC scores compared to three postPLC scores. Thus, there are five degrees of freedom. The chi-squared critical value with five degrees of freedom and a *p*-value of 0.05 is 11.1 (Pett, 2016). As reported in Table 4.6, the calculated chi-squared value is

3.792, which is less than the critical chi-squared value of 11.1. Thus, the data are a good fit for the Friedman test.

Table 4.6

Freidman Test Results for English PLCs

					Friedman	
English	*N*	*M*	*SD*	*Mdn*	χ^2	*p*
PrePLC 1	14	88.214	3.067	88.0		
PrePLC 2	14	89.000	5.233	89.0		
PrePLC 3	14	89.928	3.668	90.0	3.792	0.580
PostPLC 1	14	89.785	7.526	92.0		
PostPLC 2	14	87.071	11.357	89.5		
PostPLC 3	14	91.214	6.154	93.0		

Note. If the probability value (*p*-value) is less than 0.05, a significant difference between the data exists.

A Friedman test was used to determine if there were differences in student achievement scores on the New York State Grade 11 Regents Examination before the English PLC team began meeting compared to after the English PLC team started meeting. The median student achievement scores slightly increased from prePLC (*Mdn* = 88.0, *Mdn* = 89.0, *Mdn* = 90.0) to postPLC (*Mdn* = 92.0, *Mdn* = 89.5, *Mdn* = 93.0), but the differences were not statistically significant, $\chi^2(5) = 3.792$, $p = 0.580$. Consequently, the Friedman test suggested no statistically significant difference between prePLC English student achievement scores as compared to postPLC English student achievement scores on the New York State Grade 11 English Regents Examination.

Summary of Results

A number of public schools across America have implemented PLCs as one educational reform strategy in an effort to improve student achievement (DuFour & Eaker, 1998). As PLCs became more popular, a question arose: Is there a relationship between participation in a PLC and student achievement?

The review of literature that investigated the impact of a school's PLCs on student achievement revealed inconsistent outcomes related to the impact on student achievement (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010). Additionally, the review of literature did not uncover any research investigating student achievement data before participation in a PLC and after participation in PLC using archival student achievement data. Furthermore, the review of literature did not reveal any research investigating the relationship between the subject-specific PLC team that is most responsible for the student learning and subject-specific student achievement data.

The purpose of this retrospective, archival within-cases design study was to look at the relationship between participation in a PLC and student achievement. This study looked at the relationship between participation in a PLC and student achievement in math and student achievement in English.

Using the research methodology detailed in Chapter 3 and the statistical analysis detailed above, the study looked at the relationship between subject-specific PLC teams and their impact on student achievement on subject-specific assessments. A school screening survey was first emailed to the superintendent and high school principal of schools in the Hudson Valley region of New York State. In order to increase the number

of participating schools, this researcher expanded the study to include the following regions of New York State: Seaway, Central New York, Genesee, Long Island, Capital/Mohawk, Adirondacks, Finger Lakes, and Niagara Frontier.

The school screening survey was used to collect information about a school's math PLC team and English PLC team. The responses to the school screening survey were used to determine if a school's math PLC team and/or English PLC team met the inclusion criteria, as detailed in Chapter 3, and analyzed in this study.

Archival student achievement data were obtained from the New York State Education at a Glance website for the New York State Mathematics A Regents Examination and the New York State Grade 11 English Regents Examination of the participating school for the 3 years before the PLC started and for the 3 years after the PLC started.

The Friedman test used, assuming a large effect size ($f = 0.40$), to determine if there were differences in the mean ranks of student assessment data on the New York State Mathematics A Regents Examination for three sets of scores prePLC and three sets of scores postPLC suggested no statistically significant difference, $\chi^2(5) = 6.026$, $p = 0.304$. Thus, the Friedman test suggested that no statistically significant difference exists between student achievement scores prePLC in math as compared to postPLC in math on the New York State Mathematics A Regents Examination.

Additionally, the Friedman test was used, assuming a large effect size ($f = 0.40$), to determine if there were differences in the mean ranks of student assessment data on the New York State Grade 11 English Regents Examination for three sets of scores prePLC and three sets of scores postPLC. This also suggested no statistically significant

difference, $\chi^2(5) = 3.792$, $p = 0.580$. Consequently, the Friedman test suggested that no statistically significant difference exists between student achievement scores prePLC in English as compared to postPLC in English on the New York State Grade 11 English Regents Examination.

The implication of the results are further discussed in Chapter 5. The following chapter will also discuss the study's limitations and recommendations.

Chapter 5: Discussion

Introduction

Since the 1983 publication of *A Nation at Risk*, by the National Commission on Excellence in Education, public schools across America initiated reform efforts to improve student achievement (Lemons & Stevenson, 2015). These reform efforts were related to the recommendations of the National Commission of Excellence in Education and later federal acts. Both the Goals 2000: Educate America Act and the Federal No Child Left Behind Act provided a framework for schools to adhere to, but no direction from either the federal or individual state governments were provided as to what reform efforts public schools should implement to improve student achievement (DuFour & Eaker, 1998).

A reform strategy that a number of public schools across America have implemented in an attempt to improve student achievement is PLCs (DuFour & Eaker, 1998). PLCs are described as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (DuFour, DuFour, Eaker, & Many, 2010 p. 11).

DuFour and Eaker (1998) describe the structure of a PLC as a group of collaborative teams that share a common purpose. These collaborative teams are typically a group of teachers that teach the same curriculum, for example math or English (DuFour, DuFour, Eaker, & Many, 2010). During team meetings, teachers work together to develop learning targets and develop common assessments aligned to the learning

targets in their subject area (DuFour et al., 2010). After the administration of the common assessment, the team of teachers collaboratively analyzes the student achievement data. After, the team of teachers analyzes the student achievement data, they work together to develop intervention plans for students who did not reach proficiency. Finally, the team of teachers work together to share best teaching practices related to the subject area curriculum (DuFour et al., 2010). Eaker and Keating (2012) suggested that PLCs are one opportunity for public schools to improve student achievement.

As PLCs became more popular in public schools across America, a question arose: Is there a relationship between participation in a PLC and student achievement?

The review of earlier literature that investigated the relationship between PLCs and student achievement suggested a positive relationship (Bolman et al., 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003).

Following the earlier literature, Vescio et al. (2008) conducted meta-analysis research on PLCs. This meta-analysis research included 11 research studies on PLCs. Vescio et al. (2008) recommended that further research be conducted on the impact of PLCs and student achievement through various methodologies. Vescio et al. (2008) stated:

> Although, the analysis of data about student achievement is time-consuming, it is essential in building the case that PLCs are powerful types of reform and with the current demands that schools collect and analyze evidence of student achievement; this analysis is less difficult than it once was. (p. 90)

The review of more recent literature suggested little to no statistically significant relationship between PLCs and improved student achievement (Brucker, 2013; Burde,

2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Verano, 2010).

Furthermore, the review of literature revealed that previous researchers looked at the relationship between a school's implementation of PLCs and student achievement (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010). As a result, this researcher identified a gap in the research. The gap consisted of a lack of research that focused on subject-specific PLC teams and their impact on student achievement on the same subject-specific assessments.

This current study addressed the gap in the literature by investigating the relationship between participation in a subject-specific PLC team and student achievement on subject-specific assessments. This current study compared student achievement scores before participation in a PLC to student achievement scores after participation in a PLC to answer the following research questions:

1. Is there a relationship between participation in a PLC and student achievement on the New York State Mathematics A Regents Examination?
2. Is there a relationship between participation in a PLC and student achievement on the New York State Grade 11 English Language Arts Regents Examination?

Both research questions were answered using a retrospective, archival within-cases design methodology. Two data sources were used to answer the research questions. These data sources included an author-created school screening survey (Appendix D) and

archival student achievement data obtained from the New York State Education at a Glance website.

The school screening survey was emailed to the superintendent and high school principal of public high schools in the Hudson Valley region of New York State requesting their participation in this study. This process did not yield enough participants despite multiple recruitment attempts through email. As a result, this researcher expanded the study to include the following regions of New York State: Seaway, Central New York, Genesee, Long Island, Capital/Mohawk, Adirondacks, Finger Lakes, and Niagara Frontier. Similarly, the school screening survey was emailed to the superintendent and high school principal of the public high schools in the regions listed above. Additional requests to participate in the study were required to increase participation.

The expansion of the study yielded a total of 20 responses. This current study included 14 English PLC teams and nine math PCL teams. To be included in this study, an English PLC team must have started between 2003 and 2010, continue to meet for at least three consecutive years after beginning their PLC team, and scored at least 4 out of 8 on the English portion of the school screening survey, detailed in Chapter 3. Likewise, for a math PLC team to be included in the study, the math PLC team must have started between 2003 and 2006, continuing to meet for at least 3 years from the inception of the math PLC team, and scored at least 4 out of 8 on the math portion of the school screening survey, as detailed in Chapter 3.

As a result of the Federal No Child Left Behind Act of 2001, each state was required to measure schools' academic performance on standardized assessments in reading/ELA and math at least once during Grades 10 through 12 (USDOE, 2001). In

order to make comparisons of student achievement data from one year to another year, the assessments should be similar and consistent (Huck, 2012).

In New York State, the New York State Mathematics A Regents Examination was first offered in 1999 and was similar and consistent through the last year it was offered in 2009. Therefore, the archival student achievement data found on the New York State Education at a Glance website provided sufficient data for student achievement on the New York State Mathematics A Regents Examination to help answer the first research question.

In New York State, the New York State Grade 11 English Language Arts Regents Examination has been similar and consistent until the change in 2014 to be aligned with the Common Core Standards (NYSED:p12, 2018). Therefore, the archival student achievement data found on the New York State Education at a Glance website provided sufficient data for student achievement on the New York State Grade 11 English Language Arts Regents Examination to help answer the second research question.

The second source of data included archival student achievement scores for schools included in the study. Archival student achievement data were obtained from the New York State Education at a Glance website on the New York State Mathematics A Regents Examination for participating schools for 3 years before the PLC started and 3 years after the PLC started. Similarly, archival student achievement data were obtained from the New York State Education at a Glance website on the New York State Grade 11 English Regents Examination of participating schools for 3 years before the PLC started and 3 years after the PLC started. Using a within-cases design, meaning comparing student achievement from the same school over time, 3 years of student achievement

scores were compared to 3 years of student achievement scores after the subject-specific PLC team started.

Two findings emerged from this research study, corresponding to the two research questions. The first finding suggested no statistically significant difference in comparing student achievement scores on the New York State Mathematics A Regents Examination before participation in a math PLC as compared to after participating in a math PLC. Similarly, the second finding suggested no statistically significant difference in comparing student achievement scores on the New York State Grade 11 English Regents Examination before participation in an English PLC as compared to after participating in an English PLC.

Chapter 5 is divided into four sections. The first section examines the implications of the finding and the second section explores the limitations of the study. The third section includes recommendations for future research to assist in answering the question: is there a relationship between participation in a PLC and student achievement? The last section provides an overview of the study.

Implications of Findings

The concept of PLCs is a relatively new approach in education, which began to emerge in the literature in the late 1980s and the early 1990s. Two scholars: Shirley Hord and Richard DuFour became widely known for their work on PLCs.

Shirely Hord was a researcher and scholar with the Southwest Educational Development Laboratory's School Improvement Program. Hord (1997) identified five attributes of successful PLCs. Hord (1997) found the following attributes in schools that successfully implemented PLCs: (a) supportive and shared leadership, (b) collective

creativity, (c) shared values and vision, (d) supportive conditions, and (e) shared personal practice.

Richard DuFour was a practitioner known for successfully implementing PLCs in K-12 organizations. Richard DuFour's work on PLCs differs from Shirley Hord's work on PLCs by explaining the "how" as opposed to the "what" aspects of PLCs (DuFour & Eaker, 1998; Hord, 1997). The PLC approach is based on the concept of using action research within a learning organization (DuFour, DuFour, Eaker, & Many, 2010). DuFour, DuFour, Eaker, and Many (2010) suggest focusing on: (a) shared mission and vision, (b) collaborative teams focused on learning through collective inquiry, (c) action orientation and experimentation, and (d) a commitment to continuous improvement that is results oriented.

The work of Shirley Hord and Richard DuFour contributed to the literature on PLCs by defining both the form and function of PLCs. As more public schools across America began implementing PLCs, a questions arose: Is there a relationship between participation in a PLC and student achievement?

The review of literature surrounding PLCs and student achievement revealed that this type of research is relatively new and just beginning (Bolman et al., 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010). Additionally, the research investigating the relationship between PLCs and student achievement have suggested a positive relationship in the beginning (Bolman, McMahon, Stoll, Thomas, & Wallace, 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003) and little to no

statistically significant relationship in more recent history (Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Verano, 2010).

All of the research reviewed focused on a school's implementation of PLCs and student achievement (Bolman, McMahon, Stoll, Thomas, & Wallace, 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010). However, it is the subject-specific teachers that are most responsible for student achievement on subject-specific assessments. Despite this, previous researchers looked at the school's implementation of PLCs and various student achievement data, without being able to attribute that data to a particular subject-specific PLC team.

This research contributes to and enhances the literature surrounding PLCs and student achievement by focusing on subject-specific PLC teams in math and English, and looking at the relationship to student achievement in subject-specific assessments. Subject-specific teachers participating in subject-specific PLC teams are most responsible for student achievement on subject-specific assessments. The results of this study suggested no statistical significance between participation in subject-specific PLC teams and student achievement on subject-specific assessments, both in math and English.

Specifically, the results from this study suggested no statistically significant difference exists between 3 years of student achievement scores on the New York State Mathematics A Regents Examination before the math PLC team began meeting as compared to 3 years of student achievement scores on the New York State Mathematics A Regents Examination after the PLC team started. Similarly, the findings of this study

suggested no statistically significant difference in comparing student achievement scores for 3 years before the English PLC team began to 3 years afterwards on the New York State Grade 11 English Regents Examination.

This study focused on the subject-specific PLC teams and the relationship between the associated student achievement assessment. The Friedman test was used to analyze the data. The sample size for participating PLC teams, was relatively small for both math PLC teams ($N = 9$) and English PLC teams ($N = 14$). Therefore, the analysis of data assumed a large effect size ($f = 0.40$), meaning that it is assumed that participation in a PLC has a large effect on student achievement.

The relatively small sample size included in this study resulted from limited participation, first by schools in the Hudson Valley region of New York State. Then after the expansion of the study, limited participation from schools in the following regions of New York State: Seaway, Central New York, Genesee, Long Island, Capital/Mohawk, Adirondacks, Finger Lakes, and Niagara Frontier. Of note, this survey was answered. Although it was a small sample size, many principals and/or superintendents did reply to share that their district did not have PLCs in place at all or started PLCs before and after the specified windows, which was an inclusion criterion to participate in this study.

Although this researcher had chosen a specific population to participate in the study, during the course of the study it become apparent that modifications were required to increase participation. As is typically found in applied research, the best plans may need to be modified to deal with reality. Without expanding the study to include other regions of New York State, this researcher would not have obtained enough responses to use statistical tests to analyze the data and complete this study.

One part of the inclusion criteria for this study required that a math PLC team must have started meeting between 2003 and 2006 and that an English PLC team must have started between 2003 and 2010. The researcher chose these specific windows of time that the PLC teams must have started for three reasons.

The first reason was the type of methodology used to analyze the data. The methodology design was a retrospective, archival within-cases design with an interrupted time series. The within-cases design compares the student achievement results of the same school over time. The interrupted time series involved a comparison between 3 years of student achievement data before the PLC began and 3 years of student achievement data after the PLC started.

Second was the availability of archival student achievement data. The New York State Education at a Glance website warehouses student achievement data on all public schools, which started in 2000. For this reason, both the math and English PLC teams must have started by the year 2003. In doing so, the researcher had the ability to obtain student achievement data from the New York State Education at a Glance website for 3 years prior 2003. If the archival student data dated farther back than 2000, the PLC window could have been expanded.

Lastly, in order to compare student achievement data from one year to another year, the assessments should be similar and consistent (Huck, 2012). This study used the New York State Grade 11 English Regents Examination, which remained similar and consistent until 2014. In 2014, the New York State Grade 11 English Regents Examination assessed the new Common Core standards. Therefore, the requirement of the English PLC team to start between 2003 and 2010 allowed for consistent student

achievement data to be obtained. Additionally, this study used the New York State Mathematics A Regents Examination, which remained consistent from 1999, the first year of implementation, until 2009, the last year of implementation. This was the time period where New York State replaced the Mathematics A Regents Examination with the new Integrated Algebra Regents Examination. The limited number of years the Mathematics A Regents Examination was offered in New York State, required the math PLC team to start between 2003 and 2006 to have enough available data that is similar and consistent. Although the English Regents Examination remained consistent until 2014, the Mathematics A Regents Examination was only offered between 1999 and 2009. The 10 year time period in which the Mathematics A Regents Examination was administered limits the ability of researchers to conduct archival studies in the area of math in New York State.

To be eligible to participate in the study, a school's math PLC team must have started between the years 2003 and 2006, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the math section of the school screening survey. Additionally, to be eligible to participate in the study, a school's English PLC team must have started between the years 2003 and 2010, continued to meet for at least 3 years after starting, and scored at least 4 out of 8 on the English section of the school screening survey. Thus, the inclusion criteria for both ELA and math PLC teams established for this study had unintended implications, which may have resulted in the limited sample size. The brief window within which the math PLC team had to have started (2003-2006) and for the ELA PLC team to have started (2003-2010) was stringent but necessary for assessment consistency.

As school leaders continue to look for methods to improve student achievement, this study and previous research on the impact of PLCs and improved student achievement should be taken into account if they are considering the implementation of PLCs for their school district. Although earlier research suggesting a positive relationship between a school's implementation of PLCs and improved student achievement existed, more recent research, including this study, does not suggest a positive relationship. Specifically, school leaders should focus on research that focuses on subject-specific PLC teams and associated student achievement as, these are the teams of teachers that are most directly responsible for student performance in these subject-specific assessments.

Limitations

This section describes the limitations of this study that may influence the results and findings. First, the small sample size of the math PLCs ($N = 9$) and the English PLCs ($N = 14$) required that the analysis assume a large effect size ($f = 0.40$). Effect size is the magnitude or size of an effect (Pett, 2016). As a result of the small sample sizes included in this study, the analysis is assuming that participation in a PLC team will have a large effect on student achievement. There has not been extensive research on the effect size of PLCs on student achievement. Therefore, it is unclear if the assumed effect size in this research was suitable for the study. If a larger sample size was available, a medium or a small effect size could have been assumed, which may have impacted the results of the Friedman test.

Second, the self-reporting nature for the school screening survey presents limitation related to the responders themselves. Specifically, the respondents to the survey may or may not have been with the school district between the window of time the

PLC was to begin, between 2003 through 2006 for math and 2003 through 2010 for English. Therefore, the responses to the survey may have been their best understanding of how the PLC functioned at that time. Additionally, a number of principals and superintendents responded that they were not with the district during the specified window of time and did not have enough knowledge to answer the survey questions. These factors contributed to the limited sample size.

Third, this study did not take into account teacher training for PLCs. This study assumed that all teachers participating in the PLC teams were properly trained to function and participate effectively in the PLCs. Furthermore, this study assumed that all teachers participating in the PLC teams received similar training, independent of the school they worked in.

The fourth area of concern was teacher turnover. This study did not take into account teacher turnover in the participating PLC teams. This study assumed that all of the teachers remained the same in the PLC teams throughout the years that the student achievement scores were used to look at the relationship. This is an important assumption given the direct impact a teacher has on student performance.

Lastly, this current study examined only two subject-specific PLC teams, math and English. Although student achievement data were analyzed for math and English, other subject-specific student achievement data can be found on the New York State Education at a Glance website. The other subject areas with available student assessment data to investigate are social studies and science.

Recommendations

The findings from this current study along with the review of literature suggest several recommendations for future research, professional practice, and leaders of public school districts. The hope is that future researchers will continue to investigate the question: is there a relationship between PLCs and student achievement? The literature surrounding this question is limited as PLCs are relatively new to the field of education emerging in the late 1980s to early 1990s.

This current study adds a new approach to the body of literature on PLCs and student achievement. This current study focused on subject-specific PLC teams and subject-specific student achievement assessments. However, this study was conducted with a small sample size, requiring the assumption of a large effect size. This means that this current study made the assumption that participation in a PLC team has a large effect on student achievement. Research on the effect size of PLCs on student achievement has not been extensively researched. Therefore, it is uncertain if the assumed effect size of this research was appropriate for the study. It is recommended that this study be replicated using a larger sample size, which will reduce the assumed effect size.

This current study used a retrospective, archival within-cases design methodology. This means that student achievement data from the past were used to compare a school's student achievement data in math and English before the subject-specific PLC teams began meeting as compared to afterwards. It is recommended that other subject areas, such as social studies and science, be investigated using a within-cases design.

Additionally, it is recommended that a between-cases design be used to investigate the question: is there a relationship between PLCs and student achievement?

This means that the design would be similar in procedure to this current study, but comparing student achievement between different schools. For example, a between-cases design could compare the PLC teams that score a value of four on the school screening survey to similar schools that score a value of eight on the school screening survey. In order to make this type of comparison, a very large sample size will be required in order to be able to control for various factors that have been identified in the research to impact student achievement.

It is recommended that school leaders consider all of the research on PLCs before implementing PLCs in their districts. While the early literature demonstrated a positive relationship between PLCs and student achievement, more recent literature including this study suggested little to no statistically significant relationship between PLCs and student achievement. Additionally, most of the research is focused on a school's implementation of PLCs and student achievement results in various subject areas. It is recommended that school leaders focus on research investigating the relationship between the subject-specific PLC team, which is most responsible for the student learning, and student achievement on the subject-specific assessment.

Conclusion

After the publication of *A Nation at Risk*, public schools across America started reform efforts to improve student achievement (Lemons & Stevenson, 2015). These reform efforts looked to address the recommendations of the National Commission of Excellence in Education and subsequent federal acts. The federal acts, which included the Goals 2000: Educate America Act and the Federal No Child Left Behind Act provided an

agenda for schools to follow but no direction as to what reform efforts public schools should implement to improve student achievement (DuFour & Eaker, 1998).

One reform strategy that some public schools across America have implemented in an attempt to improve student achievement is PLCs (DuFour & Eaker, 1998). DuFour, DuFour, Eaker, and Many (2010) describe PLCs as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p. 11).

A PLC is a group of collaborative teams that share a common purpose (DuFour & Eaker, 1998). These teams typically include a group of teachers that teach the same curriculum, for example, math or English (DuFour, DuFour, Eaker, & Many, 2010). During team meetings, teachers work together to develop learning targets as well as common assessments. The common assessments are aligned to the learning targets in their subject area (DuFour et al., 2010). After the assessments are given, the team of teachers analyze the student achievement data. Then, the team of teachers work together to develop intervention plans for students who did not reach proficiency. Finally, the team of teachers work together to share best teaching practices related to the subject area curriculum (DuFour et al., 2010).

As PLCs have become more popular and researched, a question arose: Is there a relationship between participation in a PLC and student achievement.

The review of literature surrounding PLCs and student achievement revealed a positive relationship initially (Bolman, McMahon, Stoll, Thomas, & Wallace, 2005; Langer, 2000; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz &

Christman, 2003) and little to no relationship more recently (Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Lennon, 2010; Verano, 2010).

Additionally, Vescio et al. (2008) conducted meta-analysis research on PLCs. This research included 11 research studies on PLCs. Vescio et al. (2008) recommended that further research be conducted on the impact of PLCs and student achievement through various methodologies.

Moreover, the review of literature discovered that researchers focused on the relationship between a school's implementation of PLCs and student achievement (Bolman, McMahon, Stoll, Thomas, & Wallace, 2005; Brucker, 2013; Burde, 2016; Hamilton, 2013; Hardinger, 2013; Johnson-Estes, 2009; Langer, 2000; Lennon, 2010; Louis & Marks, 1998; Phillips, 2003; Strahan, 2003; Supovitz & Christman, 2003; Verano, 2010). As a result, this researcher identified a gap in the research. The gap entails a lack of research that looked at subject-specific PLC teams and their impact on student achievement on the same subject-specific assessments.

This current study addressed the gap in the literature by looking at the relationship between participation in a subject-specific PLC team and student achievement on subject-specific assessments. This current study compared student achievement scores before and after participation in a PLC.

Both research questions were answered using a retrospective, archival within-cases design methodology. The data sources used to answer the research questions included an author created school screening survey (Appendix D) and archival student achievement data obtained from the New York State Education at a Glance website.

The author-created school screening survey was emailed to the superintendent and high school principal of public high schools in the Hudson Valley region of New York State. This did not produce enough participants despite multiple recruitment attempts through email. Therefore, this researcher expanded the study to include the following regions of New York State: Seaway, Central New York, Genesee, Long Island, Capital/Mohawk, Adirondacks, Finger Lakes, and Niagara Frontier. Likewise, the author created school screening survey was emailed to the superintendent and high school principal of the public high schools in these regions.

The expansion of the study generated 20 responses which included 14 English PLC teams and nine math PCL teams. In order be included in this study, an English PLC team must have started between 2003 and 2010, continued to meet for at least three consecutive years after beginning their PLC team, and scored at least 4 out of 8 on the English portion of the school screening survey, detailed in Chapter 3. Similarly, for a math PLC team to be included in the study, the math PLC team must have started between 2003 and 2006, continued to meet for at least 3 years from the start of the math PLC team, and scored at least 4 out of 8 on the math portion of the school screening survey, detailed in Chapter 3.

As a result of the Federal No Child Left Behind Act of 2001, each state was mandated to measure a school's academic performance on standardized assessments in reading/ELA and math at least once during Grades 10 through 12 (USDOE, 2001). In comparing student achievement data from one year to another year, the assessments must be similar and consistent (Huck, 2012).

In New York State, the New York State Mathematics A Regents Examination was offered between 1999 and 2009. During this time period, the Mathematics Examination remained similar and consistent. Thus, the student achievement data found on the New York State Education at a Glance website provided enough student achievement scores on the New York State Mathematics A Regents Examination to help answer the first research question.

In New York State, the New York State Grade 11 English Language Arts Regents Examination has been similar and consistent until the change in 2014. In 2014, the New York State Grade 11 English Language Arts Regents Examination became aligned with the Common Core Standards (NYSED, 2018). Hence, the student achievement scores retrieved from the New York State Education at a Glance website provided sufficient data to help answer the second research question.

The second source of data, archival student achievement scores were obtained from the New York State Education at a Glance website. This included student achievement scores for participating schools for both the New York State Mathematics A Regents Examination and the New York State Grade 11 English Regents Examination. In both cases, student achievement data were obtained for participating schools, which included 3 years before the PLC started and 3 years after the PLC started.

A within-cases design, which compared student achievement scores from the same school over time, was used to answer the research questions. The first finding suggested no statistically significant difference in comparing student achievement scores on the New York State Mathematics A Regents Examination before participation in a math PLC as compared to after participating in a math PLC, $\chi^2(5) = 6.026$, $p = 0.304$.

Similarly, the second finding suggested no statistically significant difference in comparing student achievement scores on the New York State Grade 11 English Regents Examination before participation in an English PLC as compared to after participating in an English PLC, $\chi^2(5) = 3.792$, $p = 0.580$.

Despite the suggested outcome of this study, this researcher thinks that participation in PLCs is a worthwhile reform effort. While the connection between PLCs and positive student achievement was not supported by this study, there remain many organizational benefits associated with PLCs. PLCs are a method of operation in which a school functions. This researcher has firsthand experience implementing PLCs in a public high school and knows the areas in which school leaders need to focus their attention through the implementation process.

One of the first hurdles to overcome in implementing PLCs is getting all of the teachers and administrators to understand PLCs and buy-in to functioning as a PLC. Senge (1990) summarized this point by describing the difference between compliance and commitment. If teachers and administrators are simply compliant to the cause of PLCs, then they are not going to benefit from its purpose. The opposite is also true: if teachers and administrators are committed to the cause of PLCs, then they and their students will benefit from operating in this fashion.

Once teachers and administrators commit to operating as a PLC, then students will ultimately benefit. But, this does not come easy. This concept will be new to teachers, as this approach is typically not taught in teacher preparation schools. Teams of teachers that teach the same content need to learn to work together for the benefit of their

students. DuFour, DuFour, Eaker and Many (2010) suggest that PLC teams focus on the following four questions of learning to drive their team meetings:

1. What is it we want students to learn?,
2. How will we know if each student has learned it?,
3. How will we respond when some students do not learn it?, and
4. How can we extend and enrich the learning for students who have demonstrated proficiency? (p. 119)

Additionally, DuFour et al. (2010) suggest working in a repeating cycle of team meetings. These team meetings include the following: (a) agreeing on student learning targets, (b) developing common assessments, (c) after administering the common assessments, analyzing student achievement, (d) developing intervention plans for students who did not reach proficiency on the assessments, and (e) sharing best teaching practices. This method of operating takes a lot of time for teachers to learn and become comfortable with functioning in this process.

An additional challenge that school leaders need to be aware of when implementing PLCs is the issue of time. The question "when will time be provided during the course of the day for these team meetings?" needs to be thought through and answered by the school leader. Having dealt with this question, this researcher suggests modifying the master schedule. This researcher modified the master schedule in a public high school to provide time during the day for subject area teams of teachers to meet once a week. For example, this researcher designed the master schedule in such a way that no math classes were taught during third period. This modification to the master schedule allowed the time for teachers to follow the suggested five week meeting cycle of (a) week

one meeting: agreeing on student learning targets, (b) week two meeting: developing common assessments, (c) week three meeting: after administering the common assessments, analyzing student achievement, (d) week four meeting: developing intervention plans for student who did not reach proficiency on the assessments, and (e) week five meeting: sharing best teaching practices.

Although time consuming, this researcher has experienced that high school teachers are typically comfortable with the first three components of the PLC process. That is, (a) agreeing on student learning targets, (b) developing common assessments, and (c) administering assessments and analyzing student achievement. Frankly, identifying student learning targets, developing assessments, giving the assessment and analyzing student achievement is something that all teachers can and should be doing whether participating in a PLC or not.

This researcher has experienced and submits that high school teachers are typically not comfortable with the fourth and fifth components of PLC team meetings. Specifically, teachers are typically not comfortable with developing intervention plans for students and the sharing of best instructional practices with other teachers. This researcher suggests that being strong in these two components is the essence of highly-functioning PLC teams.

It is in these two areas that school leaders need to focus their time and attention to provide support for teachers. To accomplish this, school leaders must push back on teachers that have the mindset, “I taught it, they did not learn it.” This researcher believes that “if they did not learn it, then it wasn’t really taught.” In other words, just because it was taught, doesn’t mean it was learned. For school leaders, this can be one of the most

challenging mindsets to overcome, but is necessary for the benefit of all students. There really is only one way to change a teacher's mindset on this concept, and that is with a million conversations, one at a time. Furthermore, school leaders need to assist teachers in identifying existing interventions to assist in student achievement and/or developing interventions for students. The school leader needs to work with all teachers to develop a school-wide intervention support system. One example is to have study centers built into the master schedule for students to get extra help from content certified teachers.

Additionally, school leaders need to have teachers share best instructional practices with their colleagues. Effective instructional methodology assists in student learning. However, this researcher has not found that teachers are typically comfortable sharing their teaching methodologies. This researcher believes that the reason teachers are typically not willing to share their teaching practices is the belief that it is the secret ingredient to being a great teacher. Like the secret ingredient to a favorite meal, teaching practices are also not often shared with others. School leaders must also work to overcome this mindset. To begin to accomplish this, school leaders should model the behavior they would like to see in their staff. This means that school leaders should model sharing best teaching methodologies as well as encourage teachers to watch each other teach. These types of peer observations should not be formal or evaluative, but rather a learning opportunity for both teachers that is enhanced with a discussion after the observation.

This researcher believes that if school leaders focus support on developing these two critical components of PLC team meetings then PLC teams will be more successful. Although no statistically significant results were suggested as an outcome of this study,

that should not suggest that individual student improvement did not occur. Through teacher participation in PLC teams, students may have scored higher on the assessments than if the teachers did not participate in a PLC team. This study only looked at the overall proficiency level of a school's scores on math and English, meaning the percentage of students scoring above 65 %, and not individual scores of students.

Although this study suggested no statistically significant relationship between participation in PLCs and student achievement, this researcher believes that PLCs are a worthy reform effort. PLCs provide a mechanism for school leaders and teachers to operate. Furthermore, the PLC model provides components as guidelines for PLC teams to follow. The repeating cycle of PLC team meetings, which include: (a) agreeing on learning targets, (b) developing common assessments, (c) administering assessments and analyzing student achievement should be familiar and part of every teacher's practice – independent of participating in a PLC team. The final two components for the PLC team to follow: (d) developing intervention plans for students, and (e) the sharing of best teaching practices are the essence of highly effective PLC teams. These are the two areas of PLC team meetings in which school leaders need to focus their support to improve student achievement.

Finally, PLCs are a systematic method of operation that provides the school leader and teachers the structure, function, and purpose for to focus their work as educators to educate students. By operating in a PLC, a subject-specific PLC team can systematically move through the five-week meeting cycle focusing on the four questions for learning:

1. What is it we want students to learn?,

2. How will we know if each student has learned it?,
3. How will we respond when some students do not learn it?, and
4. How can we extend and enrich the learning for students who have demonstrated proficiency? (DuFour, DuFour, Eaker, & Many, p. 119)

In conclusion, this researcher's practical experience as a school leader who implemented PLCs in a public high school and a researcher that looked at the relationship between participation in a PLC and student achievement is hoping to see more research around this relationship in the future. Specifically, research around a subject-specific PLC team and their subject-specific assessment with a focus on the impact of teachers developing intervention plans and sharing best practices would benefit the existing literature on the topic. This researcher believes that these are the two key components of the meeting cycle and the essence of PLC team meetings.

References

Bolman, R., McMahon, A., Stoll, L., Thomas, S., & Wallace, M. (2005). *Creating and sustaining effective professional learning communities.* Research Report Number 637. London, England: General Teaching Council for England, Department of Education and Skills.

Brucker, E. (2013). *Implementation and perceived effectiveness of professional learning communities in the Kanawha county schools district in West Virginia* (Doctoral dissertation). Retrieved from ProQuest. (355812)

Burde, M. (2016). *The relationship between student achievement and professional learning communities at the middle school level* (Doctoral dissertation). Retrieved from Scholarworks.wmich.edu. (1426)

Campbell, P. L. (2011). *Peirce, pragmatism, and the right way of thinking.* Albuquerque, NM: Sandia National Laboratories.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: SAGE Publications.

Dembosky, J. W., Pane, J. F., Barney, H., & Christina, R. (2006). *Data driven decision making in Southwestern Pennsylvania school districts.* Retrieved from: http://www.rand.org/content/dam/rand/pubs/working_papers/2006/RAND_WR326.pdf

DuFour, R., DuFour, R., Eaker, R., & Many, T. (2010). *Learning by doing: A handbook for professional communities at work* (2nd ed.). Bloomington, IN: Solution Tree Press.

DuFour, R., & Eaker, R. (1998). *Professional learning communities at work: Best practices for enhancing student achievement.* Bloomington, IN: National Educational Service.

DuFour, R., Eaker, R., DuFour, R., Barth, R., Eason-Watkins, B., Fullan, M., Lezotte, L., Reeves, D., Saphier, J., Schmoker, M., Sparks, D., & Stiggins, R. (2005). *On common ground: The power of professional learning communities.* Bloomington, IN: Solution Tree Press.

Eaker, R., & Keating, J. (2012). *Every school, every team, every classroom: District leadership for growing professional learning communities at work.* Bloomington, IN: Solution Tree Press.

Eason-Watkins, B. (2005). Implementing PLCs in the Chicago Public Schools. In R. DuFour, R. Eaker, & R. DuFour (Eds.), *On common ground: The power of professional learning communities* (pp. 193-207). Bloomington, IN: Solution Tree Press.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2019). G*Power Version3.1.9.4. [computer software]. Uiversitat Kiel, Germany. Retrieved from http://www.gpower.hhu.de/

Gearing, R. E., Mian, I. A., Barber, J., & Ickowicz, A. (2006). A methodology for conducting retrospective chart review research in child and adolescent psychiatry. *Journal of the Canadian Academy of Child and Adolescent Psychiatry, 15*(3), 126-134.

Geyer, D. L. (1914). *The pragmatic theory of truth as developed by Peirce, James, and Dewey* (Doctoral thesis). Retrieved from The Project Gutenberg EBook.

Hamilton, J. (2013). *Professional learning communities impact on student achievement* (Doctoral dissertation). Retrieved from ProQuest. (3568312)

Hardinger, R. (2013). *The relationship between PLC implementation and academic achievement and graduation rates in Georgia high schools* (Doctoral dissertation). Retrieved from ProQuest. (3589990)

Harris, A., & Jones, M. (2010). Professional learning communities and system improvement. *Improving Schools, 13*(2), 172-181.

Hookway, C. (2008). Pragmatism. *The Stanford Encyclopedia of Philosophy.* Retrieved from https://plato.stanford.edu/archives/sum2016/entries/pragmatism/

Hord, S. (1997). *Professional learning communities: Communities of continuous inquiry and improvement.* Southwest Educational Development Laboratories: Austin, Texas.

Hord, S. M., & Rutherford, W. L. (1998). Creating a PLC: Cottonwood Creek School. *Issues about Change, 6*(2), 1-8.

Hord, S.M., & Sommers, W.A. (2008). *Leading professional learning communities: Voices from research and practice.* Thousand Oaks: Corwin Press and National Association of Secondary School Principals.

Huck, S. W. (2012). *Reading statistics and research* (6th ed.). Boston, MA: Pearson Education.

Hurst, D., Tan, A., Meek, A., & Sellers, J. (2003). *Overview of inventory and state education reforms: 1990 to 2000*. Washington, DC: National Center for Education Statistics.

Jerald, C. (2003). Beyond the rock and the hard place. *Educational Leadership, 61*(3), 12-16.

Johnson-Estes, L. (2009). *An analysis of the relationship of PLC implementation in Texas high schools and student achievement* (Doctoral dissertation). Retrieved from ProQuest. (3358169)

Joyce, B. (2004). How are professional learning communities created? *Phi Delta Kappan, 86*(1), 76-83.

Langer, J. A. (2000). Excellence in English in middle and high school: How teachers' professional lives support student achievement. *American Educational Research Journal, 37*(2), 397-439.

Lemons, R. W., & Stevenson, I. (2015). Turn effective practice into common practice. *The Learning Professional, 36*(5), 18-21.

Lennon, V. (2010). *Evaluation of the Missouri professional learning communities project* (Doctoral dissertation). Retrieved from ProQuest (3407354)

Lezotte, L. (1991). *Correlates of effective schools: The first and second generation.* Okemos, MI: Effective Schools Products. Retrieved from www.effectiveschools.com/Correlates.pdf

Lezotte, L. (2005). More effective schools: Professional learning communities in action. In R. DuFour, R. Eaker, & R. DuFour (Eds.), *On common ground: The power of professional learning communities* (pp. 177-191). Bloomington, IN: Solution Tree Press.

Louis, K. S., & Kruse, S. D. (1995). *Professionalism and community: Perspectives on reforming urban schools.* Thousand Oaks, CA: Corwin Press.

Louis, K., & Marks, H. (1998). Does PLC affect the classrooms teachers' work and student experience in restructured schools? *American Journal of Education, 106*(4), 532-575.

Marzano, R. J., Waters, T., & McNulty, B. A. (2005). *School leadership that works: From research to results.* Alexandria, VA: Association for Supervision and Curriculum Development.

McDonnell, T. (n.d.). Regions of New York State. Retrieved from http://www.nygeo.org/regions.html

MCREL. (2005). *MCREL insights: Schools that "beat the odds."* Retrieved from https://www.cde.state.co.us/dropoutprevention/cgpschoolthatbeattheodds

MCREL. (2006). *Success in sight: A comprehensive approach to school improvement.* Retrieved from https://files.eric.ed.gov/fulltext/ED491186.pdf

Mullen, C. A., & Schunk, D. H. (2010). A review of professional learning communities through three frames: Leadership, organization, and culture. *McGill Journal of Education, 45*(2), 185-203.

Newmann, F., & Wehlage, G. (1995). *Successful school restructuring: A report to the public and educators.* Madison, WI: Center on Organization and Restructuring of Schools. Retrieved from https://files.eric.ed.gov/fulltext/ED387925.pdf

New York Schools. (n.d.) Retrieved from http://www.newyorkschools.com/

NYSED Data Site. (2018). *New York State education at a glance.* Retrieved from https://data.nysed.gov/

NYSED. (2018). *Timeline & history of New York State assessments.* Retrieved from http://www.p12.nysed.gov/assessment/timeline-historyrev.pdf

Pande, P. (2007). *The six sigma leader: How top executives will prevail in the 21st century.* New York, NY: McGraw-Hill.

Phillips, J. (2003). Powerful learning: Creating learning communities in urban school reform. *Journal of Curriculum and Supervision, 18*(3), 240-258.

Pett, M. A. (2016). *Nonparametric statistics for health care research: Statistics for small samples and unusual distributions* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Rhoads, K. (2011). Despite rough seas, teachers in rural Maine swim together. *Journal of Staff Development, 32*(2), 22-26.

Rosenholtz, S. (1989). Workplace conditions that affect teacher quality and commitment: Implications for teacher induction programs. *The Elementary School Journal, 89*, 420-239.

Schmoker, M. (2006). *Results now: How we can achieve unprecedented improvements in teaching and learning.* Alexandria, VA: Association for Supervision and Curriculum Development.

Senge, P. (1990). *The Fifth discipline: The art and practice of the learning organization.* New York, NY: Doubleday.

Singleton, R., & Straits, B. (2005). *Approaches to social research* (4th ed.). New York, NY: Oxford University Press.

Spanneut, G. (2010). Professional learning communities, principals, and collegial conversations. *Kappa Delta Pi Record, 46*(3), 100-103.

Strahan, D. (2003). Promoting a collaborative professional culture in three elementary schools that have beaten the odds. *The Elementary School Journal, 104*(2), 127-146.

Stringer, E. (2007). *Action research* (3rd ed.). Thousand Oaks, CA: SAGE Publications.

Supovitz, J., & Christman, J. (2003). Developing communities of instructional practice: Lessons from Cincinnati and Philadelphia. *CPRE Policy Briefs* pp. 1-9. Pennsylvania, PA: University of Pennsylvania.

United States. (1983). *A nation at risk: The imperative for educational reform.*

U.S. Department of Education. (1994). *Goals 2000: Educate America act.* Retrieved from https://www2.ed.gov/legislation/GOALS2000/TheAct/index.html

U.S. Department of Education. (2001). *No Child Left Behind Act of 2001.* Retrieved from https://www2.ed.gov/policy/elsec/guid/states/index.html#aa

Verano, S. (2010). *Professional learning communities and student achievement in Pennsylvania high schools* (Doctoral dissertation). Retrieved from ProQuest. (3439761)

Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching and Teacher Education, 24*, 80-91.

Vogt, W.B., & Johnson, R. B. (2011). *Dictionary of statistics & methodology: A nontechnical guide for the social sciences* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Warren-Little, J., & McLaughlin, M. (1993). *Teachers work: Individuals, colleagues, and context.* New York, NY: Teachers College Press.

Appendix A

Letter of Introduction

Dear Superintendent and Principal,

Please allow me to introduce myself. My name is Brian Timm and I am the Director of Curriculum and Instruction for the Pine Plains Central School District and a St. John Fisher Doctoral Student. I am investigating the relationship between teacher participation in a PLC and student achievement in math and ELA. In order to be included in this investigation, a school's English PLC must have started between 2003 and 2010 and/or a school's math PLC must have started between 2003 and 2006. Archival student achievement data from the New York State Education at a Glance website will be obtained for the English 11 Regents Examination and the Mathematics A Regents Examination. This information will be used to compare prePLC student achievement data to postPLC student achievement data. I will be forwarding a School Screening Survey, consisting of only 17 questions, in the next few days to you both. If you started a math and/or English PLC between the years listed above, please consider completing the survey and participating in my study. I will share my findings with all schools that participate in the study. If interested in participating in this study, only one of you will need to complete the survey.

The St. John Fisher College Institutional Review Board (IRB) has reviewed this research. If you have any questions about this study, please contact me at (845) 797-3485. If I do not answer, please leave a voicemail with the best number to return your call. Thank you for your consideration in participating in this study.

Thank you,
Brian Timm
Director of Curriculum and Instruction, Pine Plains CSD
St. John Fisher College Doctoral Student

Appendix B

Letter of Invitation to Participate in the Study

Dear Superintendent and Principal,

Please allow me to introduce myself. My name is Brian Timm and I am the Director of Curriculum and Instruction for the Pine Plains Central School District and a St. John Fisher Doctoral Student. I am investigating the relationship between teacher participation in a PLC and student achievement in math and ELA. In order to be included in this investigation, a school's English PLC must have started between 2003 and 2010 and/or a school's math PLC must have started between 2003 and 2006. Archival student achievement data from the New York State Education at a Glance website will be obtained for the English 11 Regents Examination and the Mathematics A Regents Examination. This information will be used to compare prePLC student achievement data to postPLC student achievement data.

The School Screening Survey consists of 17 questions divided into three sections. The first section asks for the name of your high school. The second section consists of eight questions about your school's English PLC and the third section consists of eight questions about your school's math PLC. It is estimated that the survey will take no longer than 5-8 minutes to complete.

Follow this link to the survey:
Take the Survey

Or copy and paste the URL below into your Internet browser:
https://www.surveymonkey.com/r/Schoolscreeningsurvey

The St. John Fisher College Institutional Review Board (IRB) has reviewed this research. There are no known physical or psychological risks associated with completing the survey. You may refuse to answer any questions and withdraw from completing the survey at any time. By completing this survey, you consent to participate. No personally identifiable information will be associated with your responses in any published and reported results of this study. It would be greatly appreciated if you would complete the survey by February 14, 2019. My findings will be shared with all participating schools.

If you have any questions about this study, please contact me at (845) 797-3485. If I do not answer, please leave a voicemail with the best number to return your call. Thank you for your consideration in participating in this study.

Thank you,
Brian Timm
Director of Curriculum and Instruction, Pine Plains CSD
St. John Fisher College Doctoral Student

Appendix C

Letter of Reminder Invitation

Dear Superintendent and Principal,

Please allow me to introduce myself. My name is Brian Timm and I am the Director of Curriculum and Instruction for the Pine Plains Central School District and a St. John Fisher Doctoral Student. I would like to thank everyone that completed the School Screening Survey below and agreed to participate in my study. If you have not yet completed the survey and wish to participate in this study, there is still time. It would be greatly appreciated if you would complete the survey by February 14, 2019. My findings will be shared with all participating schools.

I am investigating the relationship between teacher participation in a PLC and student achievement in math and ELA. In order to be included in this investigation, a school's English PLC must have started between 2003 and 2010 and/or a school's math PLC must have started between 2003 and 2006. Archival student achievement data from the New York State Education at a Glance website will be obtained for the English 11 Regents Examination and the Mathematics A Regents Examination. This information will be used to compare prePLC student achievement data to postPLC student achievement data.

The School Screening Survey consists of 17 questions divided into three sections. The first section asks for the name of your high school. The second section consists of eight questions about your school's English PLC and the third section consists of eight questions about your school's math PLC. It is estimated that the survey will take no longer than 5-8 minutes to complete.

Follow this link to the survey: Take the Survey
Or copy and paste the URL below into your Internet browser:
https://www.surveymonkey.com/r/Schoolscreeningsurvey

The St. John Fisher College Institutional Review Board (IRB) has reviewed this research. There are no known physical or psychological risks associated with completing the survey. You may refuse to answer any questions and withdraw from completing the survey at any time. By completing this survey, you consent to participate. No personally identifiable information will be associated with your responses in any published and reported results of this study. If you have any questions about this study, please contact me at (845) 797-3485. If I do not answer, please leave a voicemail with the best number to return your call. Thank you for your consideration in participating in this study.

Thank you,
Brian Timm
Director of Curriculum and Instruction, Pine Plains CSD
St. John Fisher College Doctoral Student

Appendix D

School Screening Survey Questions

Directions:

This 17-question school screening survey is collecting information regarding a school's English PLC team and a school's mathematics PLC team. This screening survey contains a number of statements/questions about PLC team practices that occur in some schools. Please read each statement/question and respond to the statement or question.

1. What is the name of your high school?
_____

English PLC team questions/statements:

2. If the English PLC team started meeting between 2003 and 2010, please indicate the year they started. _____

3. Please check all of the years the English PLC team was meeting.
- o 2003
- o 2004
- o 2005
- o 2006
- o 2007
- o 2008
- o 2009
- o 2010
- o 2011
- o 2012
- o 2013

4. Please indicate the frequency of English PLC team meetings.
- o One time per week
- o Every other week
- o One time per month
- o Less than one time per month

5. Please indicate the approximate number of English teachers participating in the PLC team.
- o All of the English teachers
- o More than half of the English teachers
- o Less than half of the English teachers
- o Only a few English teachers

6. Did the English PLC team collectively develop learning targets/student objectives?
- Yes
- No
- I don't know

7. Did the English PLC team develop and/or use common assessments (i.e. quizzes, unit tests)?
- Yes
- No
- I don't know

8. Did the English PLC team analyze the student achievement data and develop intervention plans for students who did not reach proficiency?
- Yes
- No
- I don't know

9. Did the English PLC team develop enrichment opportunities for students who did reach proficiency?
- Yes
- No
- I don't know

Math PLC team questions/statements:

10. If the math PLC team started meeting between 2003 and 2006, please indicate the year they started. _____

11. Please check all of the years the math PLC team was meeting.
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009

12. Please indicate the frequency of math PLC team meetings.
- One time per week
- Every other week
- One time per month
- Less than one time per month

13. Please indicate the approximate number of math teachers participating in the PLC team.

- All of the math teachers
- More than half of the math teachers
- Less than half of the math teachers
- Only a few math teachers

14. Did the math PLC team collectively develop learning targets/student objectives?

- Yes
- No
- I don't know

15. Did the math PLC team develop and/or use common assessments (i.e. quizzes, unit tests)?

- Yes
- No
- I don't know

16. Did the math PLC team analyze the student achievement data and develop intervention plans for students who did not reach proficiency?

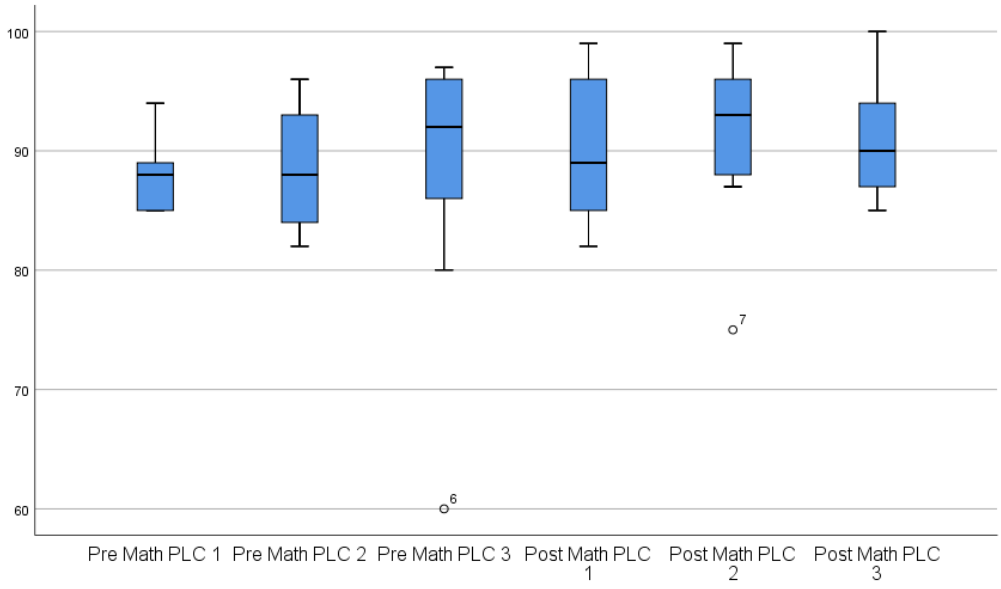
- Yes
- No
- I don't know

17. Did the math PLC team develop enrichment opportunities for students who did reach proficiency?

- Yes
- No
- I don't know

Appendix E

Math boxplot



Appendix F

English boxplot