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**CATHOLIC SCHOOL TEACHERS' PERCEPTIONS OF FACTORS RELATED
TO LOW MATHEMATICS ACHIEVEMENT: A QUALITATIVE CASE STUDY**

by

Andrzej R. Piotrowski

A Dissertation

Submitted to the
Department of Educational Services and Leadership
College of Education
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For the degree of
Doctor of Education
at
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Dissertation Chair: Carol C. Thompson, Ph.D.

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Dedications

I dedicate this dissertation to my wife, Anna. You have been a pillar of strength and words can not describe the gratitude I have towards you. Your guidance and endless support have helped make this dream a reality. I recognize that this could not be possible without your endless love and support for this journey.

I dedicate this dissertation to my two children, Max and Michael. My two sons have both been a part of this journey since their birth. I cherish those memorable moments when you played with your toys next to my desk when I was completing this dissertation. I would look down and see your beautiful smiles looking back at me. In that moment you motivated me to not give up, and I realized I could not finish this program without your love.

I dedicate this dissertation to my Mom and Dad, Anna and Jozef Piotrowski. My parents emigrated to the United States from a small farming village in Northern Poland for a better life for their children. They endured struggles with limited material resources, few friends, and no family support. My parents have taught me valuable skills, and I have gained an appreciation for work ethic, education, and discipline. Their guidance and encouragement during my life has allowed me to succeed in my life. I am so truly thankful to my parents and my brothers, Tom, Al, and Adam for their endless support.

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I would like to thank my dissertation committee for their endless guidance throughout this process. The dissertation committee provided an atmosphere of positive feedback towards the completion of this journey. I want to express my gratitude and appreciation to Dr. Carol C. Thompson, Dr. Jill Ann Perry, and Dr. Eric Milou. A very special thank you to Dr. Carol C. Thompson, who served as my dissertation chair, for her continuous support throughout the dissertation process.

Abstract

Andrzej R. Piotrowski

CATHOLIC SCHOOL TEACHERS' PERCEPTIONS OF FACTORS RELATED TO LOW MATHEMATICS ACHIEVEMENT: A QUALITATIVE CASE STUDY 2017-2018

Carol C. Thompson, Ph.D.
Doctor of Education

This qualitative case study explored Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. The three schools that participated in this study have varying degrees of ethnic diversity and vary in school enrollment. In 2015, all schools in the archdiocese produced standardized test results well above the national average in reading in second through fifth grades. In the same academic year, the gap between the national average and the district's second through fifth grade mathematics scores was significantly narrower. This study identifies the need to understand teachers' views of low achievement in mathematics in the attempt to reform policies to improve mathematics achievement.

Data was collected through school documents, semi-structured open-ended interviews, and observation of teachers in mathematics classrooms. In order to have a consistent focus observing classroom teachers, the researcher used Sawada et al.'s (2000) Reformed Teaching Observation Protocol to collect observational data consisting of a total of 450 minutes of mathematics instruction.

The results of this study identified teacher quality, curricular referencing, and cultural referencing as themes of low achievement. The first theme of teacher quality has

a direct connection to the main research question of this study. The financial stability of a Catholic elementary school has a major link to the curriculum, instruction, and school climate being offered to the school community. Schools with decreased enrollment have been affected by limited operating expenses. Catholic schools with thriving enrollments are more successful in retaining quality teachers due to their prosperous operating budget. The findings of this study have established a connection between mathematics achievement and schools with successful operating budgets and teacher quality.

Curricular referencing arose as a theme based on comments about maintaining the fast pace of the curriculum, completion of math concepts, ineffective math textbooks, and lack of instructional time. The study found a connection between the overall positive student engagement in the classroom observations and the interview data collected from all the participants.

The third theme of cultural referencing emerged based on school demographics, diversity, English Language Learners, lack of home support, and lack of home resources. The study found a connection between the theme of cultural referencing and mathematics achievement in second through fifth grade Catholic elementary school students.

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Chapter 1

Introduction

On December 10, 2015, the No Child Left Behind Act of 2001 was replaced when President Obama signed the Every Student Succeeds Act (ESSA) (U.S. Department of Education, 2015). The primary goal of the ESSA is to guarantee that every child in the United States has an equal opportunity to achieve academically (U.S. Department of Education, 2015). ESSA continues to address the challenges children experienced under NCLB and focuses on key areas of progress made by NCLB (U.S. Department of Education, 2015). Congress had passed NCLB due to alarms that the American educational system was not competitive with other countries (Klein, 2015). The main provision of NCLB was to implement federal accountability for academic success for all learners in order to increase achievement. NCLB targeted mathematics and science achievement by establishing partnerships, wherein elementary schools could participate in programs with scientists, engineers, and mathematicians to develop a rigorous curriculum (U.S. Department of Education, 2015). These mathematics partnerships were designed to develop programs that would increase teachers' mathematics knowledge and skills, develop rigorous mathematics curricula, and integrate technology into the curriculum (U.S. Department of Education, 2015). Federal legislation to fund programs to improve academic achievement, from the Elementary and Secondary Education Act of 1965 to the ESSA today, has existed in the United States for the past 50 years. However, the achievement gap in mathematics still exists and continues to be a major topic of concern for educators and policy makers.

This qualitative case study is concerned with Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. The three schools that participated in this study have varying degrees of ethnic diversity and school enrollment. In 2014, all schools in the archdiocese produced standardized test results well above the national average in reading in second through fifth grades. In the same academic year, the gap between the national average and the district's second through fifth grade mathematics scores was significantly narrower. In the archdiocese, the standardized test result was considerably lower in mathematics compared to standardized scores in reading. This study identifies the need to understand teachers' views of low achievement in mathematics in the attempt to reform policies to improve mathematics achievement.

Average mathematics scores of United States fourth graders increased by 23 points between 1995 and 2011; however, out of the 57 countries participating in the Trends in International Mathematics and Science Study (2015), the United States still ranks behind eight educational systems in average mathematics scores, and there are six additional countries with similar scores (National Center for Educational Statistics, 2015). A current study claims fourth graders in the United States score lower on mathematics assessments compared to children in many Asian countries (Ryoo, Molfese, Heaton, Zhou, Brown, Prokasky, & Davis, 2014). Specifically, several other studies indicate that American children are outperformed in counting, arithmetic, algebra, and geometry by children in China, Japan, and other East Asian countries (Siegler & Mu, 2008; Ginsburg Choi, Lopez, Netley, Chi 1997; Stevenson, Chen, & Lee, 1993).

Stevenson and Stigler (1992) suggest the learning gap between American and Asian students is evident as early as kindergarten and continues through high school.

Under ESSA, there is growing financial support to improve achievement in schools. Title II is a provision in ESSA (2015) that addresses “preparing, training, and recruiting high-quality teachers, principals, or other school leaders” (Pub.L. 114-95 §§ 1177-113). Title II in ESSA (2015) identifies the following major goals:

1. Increase student achievement consistent with the challenging State academic standards.
2. Improve the quality and effectiveness of teachers, principals, and other school leaders.
3. Increase the number of teachers, principals, and other school leaders who are effective in improving student academic achievement in schools
4. Provide low-income and minority students greater access to effective teachers, principals, and other school leaders. (Pub.L. 114-95 § 2001)

In addition, Title II of ESSA (2015) funds nonprofit organizations such as Catholic schools “to support the implementation, replication, or expansion of effective science, technology, engineering, and mathematics professional development programs in schools across the State through collaboration with school administrators, principals, and STEM educators” (Pub.L. 114-95 § 2245). Price and Ball (1997) note that, while legislation tends to encourage extensive reforms in the teaching of mathematics, current practices have remained unchanged in many schools across the country.

There are various institutions throughout the country that support ESSA’s (2015) goal to drive reform in mathematics education. The National Council of Teachers of

Mathematics (NCTM) is one of those organizations that support teaching and learning of mathematics (NCTM, 2016). In leading their reform for the highest quality teaching, they recommend the following principles for successful mathematics instruction: high mathematics expectations, strong support for all students, teachers who understand what students know and need to learn, and assessments that support learning and furnish useful information to both teachers and learners (NCTM, 2000).

While NCTM (2016) provides principles to reform mathematics education, it is essential to understand the factors related to low achievement. One factor, Sato, Rabinowitz, Gallagher, and Huang (2010) suggest, is that the language used in mathematics test items may interfere with students' ability to demonstrate understanding of content, especially when students are struggling with English (U.S. Department of Education, 2012). In a U.S. Department of Education (2012) study, students who were struggling with English performed six percentage points better on math assessments when a linguistic modification was provided. A linguistic modification is a research-based process for altering the language on a test to explain a question without significantly changing what is being assessed (Abedi, 2008; Abedi et al. 2005; Sato 2008).

Basic mathematics fluency is another factor related to low achievement in mathematics. In 2005, VanDerHeyden and Burns conducted a study to evaluate a school in which students in Grades 3 through 5 scored low in terms of basic mathematics fluency. Their study reported that using curriculum-based assessment and measurement data led to positive growth and significant improvement on the school's scores on a standardized test (VanDerHeyden & Burns, 2005).

Demographics and school climate are additional factors related to low mathematics achievement. Coleman's (1966) findings indicate the strongest predictors of student achievement are student and family characteristics. In an effort to confirm Coleman's findings, Bodovski, Nahum-Shani, and Walsh (2013) conducted a study that found that mathematics achievement varied from school to school, but that improvement depended more on school climate than on the demographics of a given school.

Purpose of the Study

The purpose of this qualitative case study is to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. The three schools participating in this study have varying degrees of ethnic diversity and vary in school enrollment. In 2014, all schools in the archdiocese produced standardized test results well above the national average in reading in second through fifth grades (see Appendix A for district mean scaled scores versus national mean scaled scores in reading). In the same academic year, the gap between the national average and the district's second through fifth grade mathematics scores was significantly narrower (see Appendix B for district mean scaled scores versus national mean scaled scores in mathematics). This case study identifies the need to understand teachers' views of low achievement in mathematics in the attempt to reform policies to improve mathematics achievement.

Research Questions

1. What perceptions do mathematics teachers in Grades 2 -5 hold about low mathematics achievement of students at X, Y, and Z's schools?

2. What perceptions do mathematics teachers hold about improving mathematics achievement in Grades 2-5 at X, Y, and Z's schools?
3. How do mathematics teachers describe their experiences working with students in Grades 2-5?
4. What teaching strategies do Grades 2-5 mathematics teachers describe as potentially improving the low mathematics achievement of students at X, Y, and Z's schools?
5. How do mathematics teachers describe their own teaching practice and philosophy regarding addressing the low achievement of mathematics?
6. What are the roles of district and elementary administrators in improving mathematics achievement?

Conceptual Framework

The conceptual framework will provide rationality to this study by connecting the research problem, purpose of the study, literature, and theory. Vygotsky's social constructivist theory provided the theoretical foundation for understanding student achievement in mathematics in this study. The factors related to low achievement guided the overall conceptual framework with the theme of understanding how children learn mathematics. Steele's (2001) research on mathematics achievement identifies the kinds of communication that are valuable in constructing mathematical understanding; within a sociocultural viewpoint, understanding of mathematical practices takes place when students "share their reasoning about ideas with others and listen to others share their thinking" (p. 404). Steele's point originates from Vygotsky's (1978) zone of proximal development, which is the space between a child's current knowledge and their potential

understanding, in which learning can occur. Vygotsky asserted that math and writing were unnatural concepts that were difficult for children to understand (Crain, 1992), but a knowledgeable person could enhance a child's intellectual learning as the child enters the zone of proximal development (Steele, 2001). Bruner (1986) put forth the view that a teacher can develop a child's learning by providing appropriate activities that build a child's knowledge base. Thus, the conceptual framework for this study expands on Vygotsky (1978) and Steele's (2001) claim that a knowledgeable person could develop a child's intellectual ability in mathematics.

Teachers' perceptions of mathematics achievement is another critical component to this conceptual framework. The fundamental question of this study attempts to answer the nature of the perceptions of mathematics teachers in Grades 2 -5 about low student achievement in mathematics. Wilkins (2008) indicates that teachers' practices are influenced by their beliefs regarding mathematics teaching and learning. Ball (1991) and Hill et al. (2008) concur that teachers' beliefs and instructional practices may affect student mathematics achievement. Research validates the view that a teacher's mathematical disposition can forecast a student's mathematical achievement (Campbell et al., 2014).

McIlrath and Huitt's (1995) teaching-learning process model provides a deep conceptual understanding of key characteristics related to the teaching and learning process. This model serves as a funnel to understand low student achievement in this study. Figure 1 displays the relationship of student achievement to community, family, school policies, and state policies (McIlrath & Huitt, 1995). McIlrath and Huitt's (1995) teaching-learning model identifies community, family, school policies, and state policies

as the main properties of student achievement. The teaching and learning process builds off of those characteristics into a narrower understanding of teacher characteristics, student characteristics, teacher behavior, and student behavior, all of which directly relate to student achievement (McIlrath & Huitt, 1995).

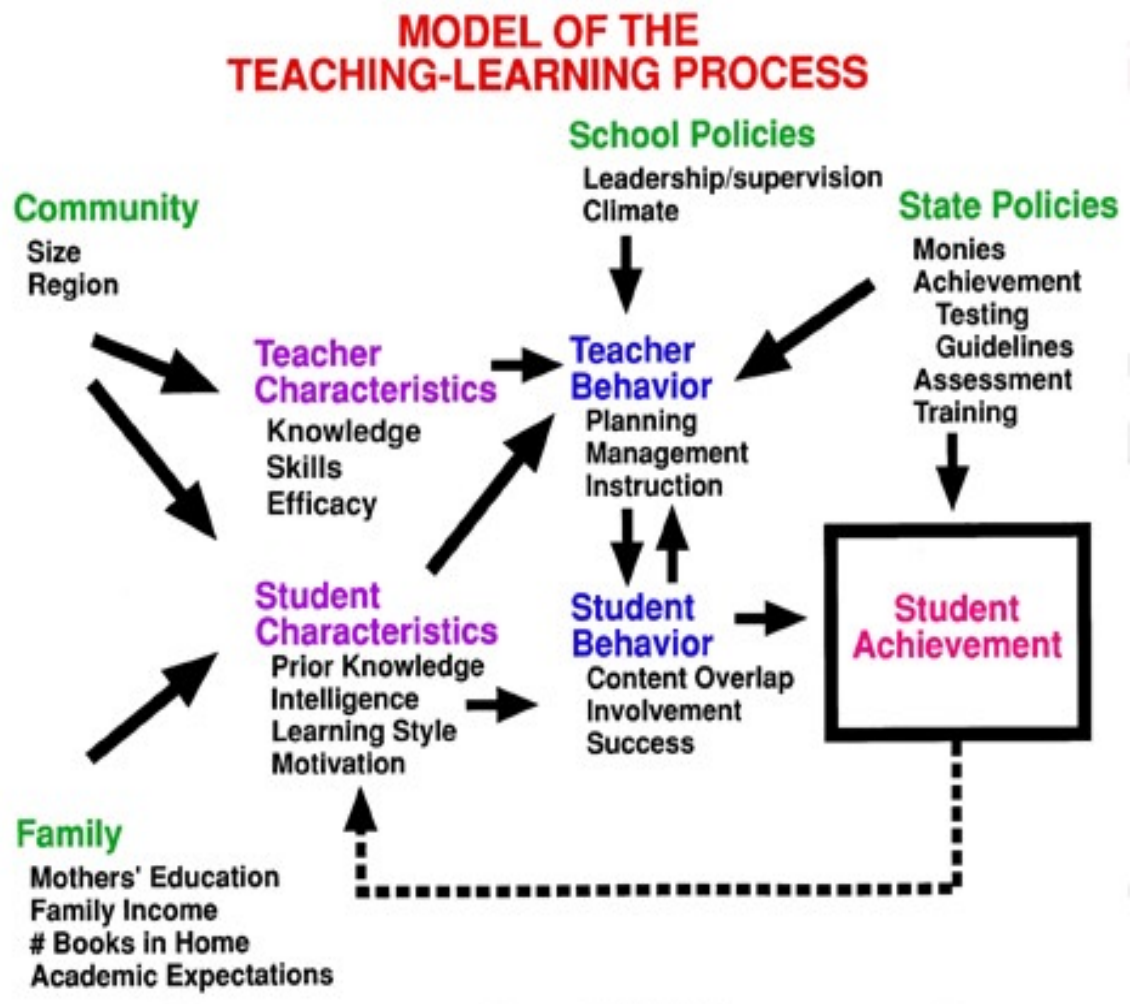


Figure 1. McIlrath and Huitt's (1995) Teaching-Learning Process Model

McIlrath and Huitt's (1995) teaching-learning process model provides extensive conceptual understanding of student achievement in a way that directly relates to this case study and is positioned to understand the factors mathematics teachers in Grades 2-5 characterize as related to the low mathematics achievement of students in three Catholic Elementary Schools.

State Policies is a category McIlrath and Huitt's (1995) teaching-learning process model identifies as affecting student achievement. Monies, achievement, testing guidelines, assessment, and training are categorized under state policies that affect student achievement. Teacher behavior is linked to state policies by the sub-categories of planning, management, and instruction (McIlrath and Huitt, 1995). One sub-category that is strongly tied to achievement in Catholic elementary schools is monies. The financial stability of a Catholic elementary school plays a major role in the curriculum, instruction, and school climate being offered to the student population. James (2007) indicates sweeping changes to funding and governance of Catholic elementary schools have been initiated since the 1950s and that there is a change to Catholicism in the United States that has directly affected systems of financial support and governance configurations in Catholic schools. Over the decades, the lack of school monies has changed classroom sizes and instructional staff and caused Catholic schools to implement new financial structures (James, 2007). Even though McIlrath and Huitt's (1995) teaching-learning process model does not address specifically a faith-based elementary school, it provides insight into how achievement is impacted by the sub-category of monies.

School policies also play an important role, and McIlrath and Huitt's (1995) teaching-learning process model discusses leadership, supervision, and climate as sub-

categories of school policy that affect student achievement. Research has demonstrated that school climate is a factor related to low mathematics achievement. Bodovski, Nahum-Shani, and Walsh (2013) conducted a study which found that mathematics achievement varied from school to school, but that improvement depended more on school climate than any other factor. McIlrath and Huitt's (1995) teaching-learning process model shows that teacher behavior is also linked to school policies.

Community is another main category McIlrath and Huitt's (1995) teaching-learning process model discusses, and region is a sub-category of community that has implications for student achievement. The community of the three schools in this study is in the Eastern United States, and these three schools have a larger Hispanic population in comparison to the peer schools in the archdiocese. Two of the three schools have three times the number of Hispanic students enrolled at their institutions as compared to the archdiocese average. The U.S. Department of Education (2000) indicates that enrollment of Hispanic students in elementary schools is currently 15% and by 2025 the number will increase to 25%. The category of student characteristics, which encompasses prior knowledge, intelligence, learning style, and motivation is linked to community. Garcia (2001) asserts that, "an optimal learning community for Hispanic student populations recognizes that academic learning has its roots in both out-of-school and in-school processes" (p. 239). McIlrath and Huitt's (1995) teaching-learning process model also connects teacher characteristics, including knowledge, skills, and efficacy, to the community.

Additionally, in the context of community, McIlrath and Huitt's (1995) teaching-learning process model indicates that size plays a part in student achievement. The

research of Bracey (1995) and Fowler(1995) indicates school size impacts student achievement. The three Catholic schools participating in this study range in enrollment from roughly 230 students to 590 students. Catholic schools admissions offices make every attempt to fill every seat in their classrooms in order to increase school monies to create additional programs. Thus, it is common practice for classes to have 30 students. Even though many believe students in smaller classes will receive better instruction, Catholic school administrators believe the financial gain from maximizing enrollment outweighs the benefits of smaller class sizes. Adler, Ball, Krainer, Lin, and Novotna, J. (2005) indicate class sizes vary in the United States, with urban schools having high teacher-student ratios compared to suburban schools with lower class sizes. When mathematics classrooms have large enrollment, it increases the overall academic diversity in the class, and the result is a challenge to provide quality instruction (Adler et al., 2005).

Family is an additional category McIlrath and Huitt's (1995) teaching-learning process model discusses. Mothers' education, family income, number of books in the home, and academic expectations are addressed as sub-categories of family that affect student achievement. These sub-categories are also related to student characteristics, including prior knowledge, intelligence, learning style, and motivation. One factor, research suggests, is that the language used in mathematics test items may interfere with students' ability to demonstrate understanding of content, especially when students are struggling with English (U.S. Department of Education, 2012). A United States Department of Education (2012) study found students who were struggling with English performed six percentage points better on math assessments when a linguistic

modification was provided. For students who are English language learners or whose families do not speak English in the home, these linguistic modifications can impact student achievement.

McIlrath and Huitt's (1995) teaching-learning process model and Vygotsky's social constructivist theory provide a deep conceptual understanding of key characteristics related to the teaching and learning process through theory and practice. McIlrath and Huitt's (1995) teaching-learning model has guided in the organization of the literature into the following themes: a) the Catholic schooling systems in the United States, (b) state policies, (c) school policies on leadership, supervision, and climate, (d) school policies on planning, management, and instruction, (e) community, and (f) family. Figure 2 displays major themes developed for this study.

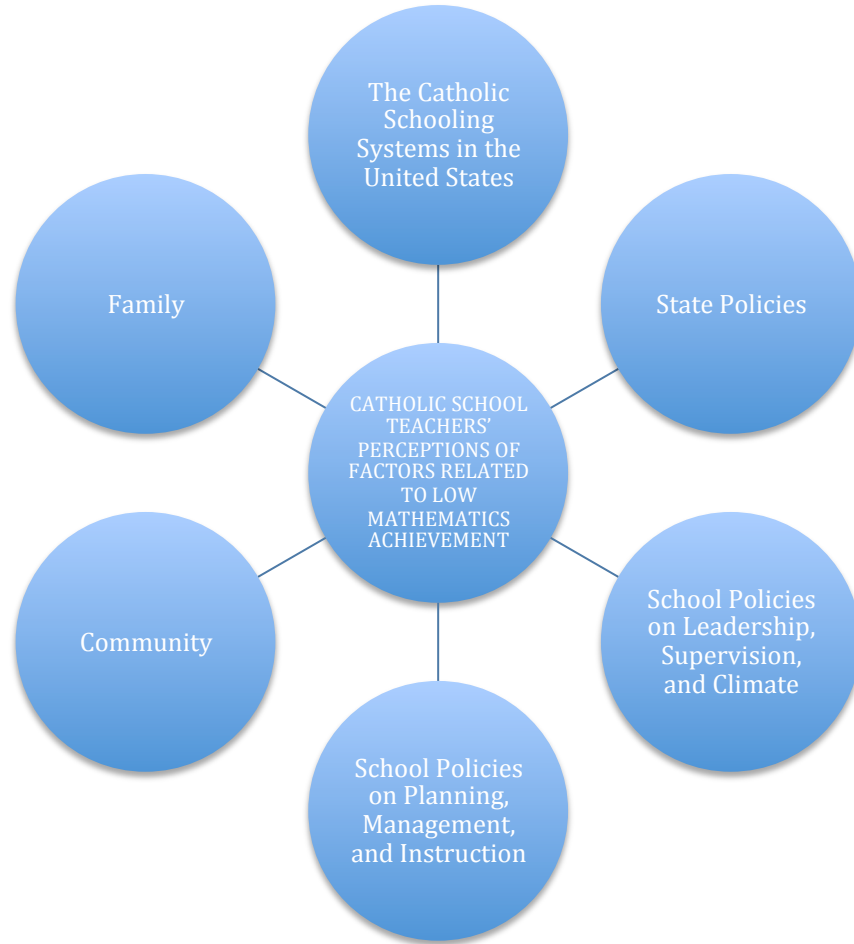


Figure 2. Outline of major themes related to mathematics achievement.

McIlrath and Huitt's (1995) teaching-learning model and the literature concur that there are a myriad of variables that affect student achievement. This qualitative case study identifies the need to understand teachers' views of low achievement in mathematics in the attempt to reform policies to improve mathematics achievement at three Catholic elementary schools in the Eastern United States. A review of the literature has revealed that there is insufficient research on mathematics achievement in Catholic

elementary schools. Prior research is primarily based on achievement in various public elementary schools, with current research into mathematics achievement in Catholic schools focusing on high schools. This study attempts to make connections from the literature regarding mathematics achievement, but there is a major gap in the research on achievement in mathematics in Catholic elementary schools. This research will potentially fill that gap.

Method

The purpose of this qualitative case study is to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. Ten second through fifth grade mathematics teachers participated in this study. In this qualitative study, the researcher collected school documents, conducted semi-structured open-ended interviews, and observed teachers in mathematics classrooms. Multiple sources of data were used in this case study in order to strengthen evidence collection related to mathematics achievement (Yin, 2009). Face-to-face in-person interviews were conducted to ask open-ended questions to prompt the views of the participants (Creswell, 2009). The researcher used a semi-structured interview process to stay open to the participants' experience so the participants would share freely (Adams, 2010). The researcher observed each teacher participating in this study once for a total of 10 classroom lessons. Observational data collection consisted of a total of 450 minutes of mathematics instruction. During the classroom observations, the researcher asked open-ended general questions of the participants to allow them to be open with their interpretations (Creswell, 2009). Documents collected for this case study were used to identify the meaning in

objects and to understand the factors related to low achievement of students in mathematics (Woodward, 2007). A database was used to store all archival data and organizational documents. In addition, any three-dimensional artifacts collected were photographed and coded into the database (Onwuegbuzie, Leech & Collins, 2010).

Initial coding was used to identify emerging patterns (Saldana, 2009). This strategy requires the researcher to stay open to all possible directions indicated by the data (Charmaz, 2006, p.46). This coding technique aligned with the purpose of this study due to its intention “as a starting point to provide the researcher with analytic leads for further exploration” (Glaser, 1978, p. 56). Axial coding was selected as a second cycle coding method because it is an extension of the analytic work from initial coding (Saldana, 2009). After initial coding is completed in first cycle coding, axial coding’s goal is to search for dominant themes emerging from data collection. Boeije (2010) reiterates the goal of axial coding is to “determine which codes are dominant and which are less dominant and to reorganize the data set” into themes (p. 109).

A case study research design was selected for this study to investigate the phenomenon of low achievement of students in mathematics (Rossman & Rallis, 2012). A case study research design allowed for comprehensive investigations of teachers’ views related to low achievement in mathematics at three organizations (Adelman, Jenkins, & Kemmis, 1983). Patton (2002) indicates using a case study research design yields detailed illustrations of what is happening at the institution. The case study design allows the researcher to discover “meaningful characteristics of real-life events” relative to school performance in mathematics (Yin, 2009, p. 4).

Current studies of international mathematics programs support the claim that low

achievement in mathematics in elementary schools in the United States is a major concern for the American educational system. Federally funded programs such as the No Child Left Behind Act of 2001 and Every Student Succeeds Act (ESSA) aim to improve academic achievement; however, the achievement gap in mathematics still exists and continues to be a major topic of concern for educators and policy makers (U.S. Department of Education, 2015). This research will aid in closing the achievement gap among elementary school students in mathematics in comparison to the other countries of the world.

Significance of the Study

Catholic elementary schools in the United States are closing their doors at an alarming rate. In 1965 in the United States, 13,500 Catholic schools were operating with an enrollment of 5.6 million students (McDonald & Schultz, 2013). Unfortunately, 48 years later in 2013, there were only 6,685 Catholic schools with an enrollment of 2 million students (McDonald & Schultz, 2013). Goldschmidt and Walsh (2013) indicate that Catholic elementary education is witnessing a substantial “decline” (p. 113).

Educational leaders in Catholic elementary schools in the United States are investigating a variety of methods to create a successful future for their Catholic schools (Goldschmidt & Walsh, 2013). In an effort to sustain their schools, Catholic school leaders and teachers are reflecting on their educational programs. This study attempts to provide a plan for school leaders and teachers to increase student achievement in mathematics. The goal of the study is to discover which factors mathematics teachers in Grades 2-5 characterize as related to the low achievement of students in mathematics.

Currently, the three schools participating in this study have reading scores well above the national average in second through fifth grades. Unfortunately, similar to all the schools in the archdiocese, their standardized scores in mathematics are below the national mean for National Blue Ribbon eligibility (see Appendix C for Scantron Performance Series reading and mathematics national mean scale score at 85th percentile for National Blue Ribbon eligibility). Schools that attain National Blue Ribbon eligibility through their standardized scores have the potential to have significant increases in school enrollment, funding, and climate (Webb, 1993). Presently, Catholic schools in the district are not ranked on academic performance but are viewed highly if they have received the National Blue Ribbon School Award. The National Blue Ribbon Schools program recognizes public and private schools on their academic excellence (U.S. Department of Education, 2016). In order to become eligible to apply for the National Blue Ribbon Schools Program, a school must score in the top 15% nationally on a norm referenced standardized test. Catholic elementary schools that receive the National Blue Ribbon Award are honored each year at a ceremony in Washington, DC. Research indicates that Catholic schools receiving the National Blue Ribbon School Awards grow student enrollment by 18%, witness an increase in annual funding, have a positive school climate, and see a 57% increase in publicity to the school (Webb, 1993). This study is significant because it can assist schools in the district in implementing strategies to improve mathematics achievement, which could result in eligibility to apply for the National Blue Ribbon Program. Thus, increasing student achievement in mathematics would have a positive effect on the longevity of Catholic schools.

Limitations of Study

There are several limitations to this study. First, only three elementary schools in one school district participated in this study. Even though the three schools are ethnically diverse elementary schools, they are situated in the same county and are fourteen miles apart from each other.

Second, the schools participating in this study administer Scantron Performance Series to their students in Grades 2-8. This standardized test is a computer-adaptive assessment and has only been administered to the schools for the past three years. Therefore, only three years of similar standardized test data is available for this study. In addition, this is the first year the local public school system has administered the standardized assessment, Partnership for Assessment of Readiness for College and Careers (PARCC). Therefore, there is only one year of data available on this assessment, since this is their baseline assessment. In addition, it will be difficult to make connections among standardized test scores since the public and private schools administer different standardized assessments. Future research in this area may include evaluating public and private standardized assessments. In addition, a future study could evaluate the effectiveness of and make comparisons between public and private elementary mathematics programs.

Third, there is limited research on the effects of attending Catholic Elementary Schools, with the focus in the literature being on public elementary schools and Catholic high schools (Reardon, Cheadle, & Robinson, 2008). This study attempts to make connections from the literature regarding mathematics achievement, but there is a major gap in the research on achievement in mathematics in Catholic elementary schools. This

research will potentially fill a gap in evaluating mathematics achievement in Catholic elementary schools.

Definition of Terms

The following vocabulary is relevant to this study. The researcher has defined these terms to establish a standardization of terms.

Archdiocese. District under the care of an arch-bishop in the Catholic Church.

Cannon law. A code of ecclesiastical laws governing the Catholic Church (United States Conference of Catholic Bishops, 2016).

Cost-based tuition. Redirects the parish subsidy to a third party committee that determines the financial need of a family and in return provides a one time financial discount on the yearly school tuition (James, 2007).

Diocese. District under the pastoral care of a bishop in the Catholic Church.

Every Student Succeeds Act (ESSA). On December 10, 2015, President Obama signed this act to guarantee that every child in the United States has an equal opportunity to achieve academically (U. S. Department of Education, 2015).

National Blue Ribbon Program. The National Blue Ribbon Eligibility program recognizes public and private schools on their academic excellence (U.S. Department of Education, 2016).

Negotiated tuition. Provides financial assistance to families in need, but the amount is negotiated with a principal and/or pastor (James, 2007).

No Child Left Behind Act (NCLB). In 2002, Congress passed this act requiring public schools receiving federal funds to administer standardized tests to all students (U. S. Department of Education, 2015).

Pastor. The canonical leader of a single Catholic church.

Parish Catholic elementary school. The dominant model of Catholic elementary school education where a school is supported by one parish.

Partnership for Assessment of Readiness for College and Careers (PARCC). PARCC is a standardized assessment developed by states to ensure students are prepared for college and career (Partnership for Assessment of Readiness for College and Careers, 2016).

Regional Catholic elementary school. A Catholic elementary school supported by multiple Catholic churches.

Inter-Parochial Catholic elementary school. A Catholic elementary school sponsored by multiple Catholic churches.

Scantron performance series. Computer adaptive standardized test administered to all students in the archdiocese.

Organization of the Study

Chapter 1 provided an overview of the study, including the context for the study, the conceptual framework, significance of the study, and limitations. Chapter 2 will provide a discussion of mathematics achievement through a review of related literature. The literature review will begin with an introduction to the history and structure of Catholic elementary schools in the United States and will go on to discuss mathematics achievement as it relates to several themes, such as a) the Catholic schooling systems in the United States, (b) state policies, (c) school policies on leadership, supervision, and climate, (d) school policies on planning, management, and instruction, (e) community, and (f) family. Chapter 3 will include a description of the research methods, with a

detailed overview of the sampling, setting, participants, and data collection, and will conclude with a summary of this study. Chapter 4 will discuss teacher quality, curricular referencing, and cultural referencing as the three major themes emerged of this study related to low mathematics achievement in second through fifth grades. Chapter 5 will examine the findings in terms of their implications for family, community, leadership, school policy, and state policy.

Summary

This qualitative case study identifies the need to understand teachers' views of low achievement in mathematics in the attempt to reform policies to improve mathematics achievement. This study addresses the reasons why teachers in three Catholic schools believe their students are not performing on standardized tests. The researcher's intention for this qualitative case study was to aid in closing the achievement gap among elementary school students in mathematics.

Chapter 2

Literature Review

The purpose of this qualitative case study is to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. Student achievement in mathematics has been researched significantly; however, a gap in mathematics achievement still exists and it is necessary to continue research on mathematics achievement. Although there has been research on mathematics achievement in elementary schools, there is limited research on the effects of attending Catholic Elementary Schools (Reardon, Cheadle, & Robinson, 2008). While average mathematics scores of United States fourth graders increased by 23 points between 1995 and 2011, average mathematics scores in the United States still rank behind eight educational systems, and there are six additional countries with similar scores (National Center for Educational Statistics, 2015). The current literature is primarily based on student achievement in various public elementary schools, with current research into mathematics achievement in Catholic schools focusing on high schools. As there has been relatively little research on this topic as it relates to Catholic elementary schools, this study will potentially fill a gap in evaluating mathematics achievement. Therefore, this chapter will focus on the following key areas: (a) the Catholic schooling systems in the United States, (b) state policies, (c) school policies on leadership, supervision, and climate, (d) school policies on planning, management, and instruction, (e) community, and (f) family.

The Catholic Schooling Systems in the United States

This section discusses the historical overview of Catholic education in the United States, then focuses on enrollment, finances, and school governance. The purpose of this qualitative case study is to understand the factors characterized by mathematics teachers in grades 2 through 5 as related to the low achievement of students in mathematics at three Catholic elementary schools in the Eastern United States. Although there has been research on mathematics achievement in elementary schools, there is limited research on the effects of attending Catholic Elementary Schools (Reardon, Cheadle, & Robinson, 2008). It is essential to understand the historical and current state of the Catholic educational system in the United States to provide a deeper understanding of the purpose and significance of this research.

In Philadelphia in the year 1783, Saint Mary's parish opened the doors of the first Catholic parish school (Walch, 1996). Catholic parish elementary schools are financially supported by one parish church. This is the foremost model of Catholic elementary education in the United States, with 77% of Catholic elementary schools employing this governance structure (James, 2007). The Catholic educational system in the United States has always been directly overseen by the United States Conference of Catholic Bishops (2017), which includes in its mission the following six key elements:

- (1) Encouraging and supporting efforts in Catholic education by fostering the distribution and implementation of both universal Church documents on education as well as related documents developed by the bishops of the United States.
- (2) Supporting educational efforts in the Church in the United States by

developing policies, guidelines, and resources for use by bishops in their dioceses.

(3) Providing consultation on educational issues when requested, including advising and representing the bishops.

(4) Collaborating with the Committee on Evangelization and Catechesis regarding evangelization and catechesis in Catholic schools and universities;

(5) Providing support and advocacy in federal public policy on behalf of Catholic educational institutions from pre-school through high school levels;

(6) Bringing to Catholic education the perspectives and concerns of other cultures and people with special pastoral needs through collaboration with other committees/offices.

The United States Conference of Catholic Bishops (2017) is guided by these key mandates in furthering the Catholic educational atmosphere in the United States.

By the late 19th century, the Catholic Church was surrounded by anti-Catholic sentiment, and in response states passed the Blaine Amendment, which forbade parochial schools from receiving tax money (Green, 2010). In 1884, due to the anti-Catholic culture in the United States, the American Catholic Bishops wrote a Pastoral Letter from the Third Plenary Council of Baltimore that discussed a goal for all Catholic parishes to have parish schools (James, 2007, p. 287). The council commanded each pastor to build a parochial school near their church and mandate the attendance of Catholic students (Gleason, Borders, Pilarczyk, & McManus, 1985). The letter expressed the importance of a Catholic education for each Catholic child:

There are still thousands of Catholic children in the United States deprived of the benefit of a Catholic school. Pastors and parents should not rest till this defect be

remedied. No parish is complete till it has schools adequate to the needs of its children, and the pastor and people of such a parish should feel that they have not accomplished their entire duty until the want is supplied. (United States Conference of Catholic Bishops, 1884, para.33)

After this Pastoral Letter, a significant increase in Catholic school enrollment took place in the United States. Table 1 displays an increase of five million students enrolled in kindergarten to twelfth grade Catholic schools between 1880 and 1965. Table 2 shows similar increases in enrollment as well as an increase in the number of Catholic schools from 1920 to 1960, with a 2.5 million increase in enrollment and 4,000 additional schools operating in 1960.

Table 1

Aggregate K-12 Catholic School Enrollment (in Millions) 1880 – 2005

| 1880 | 1900 | 1920 | 1940 | 1950 | 1960 | 1965 | 1970 | 1980 | 1990 | 2000 | 2005 |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.405 | 0.854 | 1.862 | 2.581 | 3.080 | 5.252 | 5.582 | 4.367 | 3.139 | 2.589 | 2.653 | 2.421 |

(Greene & O’Keefe, 2001; McDonald, 2005)

Table 2

Catholic Elementary School Enrollment (in Millions) and Number of Schools 1920-2005

| | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2005 |
|------------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|
| Enrollment | 1.796 | 2.223 | 2.035 | 2.561 | 4.373 | 3.359 | 2.293 | 1.983 | 2.013 | 1.780 |
| Schools | 6,551 | 7,923 | 7,944 | 8,589 | 10,501 | 9,366 | 8,100 | 7,395 | 6,923 | 6,574 |

(McDonald, 2005)

After 1965, Catholic schools in the United States experienced a steep decline in enrollment that resulted in school closures. James (2007) specifies “changing demography, value issues, economic issues, and leadership issues” as reasons for declining school enrollment (p. 288). Table 1 indicates only 2.4 million students were enrolled in kindergarten to twelfth grade Catholic schools in 2005. Table 2 shows similar decreases in enrollment and schools, with only 1.7 million students enrolled and only 6,000 schools operating in 2005. James (2007) noted sweeping changes to funding and governance of Catholic elementary schools have been initiated since the 1950s along with changes in Catholicism in the United States. These changes have led to the aforementioned school closures and dramatic decrease in enrollment (James, 2007).

The financial stability of a Catholic elementary school plays a major role in the curriculum, instruction, and school climate being offered to the student population. In addition to decreased enrollment, in the 1960s Catholic schools were experiencing a decline in religious serving at their institutions (James, 2007). Parish schools replaced religious with lay faculty, which resulted in a considerable increase in operating expenses, since lay faculty salaries were much higher than religious salaries (James,

2007). Table 3 shows an 87% decline in religious in Catholic schools from 1920 to 2005, with religious making up only 5% of employees in 2005.

Table 3

Number and Percentage of Religious in Catholic Schools

| | Number | Percentage |
|------|---------|------------|
| 1920 | 45,563 | 92.0 |
| 1930 | 65,601 | 90.4 |
| 1940 | 73,960 | 91.2 |
| 1950 | 84,925 | 90.1 |
| 1960 | 112,029 | 73.8 |
| 1970 | 80,615 | 48.4 |
| 1980 | 42,732 | 29.0 |
| 1990 | 20,020 | 14.6 |
| 2000 | 11,011 | 7.0 |
| 2005 | 7,990 | 5.0 |

Due to the increase in salaries for staff and decrease in student enrollment, schools have had increasingly limited financial resources for their student population. If there are inadequate school monies, it directly affects the services the school can provide. Over time, the lack of school monies has changed classroom sizes and instructional staff (James, 2007). In order to combat the lack of funding, Catholic schools have

implemented new tuition structures such as cost-based and negotiated tuition (James, 2007). These financial structures are unique to Catholic educational systems and provide insight into school governance as it relates to school monies. Cost-based tuition redirects the parish subsidy to a third party committee that determines the financial need of a family and in return provides a one-time discount on the yearly school tuition (James, 2007). Similar to cost-based tuition, negotiated tuition provides financial support to families in need, but the amount is negotiated with a principal and/or pastor. These two cost structures are designed to increase enrollment by providing financial assistance to families who otherwise would not have the means to send their children to a Catholic elementary school. The goal of these models is to keep schools operating at full capacity. For example, each grade level class would have 30 students enrolled, and a kindergarten through eighth grade school at full enrollment would be operating with 270 students.

An additional tuition model, called the stewardship model, is one in which the parish pays the entire cost of student tuition (James, 2007). Families in the parish are expected to give a tax-deductible donation during Sunday church services to cover 100% of the school expenses (James, 2007). Only 3% of Catholic parishes across the country utilize the stewardship tuition model (Gelo & Meitler, 2003).

The percentage of a Catholic school's funding provided by tuition is dependent on the governance model of the school. There are multiple governance models that exist in Catholic elementary schools in the United States, the most common being the parish Catholic elementary school, which represents 77% of Catholic schools in the United States. A traditional parish Catholic elementary school is financially supported by one parish church. A parish school is legally, under civil and canonical laws, under the parish

(Goldschmidt & Walsh, 2013). In Canon Law, the pastor of the church is the ecclesiastical authority over the church and the parish school. The pastor makes the final decision on all policies related to the operation and governance of the school. Each parish school is required to have a school advisory board that meets monthly and establishes and reviews school policy. However, this board only makes recommendations to the principal and pastor, who in turn are the final decision makers. A school's advisory board operates in accordance with the policies and regulations established by the diocese (if the district is under the care of a bishop) or archdiocese (if the district is under the care of a cardinal or archbishop). The board is tasked with various governance duties delegated by the pastor, unless they are specifically delegated to the pastor by Canon Law (Haney, O'Brien, & Sheehan, 2009). In the traditional parish elementary school model, less than 25% of the school's income comes from the church and a little more than 60% comes from tuition and fees (Bimonte, 2004). The school community is responsible for fundraising to generate the difference of income which usually accounts for 15% of the overall school income.

Another governance model is the inter-parochial Catholic elementary school, sometimes referred to as a regional Catholic elementary school. An inter-parochial elementary school is supported by multiple Catholic churches that are close in proximity. The inter-parochial governance model is used in 12.8% of Catholic elementary schools in the United States. One of the pastors from the multiple churches oversees the day-to-day operations, while the other pastors are *ex officio* members of the school board (James, 2007). In 1967, this governance model only accounted for 1% of Catholic schools in the United States, and 46 years later it represents 12% of Catholic elementary schools

(Goldschmidt & Walsh, 2013). The school board in an inter-parochial model has more power than an advisory board because it has authority over crucial areas of the school, such as policy, budget, strategic planning, and evaluation of leadership (James, 2007). Goldschmidt and Walsh (2013) explained inter-parochial schools are designed to strengthen enrollment and financial support while pulling from multiple parishes. The financial structure is similar to the traditional parish elementary school model, with less than 25% of the school's income coming from the church and a little more than 60% coming from tuition and fees (Bimonte, 2004). The school community is responsible for fundraising to generate the difference of income which usually accounts for 15% of the overall school income.

Another governance model, used by 5.1% of Catholic elementary schools in the United States, is the diocesan elementary school governance model (McDonald, 2005). In this model, the superintendent of schools has direct oversight, and the pastor is completely removed, with overall governance and funding coming from the diocese (James, 2007).

Various governance models exist in Catholic elementary schools, and this discussion of governance models provides perspectives about the schools that participated in this study. Two of the three schools that participated in this study are parish schools, and the third school is an inter-parochial elementary school financially supported by four parishes. All three of these Catholic elementary schools are located in the Eastern United States. The archdiocese spans two states and six counties, and has 59 elementary schools, 15 independent governing elementary schools, and 21 high schools. The three schools that participated in this study are situated in the same county and are 14

miles apart from each other. The elementary schools have varying degrees of ethnic diversity. The ethnic demographic of students in the archdiocese is 6% Asian, 12% Black, 11% Hispanic, and 69% White. The three schools in this study are accredited by the Southern Association of Colleges and Schools Council on Accreditation and School Improvements, which is a division of AdvancEd. This case study aims to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States.

State Policies

The purpose of this section is to discuss the literature about state policies and their relationship to student achievement. McIlrath and Huitt (1995) and The National Council of Teachers of Mathematics (2000) both discuss the impact of state policies on student achievement. In their teaching-learning model, McIlrath and Huitt (1995) classify state policies related to student achievement into the categories of monies and assessment. Even though McIlrath and Huitt's (1995) teaching-learning process model and the NCTM (2000) do not specifically address a faith-based elementary school, they provide insight into factors that influence student achievement in any elementary school.

One of the primary ways state policies impact schools is through assessment. The archdiocesan schools where this study was conducted outline in their policy manual the following statement on assessment in their schools:

The Archdiocese Catholic schools shall implement Archdiocesan assessment standards to regularly assess school excellence through self evaluation, analysis of outcome data, Archdiocesan school visits and other strategies. These assessments

shall focus on the analysis of multiple standard-based measures, including reviews of faculty qualifications, instructional effectiveness, leadership, student performance and growth, recognition and awards, accreditation and other relevant reports.

McIlrath and Huitt's (1995) teaching-learning model and the National Council of Teachers of Mathematics (NCTM) are aligned with best practices for implementing assessments that support learning. The archdiocese assessment policies are aligned with the National Council of Teachers of Mathematics (NCTM) (2000) recommendations for successful mathematics instruction: high mathematics expectations, strong support for all students, teachers who understand what students know and need to learn, and assessments that support learning and furnish useful information to both teachers and learners (NCTM, 2000). The National Council of Teachers of Mathematics (2000) suggest when a teacher understands what students know and need to learn that students will encounter positive mathematics instruction.

The U. S. Department of Education (2012) Institute of Education Sciences suggests the language used in mathematics assessments may interfere with students' ability to demonstrate understanding of content, especially when they are struggling with English (U.S. Department of Education, 2012). A United States Department of Education (2012) study found students who were struggling with English performed six percentage points better on math assessments when a linguistic modification was provided. A linguistic modification is a research-based process for altering the language on a test to explain a question without significantly changing what is being assessed (Abedi, 2008; Abedi et al., 2005; Sato 2008). Basic mathematics fluency is another factor related to low

achievement in mathematics. For example, VanDerHeyden and Burns (2005) evaluation of a school in which students in Grades 3 through 5 scored low in terms of basic mathematics fluency. Their study indicated that using curriculum-based assessment and measurement data led to positive growth and significant improvement on the school's standardized test scores (VanDerHeyden & Burns, 2005).

Another way state policies impact student achievement is through school monies. In the traditional parish elementary school model, less than 25% of the school's income comes from the church and a little more than 60% comes from tuition and fees (Bimonte, 2004). The school community is responsible for fundraising to generate the difference of income which usually accounts for 15% of the overall school income. The financial stability of a Catholic elementary school plays a major role in the curriculum, instruction, and school climate being offered to the student population. School monies play a major role in providing quality, knowledgeable instructors and assessments aligned to the curricular standards designed to increase academic achievement. In a study of the Milwaukee Parental Choice Program, a school voucher program funded by public tax money, Rouse (1998) found that student achievement in mathematics increased by 0.08 – 0.12 of a standard deviation per year when public funds were provided to private schools. A similar study conducted by Lefebvre, Merrigan, and Verstraete (2009) indicated that mathematics achievement in private schools is improved when public subsidies are provided. Quebec has subsidized private schools since the 1950s. In this system, the capital subsidy provided for operating costs per student is revised each year and reflects the percentage of subsidy provided to the public school system. While the subsidy per student has dropped from 80% to 60% of operating costs, the amount varies by

kindergarten, primary, secondary, and collegiate level (Lefebvre, Merrigan, & Verstraete, 2009).

As mentioned in the previous section, Catholic schools have a funding structure unique to their school governance. Out of financial necessity, Catholic schools have made changes to their funding and governance systems over the last hundred years in order to keep their schools open (James, 2007). Currently, two schools participating in this study receive Federal Title I funds because over 20% of families in the school are economically disadvantaged based on federal standards. Federal programs have existed for decades to provide financial support to improve teachers' understanding of achievement. However, the federal funds allotted for Catholic schools are miniscule in comparison to their total operating budget. The financial stability of a Catholic elementary school plays a major role in the curriculum, instruction, and school climate offered to the student population. If there are inadequate school monies, it directly affects the services the school can provide, such as school programs that improve student achievement like extra-curricular programs or academic coaches in mathematics. Thus, state policies that impact Catholic school funding can have a significant impact on student achievement.

School Policies on Leadership, Supervision, and Climate

The purpose of this section is to discuss how school policies, such as those that impact leadership, supervision, and climate, are related to student achievement. Effective mathematics instruction can be achieved when schools value high mathematics expectations, strong support for all students, and teachers who understand what students know and need to learn (NCTM, 2000). Therefore, this section will discuss climate, leadership and supervision.

Bodovski, Nahum-Shani, and Walsh (2013) followed students from the beginning of kindergarten to the end of third grade in order to study how their mathematics learning is impacted by their school's academic and disciplinary climate. Their study found that mathematics achievement varied from school to school, but that in each school, improvement depended on school climate. Over the 4-year period, increases in mathematics scores were greater by half a standard deviation, or 16 points, in schools with strong academic climates than in those with weak climates (Bodovski, Nahum-Shani, & Walsh, 2013). Thus school policies that impact school climate can significantly impact mathematics achievement.

Leadership and supervision from administrators, mentors, and fellow colleagues are valuable elements in establishing a positive academic culture and climate focused on student achievement. This leadership often comes in the form of support and professional development for teachers. Ball and Forzani (2010) suggested teaching is both one of the most common and one of the most complicated human activities. Darling-Hammond (2009) asserted that teachers are now expected to teach more diverse students higher academic standards, and Hill, Schilling, and Ball (2004) indicated teachers' knowledge of mathematics has been a concern for over two decades. During this time, the focus of the archdiocese has shifted from building-based professional development to archdiocese-driven professional development focusing on content knowledge. The Archdiocese (2009) maintains a teacher training policy that focuses on collaboration between chief administrators and teachers. Together, they are expected to outline a professional development plan and participate in at least 65 hours of professional development

annually, including 10 hours related to catechesis and spiritual formation (Archdiocese, 2009).

Bickmore and Bickmore's (2010) research suggested a principal develops a healthy school climate through positive interactions that address teachers' personal needs. A major conclusion from their investigation is the importance of including the school principal as an element of a multilayered program (Bickmore & Bickmore, 2010).

Murphy (2005) recounted teacher struggles as she called for support from the assistant principal, indicating the assistant principal was unhelpful as her struggles grew during her teaching. Burch and Spillane's (2003) study of 15 elementary school administrators and 15 curriculum coordinators from eight urban elementary schools indicated that effective strategies for improving math instruction included external supports such as professional development and sequenced instruction to develop skills. They found strong leaders made a point to interact with teachers often and discussed with them the benefit of both professional development and sequenced instructional resources (Burch & Spillane, 2003).

The impact of relationships in the workplace was a common thread five teachers shared in a study by Schlichte, Yssel, and Merbler (2006), and they acknowledged that their motivation to stay in a position was directly related to their feeling of belonging with their colleagues. Quality mentoring during the first year of teaching is a key factor for novice teachers developing expertise in their profession (Fluckiger, McGlamery, & Edick, 2006). Teachers acknowledged the need for support from individuals who possess an understanding of the roles and responsibilities of the teaching position (Mastropieri, 2001). Price and Ball (1997) stressed that district leaders are vital in the process of

recruitment of resources in order for reform to take place in mathematics education. The resources administrators can provide benefit all educators in establishing a climate of mathematics achievement for all students.

Mentoring experiences of beginning teachers in Saskatchewan indicated an overall satisfaction with the induction program, yet teachers were challenged by isolation and the workload (Hellsten, Prytula, & Ebanks, 2009). DuFour (2004) explains that research identifies collaboration among teachers as a best practice; unfortunately many teachers still work in isolation. Teachers in six rural elementary schools moved from isolation to collaboration after participating in curriculum change and professional development projects (Marneweck, 2005). Bickmore and Bickmore (2010) suggest principals can support teachers by developing organizational structures that enhance collegial work, by involving teachers in school operations, by efficiently providing resources for teachers, and by enhancing teachers' work environments. Essentially, principals must develop structures for induction of new teachers and schedule purposeful interactions between teachers and principals (Bickmore & Bickmore, 2010).

School Policies on Planning, Management, and Instruction

School policies regarding planning, management, and instruction are also key components linked to student achievement (McIlrath & Huitt, 1995). Price and Ball (1997) argued that even though reform in mathematics has existed for decades, students are still exposed to a traditional mathematics curriculum of memorization, procedure knowledge, and lecture and practice by the teacher. This curriculum consists primarily of repetitive drills and word problems that provide fictional contexts in which to practice basic skills (Price & Ball, 1997). Price and Ball (1997) suggested teachers alter their

instruction, so students can use manipulatives instead of a traditional paper and pencil or work in cooperative groups instead of working alone. They also support expanding the curriculum to include more complex mathematical topics, such as probability, geometry, and number theory (Price & Ball, 1997). The goal is for students to drive instruction through engagement in complex thinking and dialogue, with less lecture-based instruction from the teacher (Price & Ball, 1997). To develop this teacher behavior, Price and Ball (1997) contend that planning and management need be at the forefront for teachers and administrators so they can learn new ways to think about mathematical skills and content and broaden their understanding of literacy to include mathematics.

Community

Another element that impacts student achievement is community (McIlrath & Huitt, 1995). The size and region of a community play a role in the success of that community's students. In addition, McIlrath and Huitt's (1995) teaching-learning process model indicates that teacher characteristics that influence classroom community, including knowledge, skills, and efficacy, are directly linked to student achievement. Thus, this section will discuss size, region, and teacher characteristics related to student achievement.

Size and region is a sub-category of community and has implications tied to student achievement. The three Catholic elementary schools that participated in this study are unique in their size and region. It is vital to provide the demographic breakdown of students in the archdiocese to provide a deeper understanding of the size and region. The ethnic demographic breakdown of students in the archdiocese of the Catholic Schools is 6% Asian, 12% Black, 11% Hispanic, and 69% White. The three schools that participated

in this study are much more diverse than the overall ethnic demographic of the archdiocese. In this region, the Hispanic population is growing at an unprecedented pace, so this section will discuss this demographic. The United States Department of Education (2000) indicated that enrollment of Hispanic students in elementary schools was 15% in 2000, and by 2025 that number will increase to 25%. Currently, two of the schools enrolled in this study have a 30% Hispanic population.

One way the ethnic demographic of a school affects community and achievement is through disciplinary policies. Bodovski, Nahum-Shani, and Walsh's (2013) found that minority students are disproportionately impacted by a negative disciplinary climate, which in turn increases the achievement gap. Sonnenschein and Galindo (2015) indicate racial and ethnic disparities exist among students' academic outcomes in the United States.

There is also inconsistency in home learning environments across different racial and ethnic groups (Bradley, Corwyn, McAdoo, & Garcia, 2001; Brooks-Gunn & Markman, 2005). In-school and out-of-school learning must be supported to create the ideal learning community for Hispanic students (Garcia, 2001). Sonnenschein and Galindo (2015) found that, though mathematics knowledge is important at a young age to ensure future success, many students, including Black and Latino students in particular, demonstrate limited mathematical skills when they begin school.

McIlrath and Huitt's (1995) teaching-learning process model indicates that community size also plays a part in student achievement. Archdiocesan schools are given complete autonomy when it comes to the enrollment at their schools. The parish schools establish their mission with input from their school advisory board, building principal,

and the parish pastor. The archdiocese outlines their policy regarding elementary school class size in the following manner:

All Archdiocesan Schools shall determine class size for each grade level consistent with, and relative to, the integrity of the instructional program determined by the school, and in accordance with the Catholic Schools Office guidelines for class design, with exceptions to those requirements made with approval of the superintendent.

This policy gives complete autonomy to schools when it comes to the enrollment at their schools. This freedom may provide larger class sizes, which may not be the optimal size for academic achievement in mathematics. The schools in this study have various class sizes, depending on enrollment trends.

Bracey (1995) and Fowler (1995) concur that school size impacts student achievement. A study exploring the size of an inner city school and its effect on teachers and students used data from 5,000 teachers and 23,000 sixth and eighth grade students in 264 kindergarten through eighth grade schools in Chicago (Lee & Loeb, 2000). The results of the study indicated that school size can impact student achievement indirectly through teachers' attitudes, and students in small schools with less than 400 students learn more because their teachers have more positive attitudes. Adler, Ball, Krainer, Lin, and Novotna (2005) note that class sizes vary in the United States, with urban schools having high teacher-student ratios in comparison to suburban schools with lower class sizes. When mathematics classrooms have large enrollments, the overall academic diversity in the class increases and makes providing quality instruction a challenge (Adler et al., 2005).

In addition to community region and size, McIlrath and Huitt's (1995) teaching-learning process model indicates that teacher characteristics, including knowledge, skills, and efficacy, have a direct link to student achievement. Ball (1993) asserted that teachers are responsible for producing a classroom environment that supports students while creating opportunities for students to establish proficiency in mathematics. However, Hill, Schilling, and Ball (2004) noted teachers' knowledge of mathematics has been a concern for over two decades. Shulman (1986) pioneered research on the subject matter knowledge required for teaching, which he called pedagogical content knowledge. Pedagogical content knowledge focuses on subject topics relative to students' difficulties and interests, including both the most effective strategies to teach a topic as well as the most common mistakes and misconceptions of students (Hill, Schilling, & Ball, 2004). The current approach to mathematical knowledge needed for teaching evolved from Shulman's (1986) work on pedagogical content knowledge (Ball & Bass, 2000; Hill, Rowan, & Ball, 2005). Ball (1990) explained the distinction between a teacher's own mathematical skill—the ability to complete a mathematical operation—and the knowledge necessary to explain that operation to students. The model developed by Ball, Thames, and Phelps (2008) identifies two main domains: subject matter knowledge and pedagogical knowledge of teachers' mathematical knowledge for teaching. In the subject matter knowledge domain, there are three sub-domains: common content knowledge, knowledge at the mathematical horizon, and specialized content knowledge. The three sub-domains of pedagogical content knowledge are: knowledge of content and students, knowledge of content and teaching, and knowledge of curriculum (Ball, Thames, &

Phelps, 2008). Teacher characteristics, including knowledge, skills, and efficacy, are directly linked to student achievement (McIlrath & Huitt, 1995).

Students experience gains in achievement when the approach of mathematical knowledge for teaching is implemented (Hill, Rowan, & Ball, 2009). Teachers who possess mathematical knowledge for teaching have the ability to make adjustments and self-correct their students while still maintaining a high level of content (Ball, Hill, & Bass, 2005).

Ball, Hill, and Bass (2005) developed a set of questions to assess elementary school teachers on mathematical knowledge for teaching. Hill, Rowan, and Ball (2005) tested this theory while conducting research on 700 first and third grade teachers and 3,000 students. The results indicated that students of teachers who scored higher on the questions testing for mathematical knowledge for teaching gained more over the course of a year (Ball, Hill, & Bass, 2005). Students exposed to teachers with mathematical knowledge for teaching have experienced gains in their mathematics scores (Hill, Rowan, & Ball, 2005).

Hill and Ball's (2009) research showed no effect on student outcomes relative to certifications. Teachers of core subjects in the archdiocese are required to have a baccalaureate degree or equivalent from an accredited college or university before their appointment by the school; teachers of auxiliary subjects are required to have an associate degree. It's important to note that while the archdiocese requires a degree, it does not require a degree in the subject taught. In addition, teachers of core subjects are not required to possess a state license at the time they are appointed but have three years to obtain a state license.

Teachers develop mathematical knowledge for teaching when they attend mathematics-focused professional development “focused on mathematical detail, well-explicated reasoning, as well as agility with a variety of mathematical productions from textbooks and students” (Hill & Ball, 2009, p. 70). Mathematical knowledge for teaching was developed to assist mathematics teachers in what they must know and be able to do in order to teach their students, particularly when they cannot demonstrate how to solve math problems to their students (Hill & Ball, 2009). Table 4 and Table 5 outline common mathematical language that teachers overgeneralize according to Karp, Bush, and Dougherty (2014). This language causes difficulties for students later on in their development and understanding of mathematical operations. Karp, Bush, and Dougherty (2014) suggest that students benefit when teachers choose their words carefully, using language that is consistent and communicating rules in precise and accurate terms.

Table 4

Expired Mathematical Language and Suggested Alternatives

| What is stated | What should be stated |
|---|---|
| Using the words borrowing or carrying when subtracting or adding, respectively | Use trading or regrouping to indicate the actual action of trading or exchanging one place value unit for another unit. |
| Using the phrase out of to describe a fraction, for example, one out of seven to describe $\frac{1}{7}$ | Use the fraction and the attribute. For example, say one-seventh of the length of the string. The out of language often causes students to think a part is being subtracted from the whole amount (Philipp, Cabral, and Schappelle, 2005). |
| Using the phrase reducing fractions | Use simplifying fractions. The language of reducing gives students the incorrect impression that the fraction is getting smaller or being reduced in size. |
| Asking how shapes are similar when children are comparing a set of shapes | Ask, How are these shapes the same? How are the shapes different? Using the word similar in these situations can eventually confuse students about the mathematical meaning of similar, which will be introduced in middle school and relates to geometric figures. |
| Reading the equal sign as makes, for example, saying, Two plus two makes four for $2 + 2 = 4$ | Read the equation $2 + 2 = 4$ as Two plus two equals or is the same as four. The language makes encourages the misconception that the equal sign is an action or an operation rather than representative of a relationship. |
| Indicating that a number divides evenly into another number | Say that a number divides another number a whole number of times or that it divides without a remainder. |
| Plugging a number into an expression or equation | Use substitute values for an unknown. |

Table 4 (continued)

| What is stated | What should be stated |
|--|--|
| Using top number and bottom number to describe the numerator and denominator of a fraction, respectively | Students should see a fraction as one number, not two separate numbers. Use the words numerator and denominator when discussing the different parts of a fraction. |

(Karp, Bush, & Dougherty, 2014)

Table 5

Rules that Expire

| Rule Teachers Share | When the rule is not true | Grade Expires |
|---|--|---------------------|
| When you multiply a number by ten, just add a zero to the end of the number | This rule is not true when multiplying decimals ($0.25 \times 10 = 2.5$, not 0.250) | Grade 5 |
| Use keywords to solve word problems | When students scan for key words in word problems and they are misleading | Grade 3 |
| You cannot take a bigger number from a smaller number | When integers are used ($4^\circ - 22^\circ = -18^\circ$) | Grade 7 |
| Addition and multiplication make numbers bigger | Adding two negative numbers ($-3 + -2 = -5$) | Grade 7 |
| Subtraction and division make numbers smaller | If the subtraction involves two negative numbers ($-5 - (-8) = 3$) | Grade 6 and Grade 7 |
| You always divide the larger number by the smaller number | A word problem with a fraction may contradict ($1/2 \div 2 = 1/4$) | Grade 5 |

Table 5 (continued)

| Rule Teachers Share | When the rule is not true | Grade Expires |
|---|---|---------------|
| Two negatives make a positive | Rule does not always hold true for addition and subtraction of integers $(-5 + (-3) = -8)$ | Grade 7 |
| Multiply everything inside the parentheses by the number outside the parentheses | Rule is untrue when multiplication and division occurs in the parentheses $2(4 \times 9) = 2 \times 4 \times 9$ | Grade 5 |
| Improper fractions should always be written as a mixed number | Troublesome when students are working within a specific mathematical context that requires them to use improper fractions | Grade 5 |
| The number you say first in counting is always less than the number that comes next | When units are different, these relationships change (three feet is more than eight inches) | Grade 2 |
| The longer the number, the larger the number | Troublesome when applying to decimals (thinking that 0.273 is larger than 0.6) (Desmet, Gregoire, & Mussolin, 2010) | Grade 4 |
| Please Excuse My Dear Aunt Sally (PEMDAS) | Three issues arise with the application of this rule. 1. Student believe they should do multiplication before division 2. Order is not as strict 3. P in PEMDAS suggest that parentheses are first rather than grouping symbols | Grade 6 |
| The equal sign means Find the answer or Write the answer | In an equation, students may see an equal sign that expresses the relationship but cannot be interpreted as find the answer | Grade 1 |

(Karp, Bush, & Dougherty, 2014)

Teachers need specific skills and knowledge, beyond simply knowing how to execute mathematical operations, in order to create a learning community that fosters mathematics achievement in students (Hill & Ball, 2009). Shulman's (1986) research started the discussion about the resources, skills, and knowledge teachers need to be effective, and Hill, Schilling, and Ball (2004) asserted that personal knowledge of the subject was not enough for effective teaching.

Family

The purpose of this section is to discuss the literature related to how student achievement is impacted by family. Crosnoe et al. (2010) discussed the importance of home learning environments for children's early mathematics development. McIlrath and Huitt's (1995) teaching-learning process model identifies mothers' education, family income, number of books in the home, and academic expectations as elements of family life that affect student achievement. This section will discuss literature related to family and its connections to student characteristics that impact student achievement.

Current research shows inconsistency in home learning environments across racial/ethnic groups (Bradley, Corwyn, McAdoo, & Garcia, 2001; Brooks-Gunn & Markman, 2005). Therefore, the ethnic diversity of a school is a factor in how student achievement is impacted by family. The three schools participating in this study are situated in the same county and are 14 miles apart from each other but have varying degrees of ethnic diversity. Thus, it is necessary to discuss diversity as an element of student achievement and family impact. Sonnenschein and Galindo (2015) conducted a study of kindergarten mathematics achievement in home and classroom learning environments of Black, Latino, and White children. Their study found students received

scores 7 to 8 points higher in the spring if they started kindergarten proficient, regardless of race and ethnicity. However, the Latino–White and Black–White gaps in mathematics scores remained significant if children were not proficient upon entering kindergarten (Sonnenschein & Galindo, 2015).

Another way ethnic diversity can impact student achievement is through language. Hughes, Powell, and Stevens (2016) assert that language skills are necessary in the learning of mathematics. Powell and Nelson indicate (2016) that by the completion of first grade, students are expected to understand and apply over 105 mathematics vocabulary terms, and that number increases to 325 vocabulary terms by fifth grade (Powell, Driver, & Roberts, 2016). Thus, the comprehension of language is a major component to student understanding in mathematics. Research has shown that the language used in mathematics test items may interfere with students' ability to demonstrate understanding of content, especially when students are struggling with English (U.S. Department of Education, 2012). A United States Department of Education (2012) study found students who were struggling with English performed six percentage points better on math assessments when a linguistic modification was provided. Along similar lines, Hughes et al. (2016) suggested that teachers must speak precisely and correctly when teaching mathematics.

In 1966, the Coleman Report indicated that the strongest predictor of student achievement is student and family characteristics in relation to their socio-economic level (Coleman, 1966). Ramirez (2004) confirmed the Coleman Report, asserting that students whose parents have completed higher levels of education and have higher incomes demonstrate higher academic achievement than students from lower socio-economic

backgrounds. Ramirez's (2004) study compared the Chilean educational system in eighth grade mathematics to South Korea, Malaysia, the Slovak Republic, and Miami-Dade County Public Schools. The study concluded that students who expected to earn college degrees, who did not believe mathematics to be very difficult, and who did not believe their academic achievements depended on luck or innate ability performed significantly higher in mathematics (Ramirez, 2004). These beliefs about education and mathematics all originate from the home and family.

Research on home learning environment is prominent in the literature. Carrasco and Torrecilla (2012) conducted a study of 16 countries, 3,000 schools, 92,000 sixth grade students, and 3,900 teachers in Latin American schools. Their findings demonstrated that school performance in reading and math increases significantly among those students who have a computer in their home, an increase that is greater among those students who have computers at their disposal at school as well (Carrasco & Torrecilla, 2012).

Summary

The purpose of this qualitative case study is to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. Since the 1960s, the Catholic educational system has experienced a steep decline in enrollment as well as a shift in the makeup of its faculty from religious to laypeople. This has impacted the financial stability of many Catholic schools, which has the potential to affect student achievement.

The current literature abounds with factors related to student achievement in mathematics. McIlrath and Huitt's (1995) teaching-learning model categorized these factors into four areas: state policies, school policies, community, and family. Even though this model does not specifically address a faith-based elementary school, it provides insight into factors that influence student achievement in any elementary school and serves as a useful framework for discussing the research related to student achievement.

State policies have the potential to impact student achievement in a variety of ways, most notably through assessment and monies. Research has shown that using curriculum-based assessment and measurement data leads to positive growth and significant improvement in standardized test scores (VanDerHeyden & Burns, 2005). In addition, a U.S. Department of Education (2012) study found that students perform better on mathematics assessments when linguistic modifications that alter the language to explain a question without significantly changing what is being assessed are provided.

State policies also play a major role in school monies, which impact a school's ability to provide quality, knowledgeable instructors and assessments aligned to the curricular standards designed to increase academic achievement. Several studies have found that students in private schools perform better in mathematics when public funding is provided (Lefebvre, Merrigan, & Verstraete, 2009; Rouse, 1998).

School policies impact school climate, leadership and supervision, and teacher behavior such as planning, management, and instruction, all of which contribute to student achievement. Bodovski, Nahum-Shani, and Walsh (2013) found that improvement in mathematics scores depends greatly on school climate. In order to

establish a positive school climate to impact student achievement, leadership and supervision in a school must be strong. Research has shown this leadership comes in the form of mentoring (Fluckiger, McGlamery, & Edick, 2006; Hellsten, Prytula, & Ebanks, 2009), professional development (Burch & Spillane, 2003), and positive relationships between teachers and administrators (Bickmore & Bickmore, 2010; Burch & Spillane, 2003; Mastropieri, 2001; Murphy, 2005; Schlichte, Yssel, & Merbler, 2006). In addition, Price and Ball (1997) stressed that district leaders are vital in the process of recruiting resources in order for reform to take place in mathematics education. The resources administrators can provide benefit all educators in establishing a climate of mathematics achievement for all students.

School policies regarding planning, management, and instruction are also key components linked to student achievement (McIlrath & Huitt, 1995). Research has demonstrated the need to move away from the traditional curriculum of lecture and memorization and toward more hands-on, cooperative, and complex learning experiences (Price & Ball, 1997). To develop this teacher behavior, Price and Ball (1997) contended that planning and management need be at the forefront for teachers and administrators.

In terms of community, the size and region of a school are factors in the teaching and learning process that are directly linked to student achievement (McIlrath and Huitt, 1995). Bracey (1995) concurred that class size is significant, and Fowler's (1995) research indicated school size also impacts student achievement. Adler, Ball, Krainer, Lin, and Novotna (2005) point out that class sizes vary in the United States, with urban schools having high teacher-student ratios in comparison to suburban schools with smaller class sizes. When mathematics classrooms have high enrollment, it increases the

overall academic diversity in the class and makes providing quality instruction challenging (Adler et al., 2005).

McIlrath and Huitt (1995) also indicate that teacher characteristics, including knowledge, skills, and efficacy, can influence classroom community. Research on pedagogical content knowledge was pioneered by Shulman (1986), who asserted that teachers need more than the ability to perform mathematical operations themselves in order to teach mathematics to students. Ball (1990, 1993) and Ball, Thames, and Phelps (2008) have continued this research, developing a model of mathematical knowledge for teaching that is very relevant to today's mathematics curriculum. Studies conducted by Ball, Hill, and Bass (2005) and Hill, Rowan, and Ball (2009) have confirmed the effectiveness of this approach to teaching mathematics in creating a beneficial learning community for students.

Additionally, the ethnic diversity of the learning community and the students' family life play a role in academic achievement. The schools participating in this study have a high percentage of Hispanic students enrolled, which confirms an increasing trend of Hispanic enrollment in elementary schools predicted by the U.S. Department of Education (2000). Research demonstrates that the ideal learning community for Hispanic students is one that encourages academic learning not only in school but at home as well (Garcia, 2001). There is also evidence that language plays a role in mathematics achievement, which can be a factor for Hispanic students who speak more than one language at home.

Coleman's (1966) findings indicate the strongest predictor of student achievement is the socioeconomic level of the student and family. Research has shown that students

from families at a higher socioeconomic level and whose parents have achieved higher levels of education perform better in school than their more disadvantaged peers (Ramirez, 2004). Students' own beliefs and expectations about learning and their ability to do well in school, which are highly influenced by family, play a significant role in academic achievement (Ramirez, 2004). Additionally, access to computers in the home significantly increases student outcomes (Carrasco & Torrecilla, 2012). McIlrath and Huitt's (1995) teaching-learning process model identifies mothers' education, family income, number of books in the home, and academic expectations as elements of family life that affect student achievement.

This study is situated within the context of mathematics achievement in Catholic elementary schools. The focus of the literature review was to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grades. A discussion of the methods used in this qualitative case study follows in the upcoming chapter.

Chapter 3

Methods

The purpose of this qualitative case study is to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. In 2014, all schools in the archdiocese produced standardized test results well above the national average in reading in second through fifth grades (see Appendix A for district mean scaled scores versus national mean scaled scores in reading). However, in the same academic year, the gap between the national average and the district's second through fifth grade mathematics scores was significantly narrower (see Appendix B for district mean scaled scores versus national mean scaled scores in mathematics). Schools that attain National Blue Ribbon eligibility through their standardized scores have the potential to have significant increases in school enrollment, funding, and climate (Webb, 1993). Thus, schools have become invested in increasing student achievement in mathematics in order to have a positive effect on the longevity of their schools.

Current studies of international mathematics programs claim that low achievement in mathematics in elementary schools in the United States is a major concern for the American educational system. The 2011 Trends in International Mathematics and Science Study specifies that fourth graders in the United States are outperformed by children in many Asian countries on mathematics assessments (Ryoo et al., 2014). Out of the 57 countries participating in the Trends in International Mathematics and Science Study, the United States still has scores lower than eight other educational systems, and six additional countries have similar scores (National Center for

Educational Statistics, 2015). Furthermore, compared to other developed countries in the world, the United States is still behind in mathematics achievement (Slavin & Lake, 2008).

Federal programs have existed for decades to provide financial support to improve teachers' understanding of achievement. Specifically, Title II is a provision in the Every Student Succeeds Act that addresses funding for "preparing, training, and recruiting high-quality teachers, principals, or other school leaders" (Pub.L. 114-95 §§ 1177-113). Price and Ball (1997) note that, while legislation tends to encourage extensive reforms in the teaching of mathematics, current practices have remained unchanged in many schools across the country. This case study identifies the need to understand teachers' views of low achievement in mathematics in the attempt to reform policies to improve mathematics achievement.

A case study research design was selected for this study to investigate the phenomenon of low mathematics achievement of students in Grades 2 through 5 at three elementary schools (Rossman & Rallis, 2012). The case study research design allowed for comprehensive investigations of teachers' views related to low achievement in mathematics at the three organizations (Adelman, Jenkins, & Kemmis, 1983). Patton (2002) indicates using a case study research design yields detailed illustrations of what is happening at the institution. A case study design allows the researcher to discover "meaningful characteristics of real-life events" relative to school performance (Yin, 2009, p. 4).

Ten second- through fifth-grade mathematics teachers participated in this study. For this qualitative study, the researcher collected school documents, conducted semi-

structured open-ended interviews, and observed teachers in mathematics classrooms. Multiple sources of data were used in this case study in order to strengthen evidence collection related to mathematics achievement (Yin, 2009).

The goal of this research study is to potentially “develop new theories, artifacts, and practices that can be generalized to other schools and classrooms” in order to increase mathematics achievement in elementary schools (Barab, 2006, p. 153). The research questions sought to address the problem of low mathematics achievement at three Catholic elementary schools (Yin, 2009, p. 4).

Research Questions

1. What perceptions do mathematics teachers in Grades 2 -5 hold about low mathematics achievement of students at X, Y, and Z’s schools?
2. What perceptions do mathematics teachers hold about improving mathematics achievement in Grades 2-5 at X, Y, and Z’s schools?
3. How do mathematics teachers describe their experiences working with students in Grades 2-5?
4. What teaching strategies do Grades 2-5 mathematics teachers describe as potentially improving the low mathematics achievement of students at X, Y, and Z’s schools?
5. How do mathematics teachers describe their own teaching practice and philosophy regarding addressing the low achievement of mathematics?
6. What are the roles of district and elementary administrators in improving mathematics achievement?

Sampling

Setting. This study was conducted at three Catholic elementary schools located in the Eastern United States. The archdiocese has 59 elementary schools, 15 independent governing elementary schools, and 21 high schools. The archdiocese is divided into six counties spanning across two states. The ethnic demographic of students in the Catholic Schools of the archdiocese is 6% Asian, 12% Black, 11% Hispanic, and 69% White. The three schools participating in this study are accredited by the Southern Association of Colleges and Schools Council on Accreditation and School Improvements, which is a division of AdvancEd.

Throughout this study, each school will be identified as either school X, Y, or Z. This is established in order to maintain confidentiality for each school participating in the study. The goal is to “ensure freedom and integrity for both the researchers and the participants” (Rossman & Rallis, 2012, p.145).

Two schools participating in the study are traditional parish schools. The other school participating in this study is a regional Catholic school financially supported by four parishes. In Canon Law, the Pastor of X, Y, and Z’s Church is the ecclesiastical authority over the church and school. The Pastor makes the final decision on all policies related to the operation of the school. Each school has a school advisory board that meets monthly and establishes and reviews school policy, but they only make recommendations to the principal and Pastor, who in turn are the final decision makers. Each school advisory board operates in accordance with the policies and regulations established by the archdiocese.

X School is a pre-kindergarten through eighth grade Catholic school. This school

is the oldest Catholic elementary school located in the region and has educated students in the community for the past 90 years. The school has a traditional financial structure supported by a single parish. The school enrollment was 241 students for the 2017 school year. X school is a Title I school because 27% of families are economically disadvantaged, based on federal standards. The student population is 30% Hispanic, 28% Caucasian, 15% African American, 15% Multi-Racial, and 12% Asian. According to School X's website their school's mission is to "integrate core, traditional, and emerging skills that cultivate and complement the students' God-given talents. We challenge each child to become a self-regulating and self-monitoring lifelong learner" (see Appendix D for complete mission statement).

Y School is a pre-kindergarten (3) through eighth grade Catholic school. The school is a regional Catholic school financially supported by four parishes. Y School has educated students in the community for the past 60 years. The school's enrollment was 267 students for the 2017 school year. Y School receives Title I funds because over 20% of families are economically disadvantaged, based on federal standards. The student population is 30% Hispanic, 47% Caucasian, 7% African American, 7% Multi-Racial, and 9% Asian. According to School Y's website their school's mission statement is "dedicated to the development of the whole child within a Catholic community of faith and academic excellence".

Z School is a pre-kindergarten (3) through eighth grade Catholic school. The school is a traditional Catholic school financially supported by only one parish. Z School opened its doors to the community in 1966. Its enrollment was 594 students in the 2017 school year. In addition, the school is a two class per grade school. Currently, the school

receives no Title I or Title III funds because they do not have students who meet qualifying standards. Z school receives \$1,900 from Title II funds. The student population is 14% Hispanic, 64% Caucasian, 7% African American, 7% Multi-Racial, and 8% Asian. According to School Z's website their school's mission statement states:

We strive for academic excellence through the creation of a strong curriculum....committed to the creation of a faith community educated to achieve academic success and to reach out to all people in faith and compassion to bring the message of Jesus Christ. (see Appendix D for complete mission statement)

The three schools participating in this study are situated in the same county and are 14 miles apart from each other. The elementary schools have varying degrees of ethnic diversity. The two schools with one class per grade have similar ethnic diversity and enrollment size. Z school, the two-class per grade school, is much less ethnically diverse than the other schools, with a 64% Caucasian student population. In addition, the two schools with more ethnic diversity receive Federal Title I and III funds because of the total number of students who are economically disadvantaged based on federal standards. All the schools participating in the study administer Scantron Performance Series in mathematics and language arts to their students in Grades 2-8. This standardized test is a computer-adaptive assessment and has only been administered to the schools for the past three years. All the schools are required to administer Scantron Performance Series to their students, but they have complete autonomy in selecting their own curriculum and textbooks.

Participants. Ten second- to fifth-grade mathematics teachers participated in this study. The administrator at each school provided a contact list with emails and phone

numbers of all second- to fifth-grade mathematics teachers who were employed at their school in the 2017-2018 school year. All teachers were contacted via email to ascertain possible interest in the study. Upon receiving a confirmation email from those who were interested in participating in the study, a questionnaire was emailed to all participants. The questionnaire requested from all participants the following demographic information: gender, age range, years in education, years in Catholic school, years in position, highest degree earned, and graduate hours in mathematics.

The participants were selected using criterion-sampling procedures. Three criteria were developed in selecting the participants to insure rigor in the study (Patton, 2002). First, participants were required to be certificated to teach in an elementary school in the district. Secondly, participants were required to be mathematics teachers in second through fifth grades who had administered standardized tests to their students in the 2017 academic school year. This sample directly related to the scope of this study, and the amount of data established created thick descriptions that aimed for depth over breadth in research data (Rossman & Rallis, 2012).

Data Collection

Classroom observations, interviews, and document collection were the primary data collection techniques in this study. The data collection techniques aimed to investigate which factors mathematics teachers in Grades 2 through 5 characterize as related to the low achievement of students in mathematics at X, Y, and Z schools. Data collection consisted of interviewing faculty employed as mathematics instructors in second through fifth grades at X, Y, and Z schools.

Face-to-face, in-person, semi-structured interviews were conducted to engage in open-ended questions to prompt the views of the participants (Creswell, 2009). The researcher used a semi-structured interview process to stay open to the participants' experience and to create a collaborative environment so the participants would freely share their experiences (Adams, 2010). In addition, member checking took place to substantiate data collected during the interviews (Anzul, Ely, & Friedman, 2003).

Each teacher taking part in this study participated in one classroom observation, and the researcher observed a total of 10 classroom lessons. Observational data collection consisted of a total of 450 minutes of mathematics instruction. During the classroom observations, the researcher asked open-ended general questions of the participants to allow them to be open with their interpretations (Creswell, 2009). In order to separate myself as an "ordinary participant," the researcher referenced and incorporated Spradley's (1980) six principles of participant-observer role:

1. Maintain a dual purpose
2. Be explicitly aware of your surroundings
3. Incorporate a wide-angle lens to look beyond your focus
4. Be aware that you will feel like an insider and outsider
5. Engage in introspection to understand your experiences
6. Keep a record of what you see and experience. (p. 58)

To gain access to the archival data and organizational documents, the researcher contacted the superintendent and principal of each school. Documents collected for this case study were used to identify the meaning in objects to understand the factors related to low achievement of students in mathematics (Woodward, 2007). A database was used

to store all archival data and organizational documents. In addition, any three-dimensional artifacts collected were photographed and coded into the database (Onwuegbuzie, Leech, & Collins, 2010).

Table 6 is a triangulation matrix used to align research questions with data sources for this case study. The research questions have been aligned with data sources “to gain a better assessment of the validity and generality of the explanations” that are discovered in the study (Maxwell, 1996, p. 75-76). In addition, Figure 3 displays the convergence of evidence from the triangulation of data that was collected (Yin, 2009, p. 117). Triangulation consisted of using diverse methods to gather data from individuals and surroundings at three Catholic elementary schools (Denzin, 1970).

Table 6

Data Collection Triangulation Matrix

| Research Questions | Document Collection | Interviews | Observations |
|--|---|-----------------------|--|
| What perceptions do mathematics teachers in Grades 2-5 hold about low mathematics achievement of students at X, Y, and Z's schools? | Graphic elicitations Written transcripts of faculty and professional learning community meetings | Individual interviews | Observations of 10 mathematics classrooms Field notes |
| What perceptions do mathematics teachers hold about improving mathematics achievement in Grades 2-5 at X, Y, and Z's schools? | Graphic elicitations Written transcripts of faculty and professional learning community meetings | Individual interviews | Observations of 10 mathematics classrooms Field notes |
| How do mathematics teachers describe their experiences working with students in Grades 2-5? | Graphic elicitations Written transcripts of faculty meetings | Individual interviews | Observations of 10 mathematics classrooms Field notes |
| What teacher strategies do Grades 2-5 mathematics teachers describe as potentially improving low mathematics achievement at X, Y, and Z's schools? | Graphic elicitations Written transcripts | Individual interviews | Observations of 10 mathematics classrooms Field notes |

Table 6 (continued)

| Research Questions | Document Collection | Interviews | Observations |
|---|---|-----------------------|--|
| How do mathematics teachers describe their own teaching practice and philosophy regarding addressing the low achievement in mathematics? | Graphic elicitations Written transcripts | Individual interviews | Observations of 10 mathematics classrooms Field notes |
| What are the roles of district and elementary administrators in improving mathematics achievement? | Graphic elicitations Written transcripts | Individual interviews | Observations of 10 mathematics classrooms Field notes |
| How do mathematics teachers describe their own proficiency regarding addressing the low achievement in mathematics? | Graphic elicitations Written transcripts | Individual interviews | Observations of 10 mathematics classrooms Field notes |
| What factors do mathematics teachers in Grades 2-5 characterize are related to the low achievement of students in mathematics at X, Y, and Z's schools? | Graphic elicitations Written transcripts | Individual interviews | Observations of 10 mathematics classrooms Field notes |

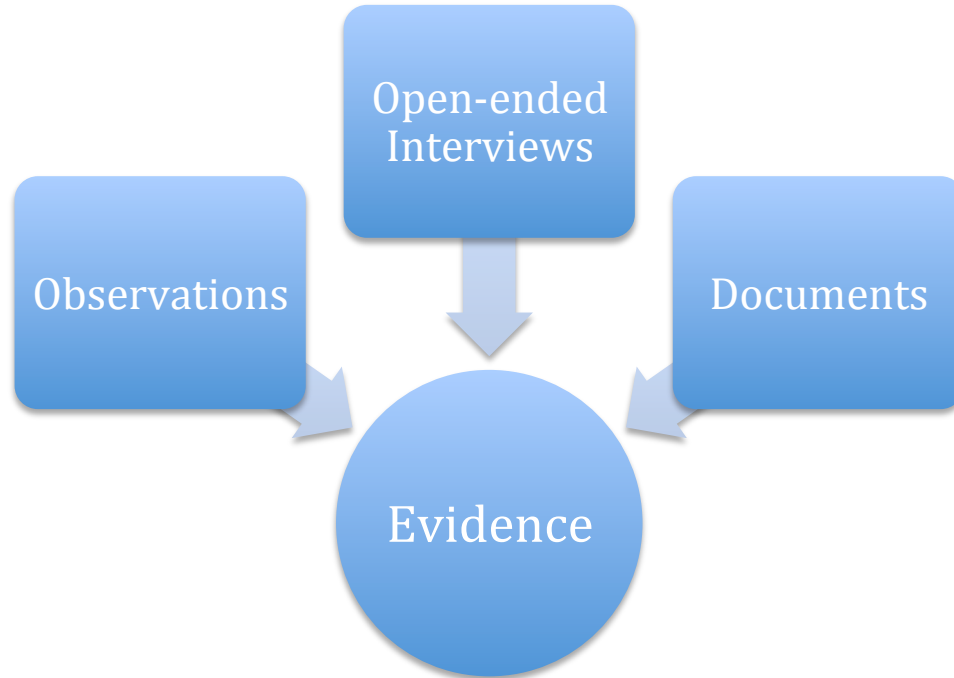


Figure 3. Triangulation of multiple sources of evidence.

Documents. Documents were collected from the school district, three elementary schools, and the 10 mathematics classrooms observed in this case study. In Canon Law, the pastor is the ecclesiastical authority over the church and school. The pastor delegates authority to the principal, who in turn oversees all school operations. The principal of each school has the authority to grant unlimited access to all school documents related to a study, and the superintendent of the archdiocese oversees all central office personnel and also has access to all documents. Thus, the researcher contacted the principal of each school and the superintendent of the archdiocese, and approval was granted to collect all documents requested. Archival data and organizational documents were used as an additional source of data collection. Archival data, such as test scores from previous years, were reviewed to identify patterns in the achievement of students in mathematics.

In addition, the researcher contacted the Director of Assessment for the archdiocese to request annual reports for X, Y, and Z schools. The following documents were collected for this study:

- Archdiocese Central Office agendas
- County Elementary School Principals Association meeting agendas, minutes, and materials
- Archdiocese Conference Day agendas, minutes, and materials
- Archdiocese Professional Day agendas, minutes, and materials
- Building-Based Professional Day agendas
- Building and district scantron standardized test scores reports
- Mathematics curriculum guides
- Building-based mathematics curriculum
- Building-based mathematics textbooks and workbooks
- Teacher lesson plans
- Instructional materials
- School-based benchmark results
- Archdiocese data reports
- Materials from professional development meetings or conferences
- Any type of communication related to mathematics
- Professional Learning Committee agendas, minutes, and materials
- Interview graphic elicitations

Woodward (2007) stresses that material culture such as inanimate things within their social setting act on people by giving symbolic meaning. Material culture was used

for document collection for this case study to identify the meaning in objects in a scholarly manner (Woodward, 2007).

Interviews. Data collection also included 10 separate interviews of teachers in Grades 2-5, with each interview lasting approximately 60 minutes (see Appendix E for interview questions). Prior to the interview, a graphic elicitation was incorporated to enhance the participants' reflexivity and to gather a holistic picture of the topic that could take into account their different needs and expressive styles (Bagnoli, 2009). The graphic elicitation asked participants to graphically display factors related to the low achievement of students in mathematics. The instructions were as broad as possible to allow the participants to structure the task in their own ways to obtain a variety of patterns (Bagnoli, 2009). In addition, the graphic elicitation sought to discover strategies for improving low achievement at X, Y, and Z's schools (see Appendix E for the graphic elicitation).

For the purpose of this study, a semi-structured interview process was used. Interview protocol consisted of 19 main questions to elicit participants' viewpoints of this topic. A responsive interview was structured around the main questions to uncover rich data in response to the research questions (Rubin & Rubin, 2012). During the interview, the researcher stated the purpose of the case study and provided some information about himself and the current course for this research. Research participants were informed how the data would be used and were asked if audio recording was permissible. Member checking took place in the form of a follow-up interview in order to confirm accuracy of major themes (Creswell, 2009).

Prior to the interview, an informed consent document was provided to the research participants for signing. Transcription and coding of recorded interviews took place after each interview in order to provide accuracy during the transcription process (Rubin & Rubin, 2012). In addition, to maintain accuracy during transcription, the researcher took notes during the interview to clarify and capture the thoughts of the participants (Rubin & Rubin, 2012).

Observations. Primary data collection also included observations of 10 classroom teachers in their mathematics classrooms. Each teacher participating in this study was observed one time. Observational data collection consisted of a total of 450 minutes of mathematics instruction. The researcher contacted the principal of each school to gain access to the teachers participating in the study. After establishing a schedule with each principal, the researcher contacted each teacher individually to set up a schedule for classroom observations. The goal of the observations was to collaborate with teachers in their setting to gain an understanding of their views related to low achievement in mathematics (Huttlinger, 2011).

In addition, observations were conducted at the following leadership meetings: County Elementary School Principals Association meetings, Archdiocese conference days, Archdiocese professional days, and building-based professional days. During these meetings and professional days, the researcher wrote field notes to develop a running record of discussions leadership was having around achievement in mathematics (Rossman & Rallis, 2012).

The participant-observation model was used to gain access to classrooms, leadership meetings, and professional days in the attempt to “perceive reality from the

viewpoint of someone inside the case study” (Yin, 2009, p. 112). During the classroom and leadership observations, the researcher wrote field notes to “describe settings, activities, people, and their interactions” (Rossman & Rallis, 2012, p. 174). The field notes consisted of a “running commentary” in answer to the questions, “What am I learning?, What am I seeing?, What should I be thinking about next?, and How does this case differ from the last?” (Eisenhardt, 1989, p. 538 – 539). In order to observe classroom teachers with a consistent focus, the researcher used Sawada et al.’s (2000) Reformed Teaching Observation Protocol (see Appendix G). This tool is an “observational instrument designed to measure reformed teaching” (Sawada et al., 2000, p. 1). The authors of the Reformed Teaching Observation Protocol give permission to all researchers who wish to use the document in their research (Sawada et al., 2000). It is organized into the following five categories:

Lesson Design and Implementation

Content: Propositional Pedagogic Knowledge

Content: Procedural Pedagogic Knowledge

Classroom Culture: Communicative Interactions

Classroom Culture: Student/teacher Relationships. (Sawada et al. 2000)

The Reformed Observational Protocol contains 25 items organized into five categories with a five point Likert scale ranging from not observed (0) to very descriptive (4) (Sawada et al., 2000). In addition, overall scores range from 0 to 100 points, “with higher scores reflecting a greater degree of reform” (Sawada et al., 2000, p. 32).

In addition, during the classroom visits the researcher focused on various factors such as the curriculum, teaching, learning, and classroom strategies used by the teacher.

After each classroom visit, the researcher took approximately 30 minutes to create thick description to the running record to establish “thick interpretations” of earlier field notes (Denzin, 1989, p. 83; Rossman & Rallis, 2012).

Institutional Review Board

The researcher sought approval by the Institutional Review Board (IRB) at Rowan University prior to making contact with participants. The researcher completed all required CITI training, as per the requirements of the IRB. The IRB reviewed and approved participants prior to the start of the research (Yin, 2009). As the participant observer, the researcher’s focus was on the teaching and learning of the teachers. Students were not interviewed during classroom observations. The names of the students will not be disclosed in order to protect the rights of the students. Participants were assured that their jobs would not be in jeopardy if they decided not to participate in the study. Participants were required to complete a signed consent form to participate in the study, and they were made aware that they could withdraw from the study at any point in time (see Appendix H for informed consent form). The informed consent form outlined instructions for participation and indicated participants’ privacy in the study. In addition, the informed consent form summarized the nature of the research and indicated how the data collected would be used in the study (Rubin & Rubin, 2012). All participants’ names will be kept confidential and will not be disclosed in the study. The raw data collected during this study will be stored for a period of five years, and after that time period all data will be appropriately discarded to avoid inappropriate use of the data (Creswell, 2009).

Data Analysis

Initial coding was used to identify emerging patterns (Saldana, 2009). This strategy requires the researcher to stay open to all possible directions indicated by the data (Charmaz, 2006, p. 46). This coding technique aligns with the purpose of this study due to its intention “as a starting point to provide the researcher with analytic leads for further exploration” (Glaser, 1978, p. 56). Also, Saldana (2009) recommends enlisting initial coding when using a wide variety of data forms. The researcher used this method to remain open to all possible emerging themes uncovered in data collection.

Axial coding was selected as a second cycle coding method because it is an extension of the analytic work from initial coding (Saldana, 2009). After initial coding is completed in first cycle coding, axial coding’s goal is to search for dominant themes emerging from data collection. Boeije (2010) reiterates the goal of axial coding is to “determine which codes are dominant and which are less dominant and to reorganize the data set” into themes (p. 109).

After the themes emerged, the researcher displayed findings using matrices, charts, concept maps, graphs, and figures (Mills, 2003). By displaying the themes, the researcher had the opportunity to extend the analysis to raise questions about the study (Mills, 2003). All the data analysis and interpretation techniques are identified in Table 7 on the next page. Observations, interviews, and documents are matched with analysis techniques such as strategies of coding, questioning, concept mapping, themes, and patterns and interpretation techniques such as extended analysis, personal experience, literature review, and advice from colleagues.

Table 7

Data Analysis & Interpretation Chart

| Data Source | Analysis Technique | Interpretation Technique |
|--------------|---|--|
| Observations | Coding of Interviews – record data on 3 x 5 index cards to reduce data to manageable form to identify patterns and themes (Mills, 2003) | Extend the analysis – raise questions about the study (Mills, 2003). |
| Interviews | | |
| Documents | Questioning – work through a series of questions to extend understanding of problems and context (Stringer, 2007). | Personal Experience – connect findings to personal interpretations (Mills, 2003). |
| | Display Findings – use matrices, charts, concept maps, graphs, and figures to display the findings (Mills, 2003). | Seek Advice - reach out to colleagues for insights that may have been missed (Mills, 2003). |
| | Themes & Patterns – copy transcripts into program to identify key words for themes and patterns in data | Literature review – uncover external sources to provide support for the study’s findings (Mills, 2003) |

Bias & Assumptions

As the former principal of X school, the researcher made efforts to remain impartial during the research in order to develop an understanding of his personal profile as it relates to this case study (Rossman & Rallis, 2012). Thus, the researcher reviewed all collected field notes with a particular focus on his worldviews. In addition, the researcher collaborated with participants by discussing emerging themes with them. The evidence collected was thoroughly examined in relation to the researcher’s personal profile so any claim made could be identified as unbiased (Rossman & Rallis, 2012).

The researcher's preliminary practicing profile encompasses two worldviews. The pragmatic view is forged out of actions, situations, and consequences; a constructivist view recognizes the environment shapes our interpretations (Creswell, 2009). As a leader, the researcher believes his experiences shape his development as an authentic leader (George & Sims, 2007). It is essential to enlist a constructivist and pragmatic worldview as a special education teacher, soccer and track coach, and administrator because a leader must adapt to stay competitive in a global society. The researcher's pragmatic view and constructivist approach has led him to enlist a democratic, situational, and emotional intelligence leadership style. It is evident a leader must make personal connections with students and staff to promote a rigorous educational environment. The researcher's leadership style and paradigm flow together with the understanding that our beliefs are constructed through our interactions with each other. For the researcher, understanding his worldview aided in eliminating his bias to maintain credibility in this study (Gasson, 2004).

Ethical Considerations

The researcher sought approval for this study from the Superintendent of Schools for the archdiocese. After approval was granted, the researcher reviewed the appropriate code of ethics for his professional research association to avoid a violation of professional code of conduct (Creswell, 2009). In addition, the technique of conformability was used to establish the acknowledgement that research is never objective and to eliminate bias if at all possible to maintain credibility in the research process (Gasson, 2004).

Chapter 4

Results

The purpose of this qualitative case study was to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. The three schools participating in this study have varying degrees of ethnic diversity and enrollment. A case study research design allowed for a comprehensive investigation of teachers' views related to low achievement in mathematics at the three organizations (Adelman, Jenkins, & Kemmis, 1983).

This chapter will focus on the following key areas: (a) context of the study, (b) teacher interviews, (c) classroom observations, and (d) emergent themes. The research questions sought to address the problem of low mathematics achievement at three Catholic elementary schools (Yin, 2009, p. 4).

Research Questions

1. What perceptions do mathematics teachers in Grades 2 -5 hold about low mathematics achievement of students at X, Y, and Z's schools?
2. What perceptions do mathematics teachers hold about improving mathematics achievement in Grades 2-5 at X, Y, and Z's schools?
3. How do mathematics teachers describe their experiences working with students in Grades 2-5?
4. What teaching strategies do Grades 2-5 mathematics teachers describe as potentially improving the low mathematics achievement of students at X, Y, and Z's schools?

5. How do mathematics teachers describe their own teaching practice and philosophy regarding addressing the low achievement of mathematics?
6. What are the roles of district and elementary administrators in improving mathematics achievement?

Context

This section identifies key characteristics of the three schools participating in the study. The three schools are required to follow archdiocesan academic standards, but the schools have complete autonomy in selecting which academic textbooks to implement at their school. The archdiocese outlines the expectation for each school with the following statement on academic standards:

Archdiocesan academic standards shall be utilized as the framework to define student expectations by content and grade level for Archdiocesan elementary schools and pre- kindergarten programs. Schools shall utilize these academic standards as a foundation for determining school readiness, intervention, retention, promotion and graduation, in accordance with guidelines established by the Catholic Schools Office. Standards are provided to all schools by the Catholic Schools Office.

In this study, the schools are identified as school X, Y, and Z. Ten second- to fifth-grade mathematics teachers participated in this study. The participants were selected using criterion-sampling procedures. Three criteria were developed in selecting the participants to insure rigor in the study (Patton, 2002). First, participants were required to be certificated to teach in an elementary school in the district. Secondly, participants were required to be mathematics teachers in second through fifth grades who had administered

standardized tests to their students in the 2017 academic school year. Table 8 lists a coded number for each participant and displays a participant profile, including gender, age range, years in education, years in Catholic school, years in position, highest degree, and graduate hours in mathematics. This is established in order to maintain confidentiality for each school and participant. The goal is to “ensure freedom and integrity for both the researchers and the participants” (Rossman & Rallis, 2012, p.145). The analysis of each school focused on: a) the school’s community context, b) the mathematics curriculum, and c) school resources. Even though the three schools are governed by the same archdiocese and are situated in the same county, each school is unique in its instructional offerings. The archdiocesan schools implement the following policy, listed in their policy manual, regarding academic textbooks, technology, and instructional resources:

Academic textbooks, technology, instructional materials and local resources shall be selected by the individual school administrator(s) to support the achievement of academic and instructional standards. Selection shall be in accordance with the guidelines provided by the Catholic Schools Office. Instructional resources for religion curriculum shall follow Catholic Identity policies and guidelines provided by the Office of Religious Education.

Table 8

Participant Demographic Information

| Participant | Gender | Age Range | Years in Education | Years in Catholic School | Years in Position | Highest Degree Earned | Graduate Hours in Math |
|-------------|--------|-----------|--------------------|--------------------------|-------------------|-----------------------|------------------------|
| 1 | F | 30-39 | 14 | 9 | 9 | B.S. | 0 |
| 2 | F | 30-39 | 13 | 11 | 6 | B.S. | 0 |
| 3 | F | 20-29 | 7 | 4 | 4 | B.A. | 0 |
| 4 | F | 20-29 | 5 | 3 | 1 | B.A. | 0 |
| 5 | F | 60-69 | 38 | 35 | 25 | M.A. | 5 |
| 6 | F | 40-49 | 7 | 6 | 6 | B.S. | 0 |
| 7 | F | 50-59 | 13 | 6 | 3 | M.A. | 42 |
| 8 | F | 20-29 | 5 | 5 | 1 | B.A. | 0 |
| 9 | F | 40-49 | 17 | 15 | 3 | M.Ed. | 6 |
| 10 | F | 20-29 | 2 | 2 | 2 | B.S. | 0 |

The participant demographic information in Table 8 presented useful information regarding gender, age range, years in education, years in Catholic school, years in position, highest degree, and graduate hours in mathematics. The average age of the participants was 38.5, and 100% of the participants were female. The average years in education was 12.8 years and 9.6 years in Catholic school. On average participants had been in their current teaching position for six years. The highest level of education for 30% of the participants was a Master's degree, and only 20% of the participants had graduate hours in mathematics.

X School is a pre-kindergarten to eighth grade Catholic school. The school has a traditional financial structure supported by a single parish. The school enrollment was 241 students for the 2017 school year. X school is a Title I school because 27% of families are economically disadvantaged based on federal standards. The student population is 30% Hispanic, 28% Caucasian, 15% African American, 15% Multi-Racial, and 12% Asian.

Saxon Math Curriculum is utilized as the primary resource in second and third grades at X school. Pre-kindergarten to third grade mathematics classes all use the curriculum for one grade higher than their current grade, so for the start of the 2017-2018 school year, the second and third grades were using the third and fourth grade Saxon Math Curriculums. Fourth grade uses Houghton Mifflin Math and fifth grade uses Holt McDougal Mathematics Course 1.

The resources at X school vary by grade. In second grade, the teacher taught the entire class of 21 students. Approximately twice a week some students were pulled out for extra mathematics support. Students are also kept in their class in third grade, and there are a total of 24 students in the third-grade class. At times there is a teacher assistant that comes in for support but does not do pull-out instruction. Starting in fourth grade, all mathematics classes are split into two groups: one on-level class and one above-level class. The students are split based on ability, their performance on the Scantron Performance Assessment, teacher recommendations, and academic grades. The fourth- and fifth-grade teachers split their classes; the fourth-grade mathematics teacher instructs the fourth-grade above-level and the fifth-grade on-level classes. The fifth-grade teacher instructs the fourth-grade on-level and the fifth-grade above-level. The fourth-grade

teacher had seven total students in the on-level fifth-grade class when the researcher conducted his observation.

Y School is a pre-kindergarten (3) to eighth grade Catholic school. The school is a regional Catholic school financially supported by four parishes. The school's enrollment was 267 students for the 2017 school year. Y School receives Title I funds because over 20% of families are economically disadvantaged based on federal standards. The student population is 30% Hispanic, 47% Caucasian, 7% African American, 7% Multi-Racial, and 9% Asian.

Y School uses the Go Math! Curriculum by Houghton Mifflin Harcourt as the primary resource in second, third, fourth, and fifth grades. The fifth grade also uses Simple Solutions as a supplemental resource.

The resources at Y school vary by grade. In second grade, the teacher taught the entire class of 21 students. There was a full-time assistant in the class to assist with instruction. In third grade, students are also kept in their class, and there are a total of 28 students. At times, there is a special education teacher who comes in for support but does not do pull-out instruction. During the lesson observed by the researcher, the special education teacher provided additional instruction to a group of students. In fourth grade, students are also kept in their class, and there are a total of 26 students in the fourth-grade class. Starting in fifth grade, all mathematics classes are split into two groups: one on-level class and one above-level class. The students are split based on ability, their performance on the Scantron Performance Assessment, teacher recommendations, and academic grades. The fifth-grade teacher had nine total students in the on-level fifth-grade class when the researcher conducted his observation.

Z School is a pre-kindergarten (3) to eighth grade Catholic school. The school is a traditional Catholic school financially supported by only one parish. The school's enrollment was 594 students for the 2017 school year. In addition, the school is a two class per grade school. Currently, the school receives no Title I or Title III funds because they do not have students who meet qualifying standards. However, Z school does receive \$1,900 from Title II funds. The student population is 14% Hispanic, 64% Caucasian, 7% African American, 7% Multi-Racial, and 8% Asian.

Z School uses the Progress in Mathematics curriculum as the primary resource in second, third, fourth, and fifth grades. The resources at Z school vary by grade, but Z school has much more flexibility because it has two classes per grade. In second grade, one teacher teaches the entire class of 23 students with a full-time assistant in the class to assist with instruction. Since there are two classes per grade students are grouped by ability level. In the second grade class, the researcher observed the above-level mathematics classroom. In third grade, there are a total of 20 students, and similar to second grade students are split based on their ability level. In fourth grade, there are 23 students, and the students are split based on their ability level. The students are placed in groups based on their performance on the Scantron Performance Assessment, teacher recommendations, and academic grades. All students requiring special education services are pulled out for separate classroom instruction.

The three schools participating in this study are situated in the same county and are 14 miles apart from each other. The elementary schools have varying degrees of ethnic diversity. The two schools with one class per grade have similar ethnic diversity and enrollment size. The two-class per grade school, Z school, has a 64% Caucasian

student population. This school is much less ethnically diverse than the other schools participating in the study. In addition, the two schools with more ethnic diversity receive Federal Title I and III funds because of the total number of students that are economically disadvantaged based on federal standards. All the schools participating in the study administer Scantron Performance Series in mathematics and language arts to their students in Grades 2-8. This standardized test is a computer-adaptive assessment and has only been administered in the schools for the past three years. All the schools are required to administer Scantron Performance Series to their students, but they have complete autonomy in selecting their own curriculum and textbook for their schools. Table 9 lists the mathematics textbooks used at the three schools participating in the study.

Table 9

Mathematics Textbooks at X, Y, and Z Schools

| Grade | 2nd | 3rd | 4th | 5th |
|----------|-----------------------------|-----------------------------|-----------------------------|------------------------------------|
| X School | Saxon Math 3rd | Saxon Math 4th | Houghton Mifflin Math | Holt McDougal Mathematics Course 1 |
| Y School | Go Math 2nd | Go Math 3rd | Go Math 4th | Go Math 5th Simple Solutions |
| Z School | Progress in Mathematics 2nd | Progress in Mathematics 3rd | Progress in Mathematics 4th | Progress in Mathematics 5th |

Teacher Interviews

In this study, eight out of the 10 participants in Grades 2-5 were interviewed, and of the eight total interviews, three were second grade teachers, two were third grade teachers, two were fourth grade teachers, and one was a fifth grade teacher. Due to conflicts in the participants' schedules, two participants were not interviewed but were kept as participants in the study since they participated in the graphic elicitation and the classroom observation. The average age of the participants was 38.5, and 100% of the participants were female. The average years in education was 12.8 years and 9.6 years in Catholic school. The average was 6 years for participants in their current teaching position. The highest level of education for 30% of the participants was a Master's degree, and only 20% of the participants had graduate hours in mathematics.

The interview protocol (see Appendix E for interview questions) was designed to discover perceptions mathematics teachers in Grades 2 -5 hold about low mathematics achievement. The interview protocol consisted of 19 main questions to elicit participants' viewpoints on this topic. A responsive interview was structured around the main questions to uncover rich data in response to the research questions (Rubin & Rubin, 2012). Each interview was approximately 50 minutes in length. Table 10 outlines the dominant themes identified in the interviews and the frequency of each response .

Prior to the interview, a graphic elicitation was incorporated to enhance the participants' reflexivity and to gather a holistic picture of the topic that could take into account their different needs and expressive styles (Bagnoli, 2009). The graphic elicitation asked participants to graphically display factors related to the low achievement of students in mathematics (see Appendix E for the graphic elicitation). The instructions

were as broad as possible to allow the participants to structure the task in their own way to obtain a variety of patterns (Bagnoli, 2009).

Table 10

Common Themes in Interview Transcripts

| Code | Number of Times Referenced |
|---|----------------------------|
| Lack of Instructional Time in Mathematics | 18 |
| Lack of Home Support | 17 |
| School Demographic | 14 |
| Lack of Home Resources | 11 |
| Completion of Math Concepts | 10 |
| Fast Pace of the Curriculum | 9 |
| Diversity | 8 |
| Teacher Quality | 8 |
| English-Language Learners | 7 |
| Standards-Based Instruction | 7 |
| Students Ill-Prepared by Previous Years | 6 |

Table 10 (continued)

| Code | Number of Times Reference |
|--|---------------------------|
| Ineffective Math Textbooks | 6 |
| Teacher Only Presents Concepts One Way | 6 |
| Teacher Foresight | 6 |
| Teacher Moves to Quickly | 6 |
| Teacher Organization | 6 |

The data gathered during the interviews provided substantial insight into the mathematics programs. The participants in this study described the challenges related to teacher quality as considerable factors for low mathematics achievement of students in second through fifth grade. The deficiency in teacher quality was a prevalent theme in the participants' descriptions and discussions of the low mathematics achievement in X, Y, and Z's schools. The participants highlighted the lack of preparation students had received in the previous year as well as subject matter appearing on the test that was not taught in class. Teacher characteristics, such as teacher foresight and organization, were also identified as factors related to mathematics achievement. Along similar lines, participants identified teachers who move too quickly through material and instruction and teachers who only present the concepts one way as factors related to low mathematics achievement. The data yielded by this study provided strong evidence that teachers perceive a connection between teacher quality and student achievement.

The participants in this study made several references to the curriculum. For example, the limited time period allotted to mathematics was a dominant concern for second- to fifth-grade mathematics teachers, and they described the challenges of teaching mathematics in one instructional period. The amount of time prearranged for mathematics classes creates a disadvantage for students. This deficiency in the curricular implementation was prevalent in the discussion of the factors related to the low mathematics achievement of students. In addition, time allotted for mathematics instruction was a topic discussed during the interviews. Participants reflected about why they believed the restricted educational period was a factor related to the low achievement of students. Participants also expressed the desire to teach basic concepts. Participants offered their viewpoints about basic math facts and how enriching students' development of foundational skills will strengthen their mastery in mathematical operations. Across second through fifth grade, math facts were identified as an area of concern, from addition and subtraction to multiplication and division.

The participants in this study made a number references to cultural elements of learning. For example, they described the challenges evident among English-Language Learners and their parents. The increased enrollment of English-Language Learners at School X and Y has been identified as a factor in the low mathematics achievement of students. These students receive less support from their parents due to the cultural disconnect with the content, and this has led to a drop in scores for these students.

Classroom Observations

All 10 participants who agreed to participate in the study received classroom observations. Of the 10 total classroom observations, three were second grade

classrooms, three were third grade classrooms, three were fourth grade classrooms, and one was a fifth grade classroom. The researcher observed mathematics classes ranging from seven to 28 students. The average age of the participants was 38.5, and 100% of the participants were female. The average years in education was 12.8 years and 9.6 years in Catholic school. On average, participants were in their current teaching position for six years. The highest level of education for 30% of the participants was a Master's degree, and only 20% of the participants had graduate hours in mathematics.

Each teacher participating in this study was observed one time. Observational data collection consisted of a total of 450 minutes of mathematics instruction. After establishing a schedule with each principal, the researcher contacted each teacher individually to set up a schedule for classroom observations. The goal of the observations was to collaborate with teachers in their setting to gain an understanding of their views related to low achievement in mathematics (Huttlinger, 2011). In order to observe classroom teachers with a consistent focus, the researcher used Sawada et al.'s (2000) Reformed Teaching Observation Protocol (see Appendix G). This tool is an "observational instrument designed to measure reformed teaching" (Sawada et al., 2000, p. 1). The authors of the Reformed Teaching Observation Protocol give permission to all researchers who wish to use the document in their research (Sawada et al., 2000).

The Reformed Observational Protocol contains 25 items organized into five categories with a five point Likert scale ranging from not observed (0) to very descriptive (4) (Sawada et al., 2000). In addition, overall scores range from 0 to 100 points, "with higher scores reflecting a greater degree of reform" (Sawada et al., 2000, p. 32). The data will be discussed in the emergent themes section of this study.

The data gathered during the observations provided insight into the mathematics programs, and the participants in this study described their classroom observation as an overall positive experience. All the participants provided lesson plans to the researcher to review during the classroom observations. During the observations, the following five categories were observed and documented:

Lesson Design and Implementation

Content: Propositional Pedagogic Knowledge

Content: Procedural Pedagogic Knowledge

Classroom Culture: Communicative Interactions

Classroom Culture: Student/teacher Relationships (Sawada et al. 2000)

The three participants who had a Master's degree received the highest overall scores on their classroom observations and in the categories of Lesson Design & Implementation and Content (Sawada et al., 2000). During their observations, those teachers received scores of “very descriptive” – the highest score on the Likert scale – and had a higher rating of overall reform in their teaching (Sawada et al., 2000, p. 32). These three participants received an overall score of 91 to 93 out of a possible 100 points. The data gathered suggests a connection between their degrees and higher ratings of reform in teaching. Figure 8 displays the indicators in the categories of Lesson Design & Implementation and Content on the Reformed Teacher Observation Protocol.

Emergent Themes

As a result of this study, three major themes emerged from the research questions related to low mathematics achievement in second through fifth grades. The themes are teacher quality, curricular referencing, and cultural referencing. All themes were

developed using initial and axial coding techniques. Table 11 outlines the emergent dominant themes in the findings identified in this research study, which emerged from interviews of second- through fifth-grade Catholic elementary school teachers, classroom observations, and analysis of documents. Table 10 outlines the frequency of each response in the interviews.

The first theme has a direct connection to the Catholic schooling system in the United States. The financial stability of a Catholic elementary school has a major link to the curriculum, instruction, and school climate being offered to the school community. Schools with decreased enrollment have been affected by limited operating expenses. Catholic schools with thriving enrollments are more successful in retaining quality teachers due to their prosperous operating budget. The findings of this study have established a connection between mathematics achievement and schools with successful operating budgets and high-quality teachers. The finding is a replication of earlier results discussed by Ball, Hill, and Bass (2005). Their research demonstrated that teachers who possess mathematical knowledge for teaching have the ability to make adjustments and self-correct their students while still maintaining a high level of content (Ball, Hill, & Bass, 2005).

Secondly, the theme of curricular referencing arose based on comments regarding the fast pace of the curriculum, completion of math concepts, ineffective math textbooks, and lack of instructional time. Price and Ball (1997) demonstrated the need to move away from the traditional curriculum of lecture and memorization and toward more hands-on, cooperative, and complex learning experiences. The findings of this study demonstrated a

connection between the overall positive student engagement in the classroom observations and the interview data collected from all the participants.

The third theme of cultural referencing emerged based on school demographics, diversity, English-Language Learners, lack of home support, and lack of home resources. Research on the elements in the category of Cultural Referencing is prominent in the literature. In 1966, the Coleman Report indicated that the strongest predictor of student achievement is student and family characteristics in relation to their socio-economic level (Coleman, 1966). Similarly, Hughes, Powell, and Stevens (2016) assert that language skills are necessary in the learning of mathematics. The teachers' perceptions demonstrate a connection between these elements of cultural referencing and mathematics achievement in second- through fifth-grade Catholic elementary school students.

Table 11

Emergent Themes in Findings

| Category | Teacher Quality | Curricular References | Cultural References |
|----------|---|-----------------------------|---------------------------|
| Codes | Standards-Based Instruction | Completion of Math Concepts | Diversity |
| | Students Ill-Prepared by Previous Years | Fast Pace of the Curriculum | English-Language Learners |
| | Teacher Foresight | Ineffective Math Textbooks | Lack of Home Support |
| | Teacher Moves Too Quickly | Lack of Instructional Time | Lack of Home Resources |
| | Teacher Organization | | School Demographics |
| | Teacher Only Presents Concepts One Way | | |

Teacher Quality

The participants in this study described the challenges of teacher quality as considerable factors for low mathematics achievement of students in second through fifth grade. The participants described deficiency in teacher quality as the teachers' lack of organization and lack of variation in concepts taught. Figure 4 and Figure 5 are graphic elicitations created by Participant 1 and Participant 10, respectively, which demonstrate the factors identified by these participants as related to low mathematics achievement. In addition to naming teacher quality directly, Participant 1 highlighted the lack of preparation students had received in the previous year as well as subject matter appearing on the test that was not taught in class, two factors that are related to teacher quality.

Participant 10 listed teacher characteristics such as teacher foresight and organization as factors related to mathematics achievement.

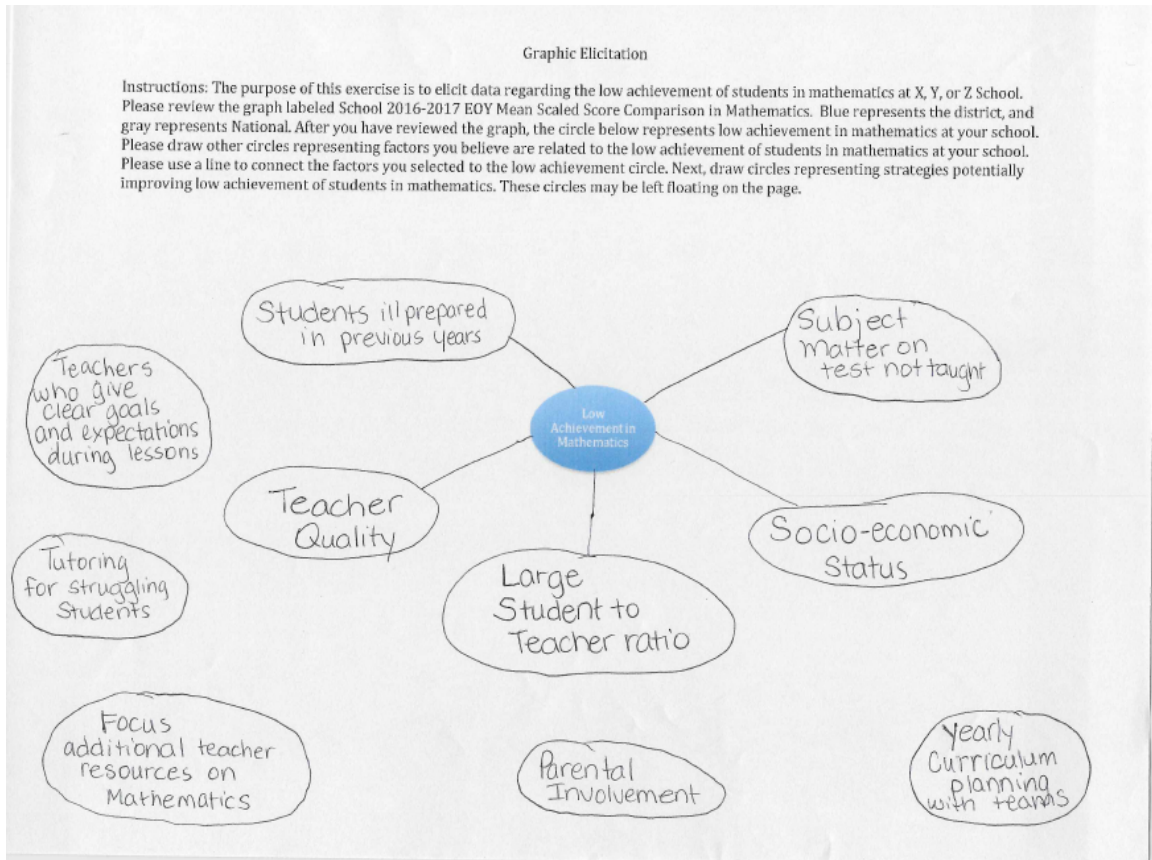


Figure 4. Graphic elicitation completed by Participant 1.

Graphic Elicitation

Instructions: The purpose of this exercise is to elicit data regarding the low achievement of students in mathematics at X, Y, or Z School. Please review the graph labeled School 2016-2017 EOY Mean Scaled Score Comparison in Mathematics. Blue represents the district, and gray represents National. After you have reviewed the graph, the circle below represents low achievement in mathematics at your school. Please draw other circles representing factors you believe are related to the low achievement of students in mathematics at your school. Please use a line to connect the factors you selected to the low achievement circle. Next, draw circles representing strategies potentially improving low achievement of students in mathematics. These circles may be left floating on the page.

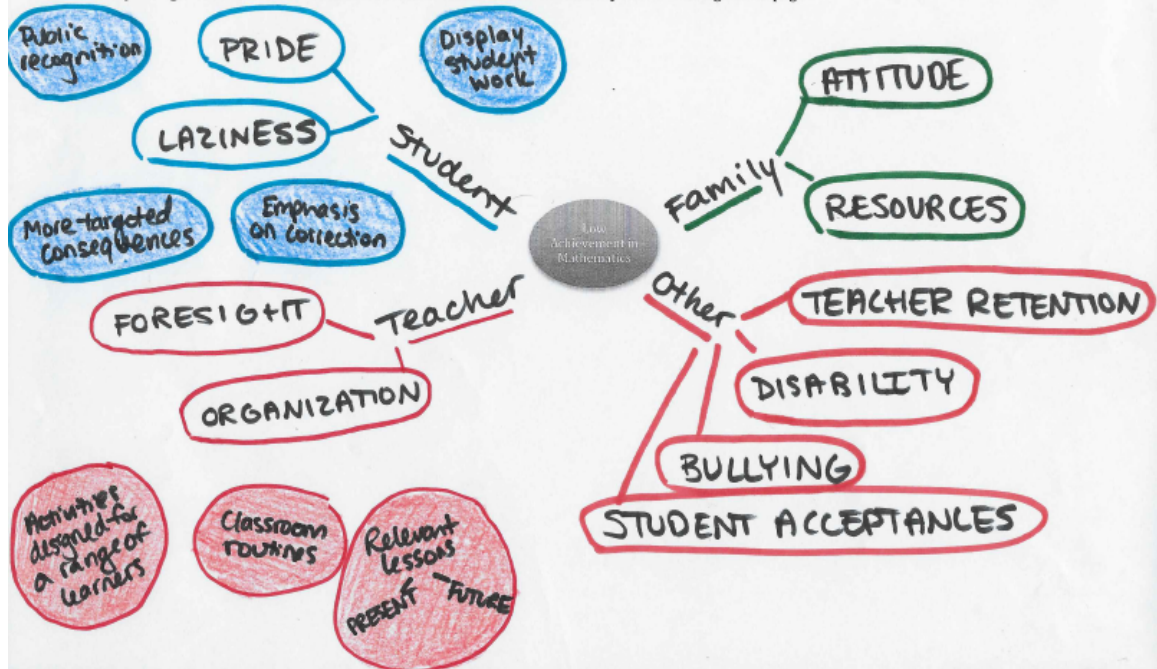


Figure 5. Graphic elicitation completed by Participant 10.

Along similar lines, Participant 7 identified teachers who move too quickly through material and instruction and teachers who only present the concepts one way as factors related to low mathematics achievement, as seen in Figure 6.

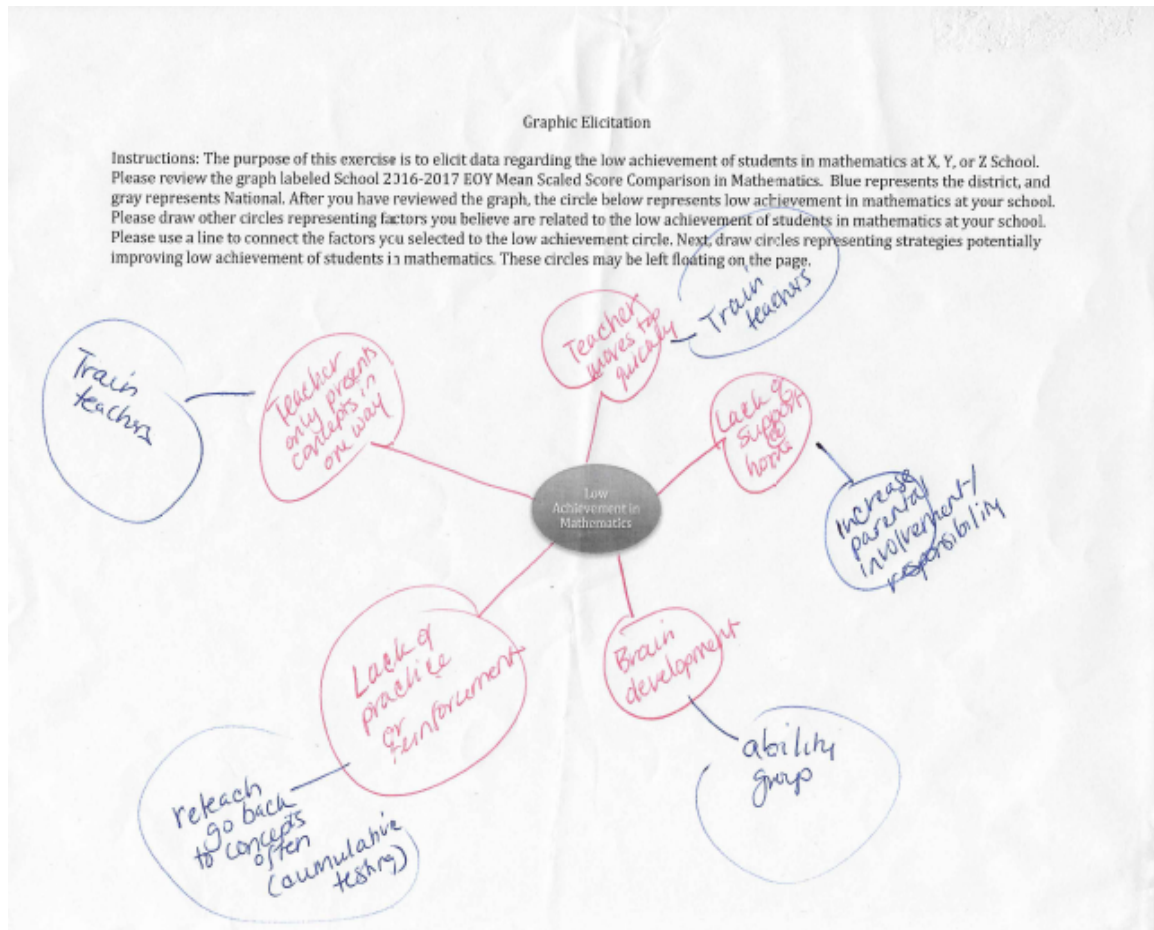


Figure 6. Graphic elicitation completed by Participant 7.

Additionally, a participant shared a story from her experiences that represented why she believed teacher quality was a factor related to the low achievement of students:

Well, I had an interest and experience with physics in high school. I did fine in the class, and then got a 1 on my AP test. So what I found out at the end of the year is I really didn't know anything about physics. And then in college I had an amazing physics professor, and I had 100% in the class. So what I learned was it wasn't an issue with me. It was an issue of delivery. And I think that that comes into my classroom a lot, because I might be teaching something one way that's failing a

group of students that they need to see it in a different way, or I need to be that college physics teacher instead of that high school physics teacher for that student, being flexible.

Along similar lines, another participant shared her struggles to understand and teach the language in mathematical terms and how the operations have changed over the years:

Language is a big one. A lot of the new textbooks and the new curriculum have different language than even when I grew up using mathematical terms, so it's sometimes hard for me to realize what they're talking about, and I can't imagine how easy it is for the kids, if I can't understand sometimes. That's a big one, and just the way that there's so many different ways how to solve problems, and I feel like the kids get confused with the different ways and which one works best for them, so that's the biggest one.

The data yielded by this study provided strong evidence that these teachers perceive a connection between teacher quality and student achievement. Participants who referenced standards-based instruction during their interviews received higher scores on their classroom observations in the categories of Lesson Design & Implementation and Content on the Reformed Teacher Observational Protocol (Sawada et al., 2000). During their observations, those teachers received scores of “very descriptive” – the highest score on the protocol – and had a higher rating of overall reform in their teaching (Sawada et al., 2000, p. 32). The data gathered through teacher perceptions suggests a connection between teacher performance and higher ratings of reform in teaching. Figure 7 below displays the indicators in the categories of Lesson Design & Implementation and Content

on the Reformed Teacher Observation Protocol.

III. LESSON DESIGN AND IMPLEMENTATION

| | | Never Occurred | Very Descriptive | | | |
|----|--|----------------|------------------|---|---|---|
| 1) | The instructional strategies and activities respected students' prior knowledge and the preconceptions inherent therein. | 0 | 1 | 2 | 3 | 4 |
| 2) | The lesson was designed to engage students as members of a learning community. | 0 | 1 | 2 | 3 | 4 |
| 3) | In this lesson, student exploration preceded formal presentation. | 0 | 1 | 2 | 3 | 4 |
| 4) | This lesson encouraged students to seek and value alternative modes of investigation or of problem solving. | 0 | 1 | 2 | 3 | 4 |
| 5) | The focus and direction of the lesson was often determined by ideas originating with students. | 0 | 1 | 2 | 3 | 4 |

IV. CONTENT

Propositional knowledge

| | | | | | | |
|-----|---|---|---|---|---|---|
| 6) | The lesson involved fundamental concepts of the subject. | 0 | 1 | 2 | 3 | 4 |
| 7) | The lesson promoted strongly coherent conceptual understanding. | 0 | 1 | 2 | 3 | 4 |
| 8) | The teacher had a solid grasp of the subject matter content inherent in the lesson. | 0 | 1 | 2 | 3 | 4 |
| 9) | Elements of abstraction (i.e., symbolic representations, theory building) were encouraged when it was important to do so. | 0 | 1 | 2 | 3 | 4 |
| 10) | Connections with other content disciplines and/or real world phenomena were explored and valued. | 0 | 1 | 2 | 3 | 4 |

Procedural Knowledge

| | | | | | | |
|-----|--|---|---|---|---|---|
| 11) | Students used a variety of means (models, drawings, graphs, concrete materials, manipulatives, etc.) to represent phenomena. | 0 | 1 | 2 | 3 | 4 |
| 12) | Students made predictions, estimations and/or hypotheses and devised means for testing them. | 0 | 1 | 2 | 3 | 4 |
| 13) | Students were actively engaged in thought-provoking activity that often involved the critical assessment of procedures. | 0 | 1 | 2 | 3 | 4 |
| 14) | Students were reflective about their learning. | 0 | 1 | 2 | 3 | 4 |
| 15) | Intellectual rigor, constructive criticism, and the challenging of ideas were valued. | 0 | 1 | 2 | 3 | 4 |

Figure 7. Lesson Design & Implementation and Content on the Reformed Teacher Observational Protocol (Sawada et al., 2000).

Another participant provided an example of extending an activity based on the standards. The participant shared experiences that she believed linked teacher quality to the low achievement of students:

That's a loaded question, because there are lots of reasons kids can be struggling. Were they taught well previously, to them getting here? What are their experiences in math? Have they had hands-on experience learning math? Is their teacher presenting the concept in more than one way? Is the teacher educated in how to teach math? Are we just teaching concepts or are we applying what we're learning? Because that's a big problem, and I think, like I was doing a lesson earlier, we were doing median, mode, and range. I generally don't teach my second graders that, but because we're so far ahead of them, and it's in the common core, we are not common core. ADW has their own standards. But I thought, "Why not, these kids are smart." I could give them data, and they understood it, but when it came to applying it in a situation where they have the line plot, it looked like, "I don't get it. I can't read it." It was a little ahead of where they are. But it's the application. Are we assessing them on? Can they apply what they're learning?

An additional participant who scored high on the Reformed Teacher Observational Protocol in the areas of Lesson Design & Implementation and Content (Sawada et al., 2000) discussed how she does not follow the textbook:

Yeah. Absolutely. I don't teach very much out of the book. I like to do my own handwritten notes and copy them for the students and showing them the baseline concepts and rules. And then we apply that out to a lot of IXLs. They do a lot of

work with technology, and I think that addresses a big group of students in terms of need, like need to interact and have that immediate feedback when they're working. I also assign a lot of video lectures for homework, not my own but watch this YouTube video and take notes on it, because, number one, they're going to see that in high school. It's not going away, that concept of a flipped classroom. But also students can go at their own pace. So they can pause the video if they don't understand it.

Curricular Referencing

The participants in this study made a number references to the curriculum. For example, the limited time period allotted to mathematics was a dominant concern for second- to fifth-grade mathematics teachers, and they described the challenges of teaching mathematics in one instructional period. The amount of time prearranged for mathematics classes creates a disadvantage for students. This deficiency in the curricular implementation was a prevalent theme in Participant 5's description of the factors related to the low achievement of students in mathematics, as evidenced in Figure 8.

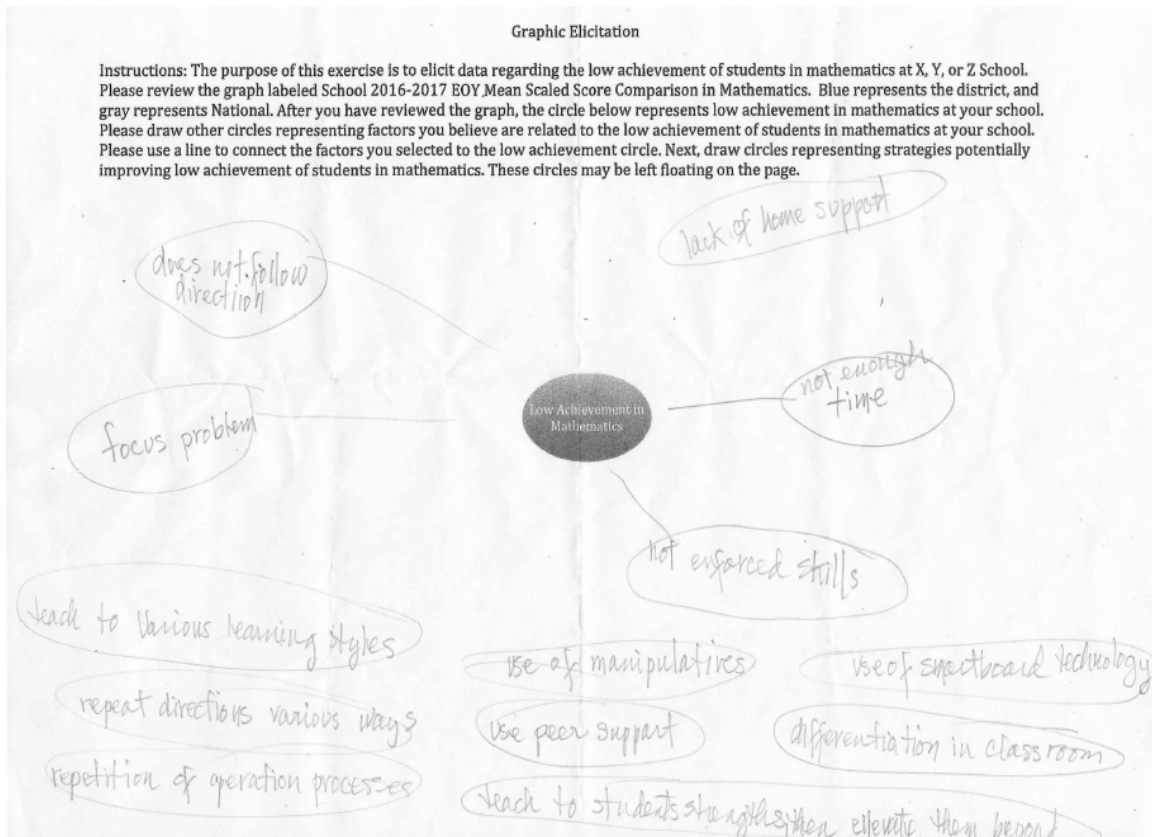


Figure 8. Graphic elicitation completed by Participant 5.

In regards to the time allotted for mathematics instruction, Participant 5 said: “We only teach Math 50 minutes per day. If we have a school mass, we always miss Math because it is the same time period.”

Another participant shared a story about why she believed the restricted educational period was a factor related to the low achievement of students:

We're talking about Blue Ribbon, and we're looking at reading, and our reading scores have historically always been very high. Oh, can I talk about a strategy?

"Look at how high these reading ... " The reading Scantrons were very high. So I said, "Can I steal time from reading?" Because I teach social studies, and I teach it

like it is a reading class. It has every component. It has vocabulary, it has fluency, it has comprehension. And, the wonderful thing about the comprehension is it has critical thinking skills, and I stress them. So I felt like I was never ... I was always delivering reading. I think this is the way I posed it. "I will still be teaching reading every day, but I want to take afternoon reading time," and like a month before Scantron, I've done this for years. I start to do a group math class. We never have enough time. It is math in particular, because my two math classes are in the morning. Every time we have a Every time we have a mass it's my two math classes. They're decimated. They're decimated.

In addition to the limited time allotted for the mathematics department, participants expressed the desire to teach basic concepts. Basic math facts will fortify mathematics comprehension in their inadequate instructional period. Two participants illustrated these ideas in their graphic elicitations, as seen in Figure 9 and Figure 10.

Graphic Elicitation

Instructions: The purpose of this exercise is to elicit data regarding the low achievement of students in mathematics at X, Y, or Z School. Please review the graph labeled School 2016-2017 EOY Mean Scaled Score Comparison in Mathematics. Blue represents the district, and gray represents National. After you have reviewed the graph, the circle below represents low achievement in mathematics at your school. Please draw other circles representing factors you believe are related to the low achievement of students in mathematics at your school. Please use a line to connect the factors you selected to the low achievement circle. Next, draw circles representing strategies potentially improving low achievement of students in mathematics. These circles may be left floating on the page.

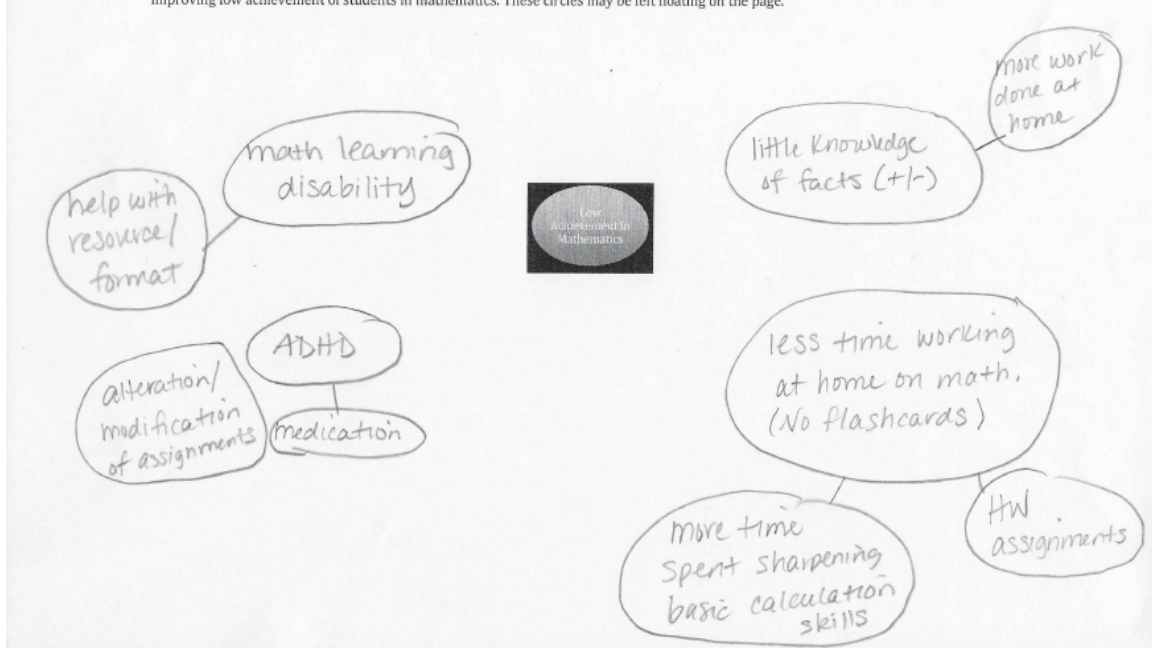


Figure 9. Graphic elicitation completed by Participant 9.

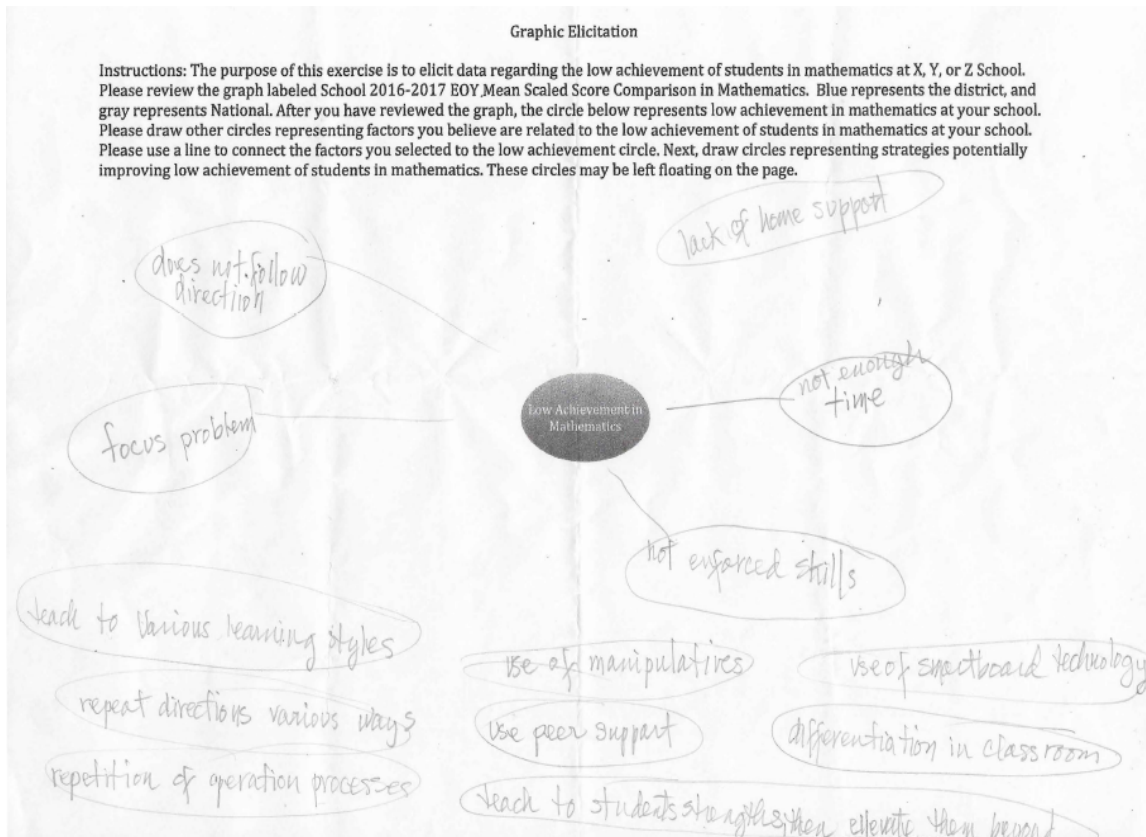


Figure 10. Graphic elicitation completed by Participant 5.

Participant 5 discussed the need to help students develop their understanding of basic math concepts:

You're not drilling on all of the additions that can equal 10, or your times tables. You are not learning your times tables, you're using them. All of a sudden, you're using skills. You're using your skills that you drilled to be able to do problems that are focusing on a certain math concepts. But if a student doesn't know those. If they come into 4th grade not knowing their times tables. They had a problem. "Well, I can't do this because I can't do this division problem: 121 divided by 11, because I'm not sure how to divide by a two-digit number. I can't remember, or I

don't know." Well, that's a basic fact. That was popcorn math. That answer should have been popping up.

Another participant offered her viewpoint about basic math facts and how enriching students' development of foundational skills will strengthen their mastery in mathematical operations:

So I find that those students that are low achievers, they haven't got those solid skills. So math is one of those things that you build on, so if you don't have ... If they don't have addition skills, they can't really ... It's going to be really hard to multiply. If you really don't learn these facts, it's going to be harder down the road. And I find that I have a student in my class who at the beginning of the year, she couldn't count to 100. And it's been very hard for her to add because she couldn't count to 100. She has to rely a lot on her number line and things to help her.

Another participant confirmed that knowledge of basic math facts was a major factor related to low mathematics achievement:

Not knowing their basic math facts, both addition and subtraction. Then that leads into the multiplication and the division. That basic foundation of knowing addition math facts by heart quickly, without using your fingers.

Across second through fifth grade, math facts were identified as an area of concern, from addition to subtraction and multiplication to division. One participant stated:

I mean, right now, since we're dealing with regrouping, I would just say, just forgetting to add that one, but I think once we move into multiplication, it's just

going to be knowing your facts. Just like quickly, four plus four equals this, you know, just.. Sometimes, I wouldn't say across the board, but I mean, a couple of them have been struggling and I just consistently say “just study your facts, study your facts, study your facts,” because when you get to multiplication, they're going to have to know them.

Additionally, a participant shared a story about why ill-prepared students have difficulty building the skills to recognize numbers in thousands or completing multiplication and division:

For example, I have a child this year who could not count. Couldn't read double digit numbers. So then, to go forward from there, when I have to jump right into recognizing numbers in thousands, or I have to jump all the way, like I said, to multiplication and division. To go to a child who then can't count, that, and was in a teacher before me class, that is difficult. That child, to me, does not seem like they were-Throughout the years that I have been here, I've seen that multiple times. It doesn't mean that's the only reason that the children might come in low. Their addition and subtraction, they need to know them. We take a one minute testing every day. They were not taught subtraction last year, for whatever reason. So that's just a skill that is an example of a skill, that addition and subtraction, when I need to get them to regrouping addition and subtraction, that's very difficult to me.

The mathematics curriculum, combined with the limited instructional time allotted for it, is noticeably on an unequal playing field compared to its testing counterpart, language arts. At School X, language arts has an hour and 30 minutes of

daily instruction compared to 50 minutes of instruction in mathematics. Also, it is evident language arts are taught across the curriculum in social studies, science, mathematics, and religion. When math standards are taught across the curriculum, there is overwhelming success. Table 12 shows 95% skill attainment by fourth graders at X school when students are tested on cross-curricular math standards such as tables, bar graphs, double bar graphs, and pictographs. These items are in the science, language arts, and social studies curriculum.

Table 12

Scantron 2016-2017 Mathematics Standards 4th Grade Results at X School

| Unit | Standard | Attained | Not Attained |
|-----------------------------|--|----------|--------------|
| Algebra | The learner will determine missing or extraneous information in problem solving scenarios. | 7 | 22 |
| Data analysis & probability | The learner will interpret the remainders in multi-step real world problems. | 3 | 26 |
| | The learner will be able to represent data using tables, bar graphs, and pictographs. | 26 | 3 |
| Data analysis & probability | The reader will be able to read a double bar graph. | 28 | 1 |

One participant discussed this phenomenon:

It's not enough time. It is not enough time. Parents have to be our partners at home. I give the weekly timed tests so that they're up on their facts, because by the time they're in this group in second grade, we don't have time to be counting on our fingers seven plus three, and eight plus two. I give them the weekly timed test, and we build on that on Fridays. They don't do well, it gets averaged into their grades. The parents have to accept that. If you're not going to work with them, IXL, or not IXL, but xtramath.com or a few aren't doing the flashcards, if you're not helping your kid at home, it's going to be reflected in their grade.

Cultural Referencing

The participants in this study made a number references to cultural elements of learning. For example, they described the challenges evident among English-language learners and their parents. The increased enrollment of English-language learners at School X and Y has been attributed as a factor in the low achievement of students in mathematics. These students receive less support from their parents due to the cultural disconnect with the content, and this has led to a drop in scores for these students. One participant explained:

If I know ... First of all, what you know about their background. If you know that a student is not receiving a lot of support at home ... Some students do. Some students have a tutor even. Or, I know that if there's a missing link by the time they walk out of the classroom, I know that support at home is going to take them back to the first lesson and reinforce it. But you have students that that doesn't

happen. You know there is no support at home. I know that I have to be ... I have to do everything.

Additionally, another participant shared a story about why she believed the lack of support at home is a factor related to the low achievement of students:

Well, sometimes they'll come back with their homework not done, or I find that those kids that don't do their homework, or ... I really push them to learn their addition facts now by rote multiplication. Not multiplication. I'm sorry, addition. And because as we become further down, they really need to know that, and really not rely on their fingers, and their number lines and things. And I find that those kids that they don't go home and practice because their parents maybe work a lot, or aren't home....

Another participant shared an experience working with English-language learners at their school. She described the struggles the students have with the reading level of questions and the academic level of questions:

So we have students who don't speak English at home, that I think struggle with the level of the questions, the reading level of the questions. We have students who have maybe not done so well, and then last year we had a student who we finally implemented a reader for his Scantron, and his scores shot up. They speak Portuguese at home, and obviously he speaks English all day every day at school. I think it comes across on tests more as a little bit of test anxiety when they're reading those questions it all of a sudden becomes, I guess, more glaringly obvious that they they're not as familiar with the language.

This story provides evidence of the hardships students are exposed to when their parents do not speak or write the English language. Figure 11 illustrates such evidence as well.

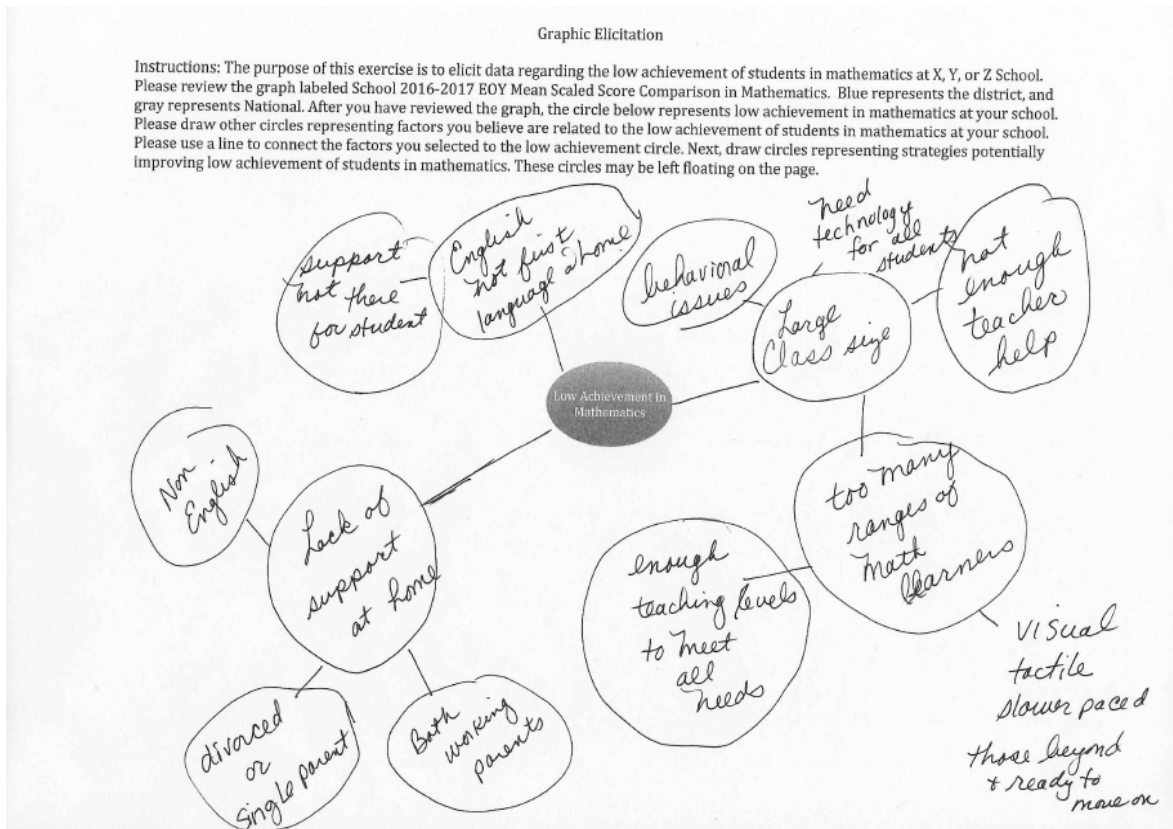


Figure 11. Graphic elicitation completed by Participant 2.

In addition to the lack of parental support in the content, ELL comprehension is a factor contributing to the drop in scores in mathematics. In the earlier grades the focus is on basic math concepts, but as students move from second to fifth grade, math success is related to the comprehension of multi-step word problems. As demonstrated in Table 11, seven out of 22 fourth grade students are unable to determine missing or extraneous

information in problem-solving scenarios on standardized tests. In addition, three out of 26 fourth grade students are unable to interpret the remainders in multi-step real world problems. Figure 12 shows a drop in Scantron scores in fourth grade, when multi-step word problems are in the curriculum at X School. A participant stated, “English-Language Learners are raised with a different language and struggle to pull apart word problems such as multi-step word problems in the fourth grade.” This data confirms the difficulty students have with multi-step word problems.

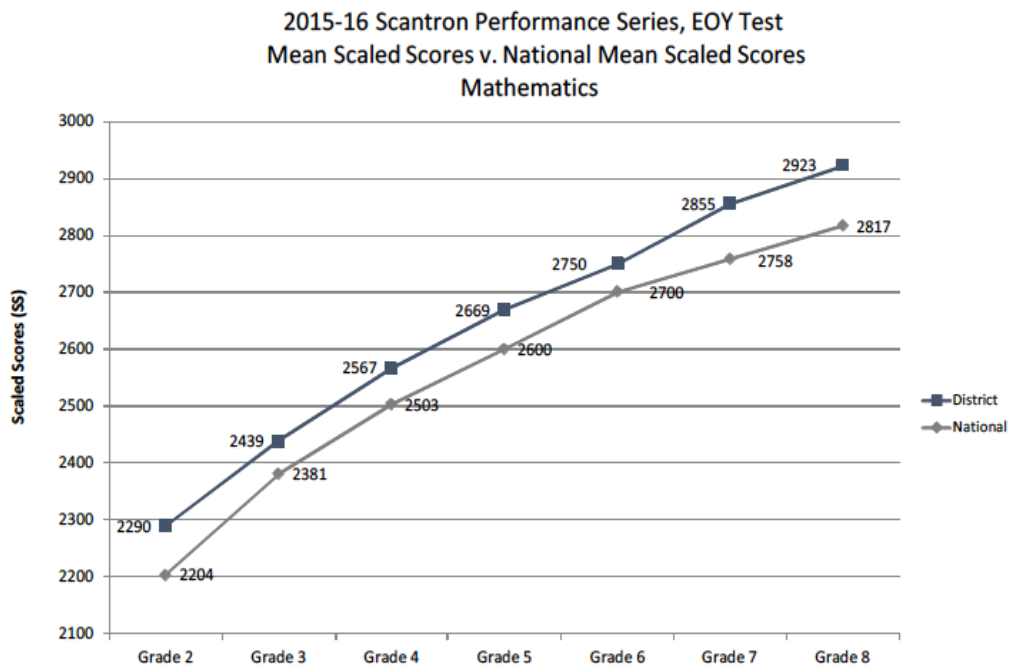


Figure 12. 2015-2016 Scantron Performance Series

Summary

The researcher was able to address the purpose of this qualitative case study by exploring Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. As a result of these findings, three major themes were discovered that tie directly into low mathematics achievement in Catholic elementary schools. These themes were teacher quality, curricular referencing, and cultural referencing. Teacher quality was a major theme was an unexpected finding in this study. Factors related to teacher quality cited by the participants included students being ill-prepared by their teachers in previous years, teachers moving too quickly through the curriculum, and teachers not teaching concepts in more than one way or not teaching content that would be tested. Alternatively, participants discussed being willing to extend teaching beyond the curriculum and the textbook in order to improve mathematics achievement. In regards to the curriculum, the participants cited lack of instruction time for mathematics and the need to focus more on building students' foundational math knowledge as factors related to low mathematics achievement. Cultural issues cited by participants included the added learning challenges for English language learners and a lack of support at home as factors related to low mathematics achievement.

The themes of teacher quality, curricular referencing, and cultural referencing are essential in evaluating current mathematics programs at the primary school level. Price and Ball (1997) note that, while legislation tends to encourage extensive reforms in the teaching of mathematics, current practices have remained unchanged in many schools across the country. These themes have overall implications for family, community,

leadership, school policy, and state policy.

Chapter 5

Discussion

This chapter begins with the overview and purpose of the research study. The researcher will discuss the findings in terms of their implications for family, community, leadership, school policy, and state policy. The researcher will then address recommendations for future research and conclusions.

Introduction

The purpose of this qualitative case study was to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. The three schools participating in this study have varying degrees of ethnic diversity and enrollment. In 2014, all schools in the archdiocese produced standardized test results well above the national average in reading in second through fifth grades (see Appendix A for district mean scaled scores versus national mean scaled scores in reading). In the same academic year, the gap between the national average and the district's second through fifth grade mathematics scores was significantly narrower (see Appendix B for district mean scaled scores versus national mean scaled scores in mathematics). The purpose of this qualitative case study is to explore Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States.

As a result of this study, three major themes emerged related to low mathematics achievement in second through fifth grades: teacher quality, curricular referencing, and cultural referencing. All themes were developed using initial and axial coding techniques.

The three dominant themes emerged from interviews of second through fifth grade Catholic elementary school teachers, classroom observations, and analysis of documents.

Implications

Family. The findings of this study align with the current research on the importance of home learning environments for children's early mathematics development (Crosnoe et al., 2010). The findings of this study indicate lack of home resources and lack of home support are major factors perceived by Catholic elementary school teachers as affecting mathematics achievement. During the interviews, multiple participants reflected on their struggles with the lack of home support their students seemed to have, and they described the challenges evident among English-language learners and their parents. The increased enrollment of English-language learners at School X and Y has been identified as a factor in the low achievement of students in mathematics.

McIlrath and Huitt's (1995) teaching-learning process model outlines indicators such as mothers' education, family income, number of books in the home, and academic expectations as elements of family life that affect student achievement. Decades later, the Coleman Report's (1966) assertion that the strongest predictor of student achievement is student and family characteristics in relation to their socio-economic level still holds true. Students' own beliefs and expectations about learning and their ability to do well in school, which are highly influenced by family, play a significant role in academic achievement (Ramirez, 2004). It is imperative that administrators and teachers continue to support families with resources to combat the lack of home resources and lack of home support. The recommendation of the researcher is for Catholic schools to pilot an academic drop-in-center at the school for families who lack home support for academic

readiness in mathematics. This pilot program would be available after school, and students would have the ability to attend to complete necessary work. The researcher has implemented a similar academic program at a Title I school. The program was designed for students qualifying for free and/or reduced lunch under federal guidelines. The academic drop-in-center implemented by the researcher targeted student performance on standardized state-mandated proficiency assessments. Students participating in the program increased academic achievement on state-mandated assessments.

Community. In terms of community, the size and region of a school are factors in the teaching and learning process that are directly linked to student achievement (McIlrath and Huitt, 1995). Schools with decreased enrollment are affected by limited operating expenses. Catholic schools with thriving enrollments are more successful in retaining quality teachers due to their prosperous operating budget. In addition, schools with successful school enrollments have the ability to provide more resources for their students. Bracey (1995) concurred that class size is significant, and Fowler's (1995) research indicated school size also impacts student achievement. An example of this took place at Z School. Z school had a successful school enrollment of 594 students enrolled in the 2017 school year. Since Z school was a two class per grade school at the primary level, all mathematics classes were leveled based on ability. Participants in the research study did not identify leveling as a factor of low achievement in mathematics. Further, the three participants observed at Z School had the highest overall rating on the Reformed Teacher Observational Protocol (Sawada et al., 2000). Additionally, the two participants with the highest degree earned were employed at Z School.

The data gathered suggests a connection between higher ratings of reform in

teaching and teacher quality. The implications for this study are significant for mathematics achievement in elementary schools. The three participants observed at Z School had the highest overall rating and displayed strong teacher characteristics. The implications of this study suggest teachers with education beyond an undergraduate degree score higher on the Reformed Teacher Observational Protocol (Sawada et al., 2000). This evidence will give school leaders a tool to use when hiring a potential candidate during their demonstration lesson in mathematics. Additionally, it will give school and district leaders reason to provide financial funding to teachers wishing to continue in their graduate degrees.

McIlrath and Huitt (1995) indicate that teacher characteristics, including knowledge, skills, and efficacy, can influence the classroom community. Research on pedagogical content knowledge was pioneered by Shulman (1986), who asserted that teachers need more than the ability to perform mathematical operations themselves in order to teach mathematics to students. Ball (1990, 1993) and Ball, Thames, and Phelps (2008) have continued this research, developing a model of mathematical knowledge for teaching that is very relevant to today's mathematics curriculum. Studies conducted by Ball, Hill, and Bass (2005) and Hill, Rowan, and Ball (2009) have confirmed the effectiveness of this approach to teaching mathematics in creating a beneficial learning community for students.

Research has demonstrated the need to move away from the traditional curriculum of lecture and memorization and toward more hands-on, cooperative, and complex learning experiences (Price & Ball, 1997). Ball (1993) asserted that teachers are responsible for producing a classroom environment that supports students while creating

opportunities for students to establish proficiency in mathematics. Thus, it is imperative for teachers in the primary grades to take on the challenge to improve the classroom environment in mathematics.

Leadership. The findings of this research regarding teacher quality and its impact on classroom community also have implications for those in school leadership positions. Educational leaders should evaluate current policies relative to the selection of qualified mathematics teachers in the primary grades. Administrators must take the factors related to teacher quality into consideration when making hiring decisions. The researcher recommends building principals use the Reformed Teacher Observational Protocol (Sawada et al., 2000) when hiring new teachers for elementary teaching positions. The protocol would provide a strong overall assessment of teachers' capacity for reform in their teaching (Sawada et al., 2000, p. 32). Even though a Catholic elementary school may not have a thriving enrollment with excess operating budget, the protocol would aid in hiring teachers that possess the ability to progress the success of mathematics at the elementary school level. The researcher will present the potential findings to all X, Y, and Z's schools staff, archdiocese board of education members, and central office administrators

School policy. Within the theme of curricular referencing, lack of instructional time was cited by many participants as a barrier to mathematics achievement. This obstacle was the most dominant theme that emerged from the participants' comments. To address this issue, the researcher recommends piloting a program to offer a double period or block in mathematics. This would afford teachers opportunities to make mathematics instruction more hand-on and cooperative, which research has demonstrated is more

effective than the traditional curriculum of lecture and memorization (Price & Ball, 1997). This recommendation would require substantial financial support from district and building administration for professional development. Teachers would require training on teaching mathematics in a double period.

State policy. State policies have the potential to impact student achievement in a variety of ways, most notably through assessment and monies. The challenges that were highlighted by this study's participants are all connected to the issue of school monies. The financial stability of a Catholic elementary school has major link to the curriculum, instruction, and school climate being offered to the school community. Schools with decreased enrollment have been affected by limited operating expenses. Catholic schools with thriving enrollments are more successful in retaining quality teachers due to their prosperous operating budget. The findings of this study have added to the already established data indicating a connection between schools with successful operating budgets and the quality of their teachers, and these factors impact mathematics achievement. State policies play a major role in school monies, which impact a school's ability to provide quality, knowledgeable instructors and assessments aligned to the curricular standards designed to increase academic achievement. Several studies have found that students in private schools perform better in mathematics when public funding is provided (Lefebvre, Merrigan, & Verstraete, 2009; Rouse, 1998).

It is imperative for the archdiocese and Catholic schools to continue the push to advocate for increased funding from federal and state bodies. Due to the challenges schools encounter, the Catholic schools must be fiscally responsible. Z School offers more academic resources than X and Y schools in mathematics due to its large student

enrollment. At Z School, all students requiring special education services and remedial services in mathematics are pulled out for additional classroom instruction. Catholic schools have to compete with the local public schools for teachers and the continued increase in salaries for their current staff. Schools with flourishing enrollments have the ability to provide unlimited resources to their student body. When there are inadequate school monies, it directly affects the services the school can provide.

Additionally, X and Y School receive Title II and Title III services. The schools receive outside tutoring services for English Language Learners who are selected based on their performance on an assessment. Also, the schools receive a financial allotment from the federal government for Title III professional development. Policymakers who recognize the findings from this study should see the need to extend Title III services to parents of English-Language Learners. It is evident parents who are non-native English speakers struggle with maintaining support for their children. This report's findings clearly outline the struggle exhibited by parents. The recommendation of the researcher is to pilot an academic drop-in-center similar to programs offered to Title I schools for families who are non-native English speakers who struggle to support their children with academic readiness in mathematics. This pilot program would be available after school, and students would have the ability to attend to complete necessary work.

Recommendations for Future Research

The topic of low mathematics achievement in primary grades in Catholic elementary schools across the United States warrants continued investigations. The findings of this study have established a connection between mathematics achievement and successful school enrollments, which positively affect the schools' operating budgets

and give schools the ability to hire quality teachers. Thus, a study to evaluate the perceptions of mathematics teachers in schools with successful enrollments is necessary. An investigation of whether schools with successful enrollments have teachers that possess mathematical knowledge for teaching would serve to deepen the understanding of the connection between teacher quality and enrollment as it relates to mathematics achievement. Ball, Hill, and Bass's (2005) research demonstrated that teachers who possess mathematical knowledge for teaching have the ability to make adjustments and self-correct their students while still maintaining a high level of content (Ball, Hill, & Bass, 2005).

Even though the study was conducted in three Catholic elementary schools, public schools would benefit from a study of the perceptions mathematics teachers hold about low mathematics achievement. A possible study in this area may include evaluating public and private standardized assessments. A future study could evaluate the effectiveness of and make comparisons between public and private elementary mathematics programs. The local public school system situated within the three Catholic elementary schools has been administering their standardized assessment, Partnership for Assessment of Readiness for College and Careers (PARCC), for three years. Therefore, there are only three years of data available on their assessment. A deeper evaluation of the perceptions of public school teachers that administer standardized assessments in the elementary grades is necessary; unfortunately, however, it will be difficult to make connections between standardized test scores since the public and private schools administer different standardized assessments.

Another major issue that was highlighted throughout the findings was a lack of instructional time. Therefore, it would be beneficial to examine perceptions of teachers about achievement in mathematics in schools that offer double or block periods in the primary grades. The research should focus on how schools address the lack of instructional time in mathematics. While the literature review of this study did not discuss lack of instructional time as a factor related to low mathematics achievement in elementary schools, the available evidence seems to suggest that lack of instructional time is a concern for primary grade teachers in this study.

It would also be valuable to understand the perceptions of Catholic school elementary building administrators about low mathematics achievement. A possible future study could evaluate the principals' role in overseeing the success of mathematics in their buildings. The recommendation of the researcher is for Catholic school principals' to maintain a connection to instruction of mathematics in their schools. Research has shown this leadership comes in the form of mentoring (Fluckiger, McGlamery, & Edick, 2006; Hellsten, Prytula, & Ebanks, 2009), professional development (Burch & Spillane, 2003), and positive relationships between teachers and administrators (Bickmore & Bickmore, 2010; Burch & Spillane, 2003; Mastropieri, 2001; Murphy, 2005; Schlichte, Yssel, & Merbler, 2006). In addition, Price and Ball (1997) stressed that district leaders are vital in the process of recruiting resources in order for reform to take place in mathematics education. The resources administrators can provide benefit all educators in establishing a climate of mathematics achievement for all students.

This study found a connection between mathematics achievement and English-language learners, but further research is necessary. School X and School Y indicated an increase in enrollment of English-language learners. The researcher recommends a pilot program at both of those schools to develop a professional learning community addressing the needs of English-language learners. The members of the professional learning community would guide the schools to effectively promote a successful academic environment. The professional learning community would be tasked with the responsibility to identify a new mathematics series, which will narrow the achievement gap for all learners.

These potential studies would continue to highlight the need to address the low mathematics achievement of students in Catholic elementary schools. Federal legislation to fund programs to improve academic achievement have existed for decades, from the Elementary and Secondary Education Act of 1965 to the ESSA today. These mathematics partnerships were designed to develop programs that would increase teachers' knowledge and skills in mathematics, develop rigorous mathematics curricula, and integrate technology into the curriculum (U.S. Department of Education, 2015). However, the achievement gap in mathematics still exists and continues to be a major topic of concern for educators and policy makers.

Ethical Considerations and Limitations

The Superintendent of Schools for the archdiocese granted approval for this study. After approval was granted, the researcher reviewed the appropriate code of ethics for his professional research association in order to avoid a violation of professional code of conduct (Creswell, 2009). In addition, the technique of conformability was used to

establish the acknowledgement that research is never objective and to eliminate researcher bias if at all possible to maintain credibility in the research process (Gasson, 2004). As the former principal of X school, the researcher was aware that participant responses may have been affected by his previous role at the school. At times it was evident during interviews that participants were reluctant to share more information relative to their colleagues or administrators. In order to remain impartial, the researcher reviewed all collected field notes with a particular focus on his worldviews. In addition, the researcher collaborated with participants by discussing emerging themes. The evidence collected was thoroughly examined in relation to the researcher's personal profile so any claim made during the research can be identified as unbiased (Rossman & Rallis, 2012).

Another limitation is that the research took place in one archdiocese located in one county. Even though the schools are ethnically diverse elementary schools, they are situated only 14 miles apart from each other. In addition, the schools participating in this study administer Scantron Performance Series to their students in Grades 2-8. This standardized test is a computer-adaptive assessment and has only been administered to the schools for the past three years. Therefore, only three years of similar standardized test data was available for this study. A challenge to this study was having complete access to data. As the former principal of X school, it was easier to conduct in-depth analysis of student performance on standardized assessments.

Another limitation is the limited research on the effects of attending Catholic Elementary Schools. The literature on mathematics achievement primarily addresses achievement in various public elementary schools, with current research into

mathematics achievement in Catholic schools focusing on high schools. This study attempts to make connections from the literature regarding mathematics achievement, but there is a major gap in the research on achievement in mathematics in Catholic elementary schools. Thus, this research will potentially fill a gap in evaluating mathematics achievement in Catholic elementary schools.

Conclusion

This chapter discussed the implication of this study's findings for family, community, leadership, school policy, and state policy. Recommendations for future research and conclusions are addressed relative to improving achievement in mathematics in Catholic elementary schools. This qualitative case study was significant because it addressed a direct need for improvement in Catholic schools. Multiple recommendations are made based on the perceptions of Catholic school teachers about the low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States.

Price and Ball (1997) note that, while legislation tends to encourage extensive reforms in the teaching of mathematics, current practices have remained unchanged in many schools across the country. This research study provided recommendations in line with reforms in federal legislation. Title II of ESSA (2015) funds nonprofit organizations such as Catholic schools "to support the implementation, replication, or expansion of effective science, technology, engineering, and mathematics professional development programs in schools across the State through collaboration with school administrators, principals, and STEM educators" (Pub.L. 114-95 § 2245). In addition, under ESSA, there is growing financial support to improve achievement in schools. Title II is a

provision in ESSA (2015) that addresses “preparing, training, and recruiting high-quality teachers, principals, or other school leaders” (Pub.L. 114-95 §§ 1177-113). It identifies the following major goals:

1. Increase student achievement consistent with the challenging State academic standards.
2. Improve the quality and effectiveness of teachers, principals, and other school leaders.
3. Increase the number of teachers, principals, and other school leaders who are effective in improving student academic achievement in schools
4. Provide low-income and minority students greater access to effective teachers, principals, and other school leaders. (ESSA, 2015, Pub.L. 114-95 § 2001)

To this end, this case study addressed the need to understand teachers’ views of low achievement in mathematics in the attempt to reform policies to improve achievement in mathematics.

The recommendations of this study aim to encourage Catholic school leaders and teachers to reflect on their educational programs to sustain their schools. The goal of the study was to halt the closing of Catholic schools by addressing mathematics achievement. This study provided recommendations for school leaders and teachers to increase student achievement in mathematics. The researcher has significant leadership experience in public and Catholic schools, which provided a unique point of view that was valuable for this study. The main challenge as an educational leader at a private school is the ability to financially support the academic needs of all of the students. In the traditional parish elementary school model, where the researcher served as a building principal, less than

25% of the school's income comes from the church and a little more than 60% comes from tuition and fees (Bimonte, 2004). The school community is responsible for fundraising to generate the difference of income, which usually accounts for 15% of the overall school income. One of the primary goals of a school leader is to be creative in developing programs that increase enrollment and increase revenue. These increases allow school leaders to provide additional resources for students.

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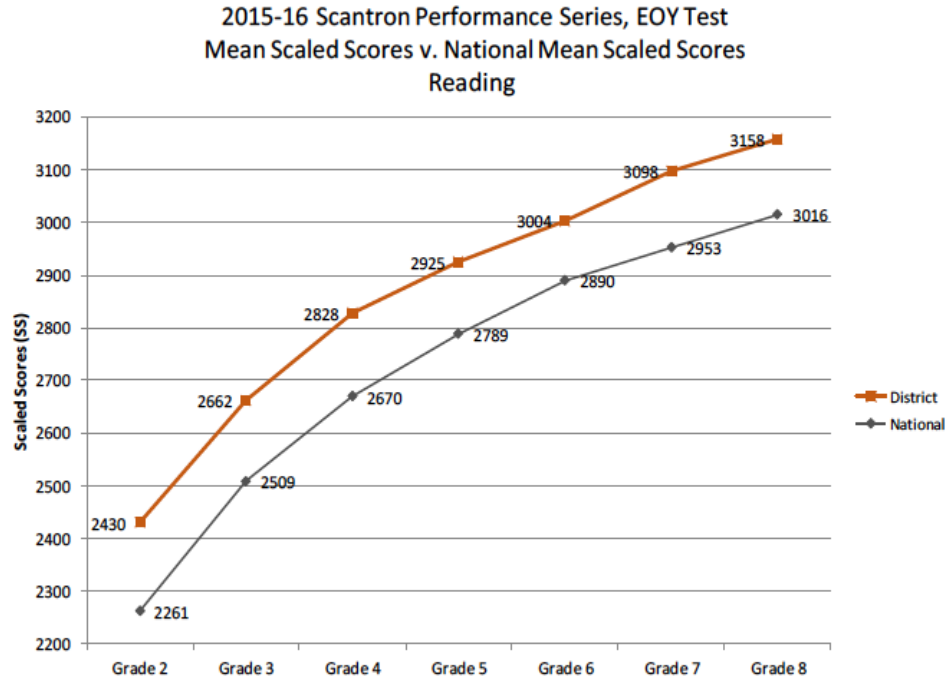
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Appendix A

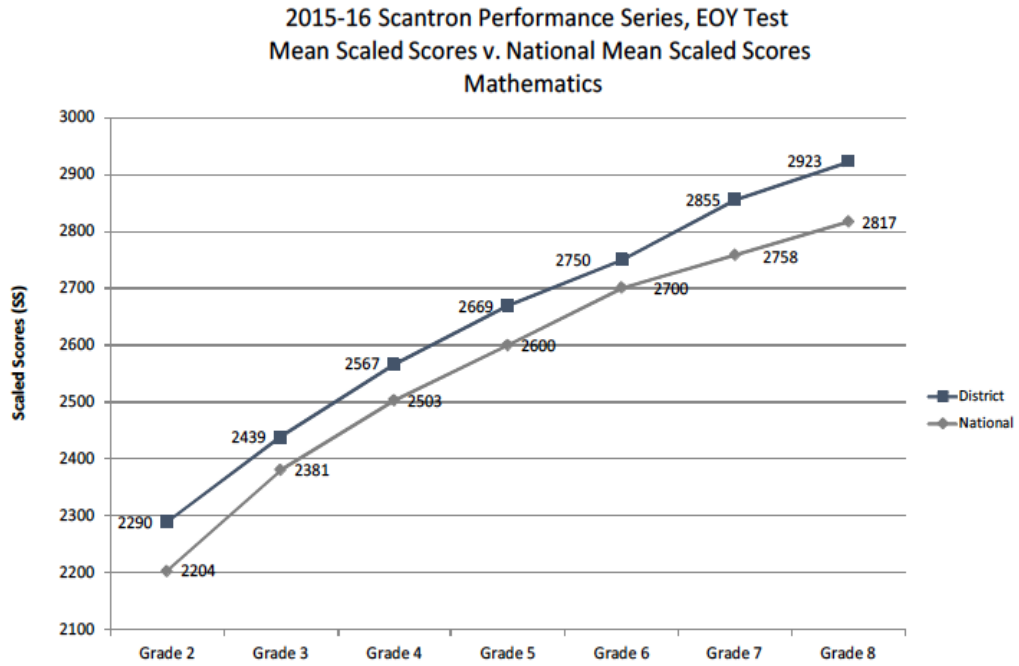
District Reading Scaled Scores



- 30 -

Appendix B

District Mathematics Scaled Scores



- 26 -

Appendix C

Scantron Performance Series Reading and Mathematics National Mean Scale Score at 85th Percentile/National Blue Ribbon Eligibility Requirements

| Grade | Mathematics Mean Scale Score at 85th Percentile | Reading Mean Scale Score at 85th Percentile |
|-------|---|---|
| 2 | 2309 | 2494 |
| 3 | 2461 | 2663 |
| 4 | 2591 | 2786 |
| 5 | 2687 | 2897 |
| 6 | 2756 | 2986 |
| 7 | 2843 | 3059 |
| 8 | 2911 | 3105 |

Appendix D

School Mission Statements

School X

The mission of X School is to educate children in Christ-centered environment. Our students encounter the Living God through faith formation, prayer, and participation in the sacramental and liturgical life of the Church. We live the Gospel Values by spreading the message of love and service to each other and the extended community.

We are committed to the spiritual, intellectual, physical, emotional, and social growth of all of our students. We seek to integrate core, traditional, and emerging skills that cultivate and complement the students' God-given talents. We challenge each child to become a self-regulating and self-monitoring lifelong learner.

School Y

The mission of Y School is dedicated to the development of the whole child within a Catholic community of faith and academic excellence.

School Z

The mission of Z school is to provide the highest quality spiritual formation in an environment that is rooted in the Gospel of Jesus Christ and the teachings of the Roman Catholic Church. Toward this end, the administration, faculty, staff, and parents endeavor to live and learn in a community of faith where each individual is recognized, respected, and encouraged to grow. We strive for academic excellence through the creation of a strong curriculum. Z school is committed to the creation of a faith community educated to achieve academic success and to reach out to all people in faith and compassion to bring the message of Jesus Christ.

Appendix E

Interview Questions



Department of Educational Services and Leadership
College of Education
James Hall, 3rd Floor
201 Mullica Hill Road
Glassboro, NJ 08028
856-256-4755 phone
856-256-5677 fax

CATHOLIC SCHOOL TEACHERS' PERCEPTIONS OF FACTORS RELATED TO LOW MATHEMATICS ACHIEVEMENT: A QUALITATIVE CASE STUDY

Interview Protocol

I. Teacher's Knowledge

1. How do mathematics teachers describe their own teaching practice and philosophy regarding addressing the low achievement of mathematics?
2. How have teacher experiences contributed to the development and implementation of successful strategies regarding low achievement?
3. What influences a teacher's decision in the actions they take in their student's mathematical development?
4. How do mathematics teachers describe their experiences in working in 2nd -5th grades?

Describe their experiences with parents?
Describe their experiences with administrators?
Describe their experiences with colleagues?

5. What perceptions do mathematics teachers in grades 2 -5 hold about low mathematics achievement of students at X, Y, and Z's schools?
6. What factors do mathematics teachers in grades 2nd -5th characterize as related to the low achievement of students in mathematics at X, Y, and Z's schools?

II. Teacher's Behavior

7. What do teachers believe their roles in addressing the low achievement of students in mathematics at X, Y, and Z's schools?

Believe administration roles in addressing low achievement?
Believe parents roles in addressing low achievement?

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8. What perceptions do mathematics teachers hold about improving mathematics achievement in grades 2nd -5th at X, Y, and Z's schools?
9. What current teacher strategies do 2nd -5th grade mathematics teachers describe as improving low achievement of students in mathematics at X, Y, and Z's schools?

What administrator strategies are used to improve low achievement in mathematics?
What parent strategies are used to improve low achievement in mathematics?

III. Student Characteristics in Mathematics Achievement

10. What school-based factors inhibit the success of students in mathematics?

What non school-based factors inhibit the success of students in mathematics?

11. How would you describe the academic readiness of students as they enter your classroom at the start of the new academic school year?
12. How would you describe the overall size of your mathematics classroom?

Do you feel you meet the academic needs of each student?

13. Do you perceive changes in students' attitudes towards math since entering your class?
14. Could you describe your students' characteristics towards mathematics?

Are students' motivated to participate in mathematics lessons?
Are you aware of their learning styles?

IV. School Policies relative to Mathematics Achievement

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15. What are the roles of district and elementary administrators in improving mathematics achievement?
16. Does the math curriculum/textbook offered in your classroom affect students with different characteristics?
17. Are student performances affected by the implementation of the math curriculum/textbook?
18. What classroom resources do you use in daily planning of lessons? Are there resources you would like to incorporate in your daily lesson plans?
19. What opportunities do you have to participate in school based professional development?

What opportunities do you have to participate in mathematics based professional development?

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Appendix F

Graphic Elicitation



Department of Educational Services and Leadership
College of Education
James Hall, 3rd Floor
201 Mallica Hill Road
Glassboro, NJ 08028
856-256-4755 phone
856-256-5677 fax

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Graphic Elicitation

Instructions: The purpose of this exercise is to elicit data regarding the low achievement of students in mathematics at X, Y, or Z School. Please review the graph labeled School 2016-2017 EOY Mean Scaled Score Comparison in Mathematics. Red represents your school, blue represents the district, and green represents National. After you have reviewed the graph, the circle below represents low achievement in mathematics at your school. Please draw other circles representing factors you believe are related to the low achievement of students in mathematics at your school. Please use a line to connect the factors you selected to the low achievement circle. Next, draw circles representing strategies potentially improving low achievement of students in mathematics. These circles may be left floating on the page.

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Appendix G

Reformed Teaching Observation Protocol (RTOP)

(Sawada et al., 2000)



Department of Educational Services and Leadership
College of Education
James Hall, 3rd Floor
201 Mullica Hill Road
Glassboro, NJ 08028
856-256-4755 phone
856-256-5677 fax

CATHOLIC SCHOOL TEACHERS' PERCEPTIONS OF FACTORS RELATED TO LOW MATHEMATICS ACHIEVEMENT: A QUALITATIVE CASE STUDY

Appendix I Reformed Teaching Observation Protocol (RTOP)

Daiyo Sawada Michael Pitum
External Evaluator Internal Evaluator

and

Kathleen Falconer, Jeff Tarley, Russell Senford and Irene Bloom
Evaluation Facilitation Group (EFG)

Technical Report No. N00-1
Arizona Collaborative for Excellence in the Preparation of Teachers
Arizona State University

I. BACKGROUND INFORMATION

Name of teacher _____ Announced Observation? _____
(yes, no, or explain)

Location of class _____
(district, school, room)

Years of Teaching _____ Teaching Certification _____
(K-6 or 7-12)

Subject observed _____ Grade level _____

Observer _____ Date of observation _____

Start time _____ End time _____

II. CONTEXTUAL BACKGROUND AND ACTIVITIES

In the space provided below please give a brief description of the lesson observed, the classroom setting in which the lesson took place

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 College of Education
 James Hall, 3rd Floor
 201 Mullica Hill Road
 Glassboro, NJ 08028
 856-256-4755 phone
 856-256-5677 fax

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Record here events that may help in documenting the ratings.

| Time | Description of Events |
|------|-----------------------|
| | |

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III. LESSON DESIGN AND IMPLEMENTATION

| | | Never Occurred | Very Descriptive |
|----|---|----------------|------------------|
| 1) | The instructional strategies and activities respected students' prior knowledge and the preconceptions inherent therein. | 0 | 1 2 3 4 |
| 2) | The lesson was designed to engage students as members of a learning community. In this lesson, student exploration preceded formal presentation. | 0 | 1 2 3 4 |
| 3) | This lesson encouraged students to seek and value alternative modes of investigation or of problem solving. | 0 | 1 2 3 4 |
| 4) | The focus and direction of the lesson was often determined by ideas originating with students. | 0 | 1 2 3 4 |

IV. CONTENT

| Proportional knowledge | | | |
|------------------------|---|---|---------|
| 6) | The lesson involved fundamental concepts of the subject. | 0 | 1 2 3 4 |
| 7) | The lesson promoted strongly coherent conceptual understanding. | 0 | 1 2 3 4 |
| 8) | The teacher had a solid grasp of the subject matter content inherent in the lesson. | 0 | 1 2 3 4 |
| 9) | Elements of abstraction (i.e., symbolic representations, theory building) were encouraged when it was important to do so. | 0 | 1 2 3 4 |
| 10) | Connections with other content disciplines and/or real world phenomena were explored and valued. | 0 | 1 2 3 4 |

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College of Education
James Hall, 3rd Floor
201 Mullica Hill Road
Glassboro, NJ 08028
856-256-4755 phone
856-256-5677 fax

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Continue recording salient events here.

| Time | Description of Events |
|------|-----------------------|
| | |

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V. CLASSROOM CULTURE

| | Communicative Interactions | Never Occurred | Very Descriptive |
|--------------------------------------|---|----------------|------------------|
| 16) | Students were involved in the communication of their ideas to others using a variety of means and media. | 0 | 1 2 3 4 |
| 17) | The teacher's questions triggered divergent modes of thinking. | 0 | 1 2 3 4 |
| 18) | There was a high proportion of student talk and a significant amount of it occurred between and among students. | 0 | 1 2 3 4 |
| 19) | Student questions and comments often determined the focus and direction of classroom discourse. | 0 | 1 2 3 4 |
| 20) | There was a climate of respect for what others had to say. | 0 | 1 2 3 4 |
| Student/Teacher Relationships | | | |
| 21) | Active participation of students was encouraged and valued. | 0 | 1 2 3 4 |
| 22) | Students were encouraged to generate conjectures, alternative solution strategies, and ways of interpreting evidence. | 0 | 1 2 3 4 |

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Appendix H

Informed Consent Form



Department of Educational Services and Leadership
College of Education
James Hall, 3rd Floor
201 Mallica Hill Road
Glassboro, NJ 08028
856-256-4755 phone
856-256-5677 fax

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Informed Consent for Interviews or Interviews with Record Reviews (Expedited Review with Identifiers)

Please read this consent document carefully before you decide to participate in this study.

You are invited to participate in a research study about understanding Catholic school teachers' perceptions of factors related to low mathematics achievement in second through fifth grade at three Catholic elementary schools in the Eastern United States. This study is being conducted by researchers in the Department of Teacher Education at Rowan University. The Principal Investigator of the study is Dr. Carol Thompson and the Co-Investigator is Andrzej Piotrowski.

Participation in this study is voluntary. If you agree to participate in this study, you would be interviewed for about 60 minutes. The number of participants in the study is 12, 2nd through 5th grade mathematics teachers. The participants will be asked to respond to questions regarding low mathematics achievement in grades 2nd through 5th grades.

There is little risk in participating in this study; after the interview, you may be asked to meet one additional time to review data from the interview transcripts to confirm accuracy. Your identity will be kept confidential to the extent provided by law. Your information will be assigned a code number that is unique to this study. No one other than the researchers would know whether you participated in the study. Study findings will be presented only in summary form and your name will not be used in any report or publications.

Participating in this study may not benefit you directly, but it will help us learn about the factors related to low mathematics achievement in second through fifth grades. Your participation in this study is completely voluntary. If you choose not to participate in this study, this will have no effect on the services or benefits you are currently receiving. You may skip any questions you don't want to answer and withdraw from the study at any time without consequences.

If you have any questions about this study, please contact Dr. Carol Thompson thompsonc@rowan.edu or Andrzej Piotrowski at apiotrowski@haziel.org. If you have questions about your rights as a research participant, please contact the Rowan University SOM IRB Office at (856) 566-2712 or Rowan University Glassboro/CMSRU IRB at 856-256-4078.

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 College of Education
 James Hall, 3rd Floor
 201 Mallica Hill Road
 Glassboro, NJ 08028
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YOU WILL BE GIVEN A COPY OF THIS FORM WHETHER OR NOT YOU AGREE TO PARTICIPATE.

**ROWAN UNIVERSITY INSTITUTIONAL REVIEW BOARD
 AUDIO/VIDEOTAPE ADDENDUM TO CONSENT FORM**

We are asking for your permission to allow us to audiotape the interview as part of that research study.

The recording(s) will be used for analysis of data from the interview.

The recording(s) will include only information and will not include your name or position.

The recording(s) will be stored on a flash drive. It will be stored in a locked cabinet and linked with a code. The recordings will be retained and destroyed upon completion of the study.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Social and Behavioral IRB Research Agreement

I have read the procedure described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.

Name (Printed) _____

Signature: _____

Date: _____

Principal Investigator: _____ Date: _____

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Appendix I

Demographic Questionnaire



Department of Educational Services and Leadership
College of Education
James Hall, 3rd Floor
201 Mallia Hill Road
Glassboro, NJ 08028
856-256-4755 phone
856-256-5677 fax

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Demographic Questionnaire

Upon receiving a signature on the informed consent form the participants a questionnaire will be emailed to all participants. The questionnaire will request from all participants the following demographic information: gender, age range, years in education, years in Catholic school, years in position, highest degree earned, and graduate hours in mathematics. All participants' names will be kept confidential and will not be disclosed in the study.

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