

ABSTRACT

SCHULZ, DENISE LEE. A Qualitative Case Study of the Perceptions and Positioning of School-Based Elementary Mathematics Specialists in the Public School Environment. (Under the direction of Dr. Jennifer Ayscue).

The purpose of this study was to investigate the perceptions that teachers, administrators, and mathematics specialists held about the role and contributions of a school-based elementary mathematics specialist to the school community. The study was also focused on determining how the mathematics specialist was positioned in professional interactions. How a mathematics specialist is positioned within the elementary school community based on perceptions and expectations may influence the interactions the specialists will have with members of the school community. The effectiveness of the mathematics specialist in supporting a school's mathematics program may also be influenced by how they are positioned.

This qualitative study was conducted in a public, traditional K-5 elementary school with just over 500 students, in a suburban district. The participants in this study included district and school administration, the school-based elementary mathematics specialist, and 26 classroom teachers who taught mathematics. The site was purposefully selected because it employed an elementary mathematics specialist full-time, and the specialist only had duties at this site.

Data regarding the perception of the role of the mathematics specialist was collected through interviews of the mathematics specialist, teachers, and school and district administrators. Perception data was analyzed through constant comparative analysis to reveal four key themes: specialist as a developer, specialist as a facilitator, specialist as a provider, and specialist as a leader. Perceived functions of the role of the specialist correspond to each of the key themes. Interaction data to determine positioning was collected through observations of professional interactions between the mathematics specialist and teachers. Field notes and memos were also

kept throughout the data collection process. Positioning data was analyzed using guiding questions to determine how the participants were positioned in relation to each other, how the specialist positioned herself to the group, and how the group positioned the specialist. Professional interactions required the specialist to negotiate the positions of navigator, collaborative colleague, and instructor. The findings emphasized the complex, multi-faceted role of mathematics specialists in supporting teachers, students, and school-wide instructional improvement.

Implications for policy and practice and recommendations for future research have also been offered. Elementary mathematics specialists have the potential to benefit school-wide mathematics programs. A well-qualified mathematics specialist, whose role expectations are clearly defined and who is positioned effectively, may contribute to teacher growth and positive student outcomes.

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A Qualitative Case Study of the Perceptions and Positioning of School-Based Elementary
Mathematics Specialists in the Public School Environment

by
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A Dissertation submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Educational Leadership, Policy, and Human Development

Raleigh, North Carolina
2025

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DEDICATION

This is for my mom and dad, who instilled in me the value of education, empowered me to walk my own path, and taught me the importance of hard work and perseverance.

BIOGRAPHY

Denise Schulz has been an educator her entire professional career. She graduated from Lenoir-Rhyne University with a degree in Elementary Education and a minor in mathematics. Denise was an elementary classroom teacher for ten years. During that time, she continued her education and earned a master's degree in Special Education—Academically and Intellectually Gifted Education. With that degree, Denise was able to become an AIG specialist for her school district, serving students in a pull-out and consultation program. Denise returned to school and earned a master's degree as a Curriculum Specialist. Denise worked as an instructional coach for her district for four years. While she worked with all content areas, her primary focus was on mathematics education.

Following her work in school districts, Denise made the move to the North Carolina Department of Public Instruction as the Elementary Mathematics Consultant. She held that role for 11 years, providing support for North Carolina's 115 school districts in the implementation of the mathematics standards. She developed and facilitated professional learning opportunities, developed math content resources, and worked with districts on the implementation of legislation and school board policies. Denise served the state of NC as an educator for 26 years.

Denise joined the Charles A. Dana Center at the University of Texas at Austin as a Professional Learning and Implementation Specialist. She develops and facilitates professional learning opportunities and creates resources for teachers and leaders to catalyze school and district improvements that increase student success in mathematics. Denise designs and utilizes research-based tools and protocols to support the continuous improvement of districts and schools in the areas of high-quality curriculum and instruction, policy implementation, and educational leadership to ensure that all students receive a high-quality mathematics education.

ACKNOWLEDGMENTS

I would like to thank my family and friends for their continuous support in my efforts to attain a doctoral degree.

To my mom, Hyon Sik Schulz, thank you for always believing I can accomplish anything and providing support and encouragement my entire life.

To my friend and colleague, Lisa Ashe, thank you for the countless hours spent doing schoolwork together. I would not have made it through this program without your collaboration and support. Those weekend work sessions at Panera and countless phone calls and check-in were what kept this degree moving forward.

To my network of mathematics educators—classroom teachers, coaches, district leaders, professors, and colleagues— thank you for always being willing to listen to my ideas in mathematics education and offering valuable advice both professionally and academically. I am constantly amazed at the work you do for the students of this state.

Every woman should belong to group of strong women that support when needed, comfort in times of stress or grief, humor each other daily, and help each other grow. Michele, Krista, Gwen, Amy, Kat, Emily, and Melissa thanks for always being part of that group.

To Lisa, Kendall, and Lindsey, thank you for all the celebrations, commiserations, and advice.

Finally, thank you to my committee for your questions and feedback to keep me moving forward. And, a special thank you to my advisor, Dr. Jennifer Ayscue for your calm encouragement over the years. I am grateful for your expertise and continual support.

TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES	viii
Chapter 1: Introduction	1
Who are Elementary Mathematics Specialists?	2
Problem Statement	4
Purpose Statement and Research Questions	7
Positioning Theory	8
Significance of Study	9
Definition of Key Terms	10
Summary	11
Chapter 2: Review of Literature	12
Theoretical Framework	12
Positioning Theory	12
Positioning Triangle	13
Applications of Positioning Theory	15
Content Coaches	17
History and Development of the Elementary Mathematics Specialist Role	18
Role of the Elementary Mathematics Specialist as Content Coach	22
Required Skills of an Elementary Mathematics Specialist	24
Content Knowledge for Teaching Mathematics	26
Pedagogical Knowledge for Teaching Mathematics	28
Leadership Skills and Knowledge	30
Conceptual Framework	30
Summary	32
Chapter 3: Methodology	34
Research Design	34
Positionality Statement	35
Participants	36
Data Collection	38
Data Analysis	43
Procedures	43
Methodological Integrity	51
Delimitations and Limitations	52
Ethical Issues	53
Chapter 4: Findings	55
Summary of Methods	55
Participant and School Profiles	57
School Profile	58
Participant Biographies	59
Findings	62
Research Question 1: Perceptions	62

Research Question 2: Positioning	87
Summary	97
Chapter 5: Discussion	99
Summary of Findings.....	99
Research Question 1: Perceptions.....	99
Research Question 2: Positioning	100
Discussion of Findings.....	101
Reflections on Theoretical Framework.....	106
Discussion of Limitations	111
Implications for Policy and Practice	112
Implications for Policy.....	112
Implications for Practice	114
Recommendations for Future Research	115
Conclusion	117
References.....	119
Appendices.....	128
Appendix A: Informed Consent.....	129
Appendix B: Interview Protocol-Elementary Mathematics Specialist Interviews	132
Appendix C: Interview Protocol-School Leadership Interviews	134
Appendix D: Interview Protocol-Teacher Interviews.....	135
Appendix E: Interview Protocol-District Math Leader Interviews.....	137
Appendix F: Elementary Mathematics Specialist-Reflective Summary	137

LIST OF TABLES

Table 3.1	Data Collection Sources	39
Table 3.2	Data Collection Summary	42
Table 3.3	Collection Methods for Interaction Data.....	43
Table 3.4	Initial Coding for Interview Data-Includes Specialist Identity and Domains of Mathematics Coaching Knowledge.....	46
Table 3.5	In Vivo and Descriptive Codes Grouped by Specialist Identities and Perceptions of Participant Perceptions	47
Table 3.6	In Vivo and Descriptive Codes Grouped by Theme	48
Table 4.1	Summary of Participant Characteristics	59

LIST OF FIGURES

Figure 2.1	Positioning Triangle	14
Figure 2.2	Conceptual Framework for Studying Perceptions and Positioning of Elementary Mathematics Specialists in School Communities	31
Figure 3.1	Data Analysis Framework for Interaction Data	49
Figure 3.2	Interaction Data Analysis Example	50
Figure 5.1	Conceptual Framework for Studying Perceptions and Positioning of Elementary Mathematics Specialists in School Communities	107
Figure 5.2	New Conceptual Framework for Studying Perceptions and Positioning of Elementary Mathematics Specialists in School Communities	109

CHAPTER 1: INTRODUCTION

In many public elementary schools, content area specialists are employed to alleviate the need for general elementary teachers to be content experts. Elementary teachers tend to be generalists and may often lack a deep understanding of specific content knowledge in mathematics that a specialist could provide; therefore, having a content area specialist can take the burden off of classroom teachers to become content experts (Association of Mathematics Teacher Educators, 2013; Association of Mathematics Teacher Educators et al., 2010; Brobst & Markworth, 2019). Wu (2009) also explains that teachers in elementary school often lack the knowledge they need to teach mathematics with precision, reasoning, and coherence. Because elementary teachers must acquire a large amount of advanced knowledge for teaching reading, it is unrealistic to expect elementary teachers who are generalists to also possess a large amount of advanced mathematical content knowledge (Wu, 2009). To better support teacher understanding of mathematics content, mathematics education organizations have recommended the implementation of mathematics specialists, which will impact student achievement in mathematics (Association of Mathematics Teacher Educators et al., 2010; Association of Mathematics Teacher Educators, 2013; Conference Board of the Mathematical Sciences, 2010; National Council for Teachers of Mathematics, 2000; National Mathematics Advisory Panel, 2008; National Research Council, 1989).

Since content specialists could play a role in the success of the teachers and students in a school, it is important to investigate the role that a specialist, such as an elementary mathematics specialist, plays in the school environment. In this study, the mathematics specialist serves the school in the role of a content coach. How a specialist is perceived and positioned as a coach

may influence how the specialist is received and may determine what the specialist can contribute to a school's achievement.

In this chapter, I will provide an overview of the varying definitions of the elementary mathematics specialist. This chapter will also introduce the problem, research questions, purpose of the study, substantive content theory, and study significance. The chapter will conclude with a listing of key terms and definitions as well as a summary of the next chapters.

Who are Elementary Mathematics Specialists?

The major national mathematics education organizations—the Association of Mathematics Teacher Educators, the Association of State Supervisors of Mathematics, the National Council for Supervisors of Mathematics, and the National Council for Teachers of Mathematics—define elementary mathematics specialists as “teachers, teacher leaders, or coaches who are responsible for supporting effective mathematics instruction and student learning at the classroom, school, district, or state levels” (Association of Mathematics Teacher Educators, 2013; Association of Mathematics Teacher Educators et al., 2010, p. 1). Mathematics specialists are educators who work in leadership roles, most often with an advanced certification as a mathematics instructional leader, and mathematics specialists often find themselves in a gray area with regards to who they are and who they are not within the school environment (Hull et al., 2009). The overarching title of elementary mathematics specialist refers to educators who may work primarily with students and educators who work primarily with teachers. Regardless of the specific title or the population with which the specialist works, a robust understanding of mathematical content and pedagogy in elementary mathematics is imperative (Campbell & Malkus, 2014; Polly et al., 2013).

A specialist who works with students may fill different roles. The specialist could be a classroom teacher who teaches students directly. This type of specialist may also serve as a leader in mathematics education who provides support to other classroom teachers affecting students in multiple classrooms. In this role, the specialist is primarily a teacher who may have other duties. A specialist working with students may also be an interventionist. In this role, the specialist works with small groups of students providing remediation or additional support (McGatha & Ringleman, 2017). The focus of this study is on the school-based mathematics specialist who works with teachers. In this capacity, the specialist is often referred to as a coach. Hull et al. (2009) define a mathematics coach as “an individual who is well versed in mathematics content and pedagogy and who works directly with classroom teachers to improve student learning of mathematics” (p. 3). Specialists in the role of a coach are not classroom teachers, supervisors, or school administrators. Many coaches come into the role because they were strong classroom teachers and must shift their ways of thinking and how they do work in the coaching role (Hull et al., 2009). A school-based specialist, or coach, is located at a school rather than at the district level. The school-based specialist spends most of their working time in one school site rather than traveling to other sites in the district. I have chosen to focus on school-based mathematics specialists in the coaching role because the contributions they may make to a school community may differ from the contributions of a classroom teacher or an interventionist. Developing an in-depth description of the perceptions and positioning of the role could draw attention to the importance the role of the mathematics coach could play in the development of teacher content knowledge and student achievement.

Problem Statement

More and more school districts across the United States are utilizing mathematics specialists in the coaching role to improve mathematics instruction and to increase teacher learning of content knowledge (Cobb & Jackson, 2011; Sutton et al., 2011). However, how the role is designed varies widely (Cobb & Jackson, 2011; Conference Board of the Mathematical Sciences, 2010). Elementary mathematics specialists are employed by some districts and schools within the state of North Carolina and the roles and responsibilities for the specialists differ from district to district and school to school. Depending on the school, the specialist in a coaching role may also serve in a variety of ways, which could include leading professional development, mentoring, co-planning, or serving as the lead teacher for all mathematics classes (Conference Board of the Mathematical Sciences, 2010).

Mathematics specialists are often funded with Title I funds or local funding rather than federal or state funding. Title I funds are federal funds that supplement state and local education funding for low-income students “to provide all children significant opportunity to receive a fair, equitable, and high-quality education, and to close educational achievement gaps by allocating federal funds for education programs and services.” (National Center for Education Statistics, n.d., response 1). In schools where at least 40% of the student enrollment is from low-income families, the school can use Title I funds to operate school-wide programs that serve all children to raise the achievement of the lowest achieving students (US Department of Education, n.d.). In schools where Title I funds are designated for the whole school, the money can be used in a variety of ways, including extra professional training for teachers, purchasing one-on-one devices for students, or implementing new programs to enhance student engagement (Waters, 2021). Funding sources may play a role in this study because how a school funds the role could

impact the responsibilities the specialist will undertake. Schools with a dedicated mathematics coach paid through Title I funds may have additional responsibilities involving school improvement.

Prior research (Campbell & Malkus, 2011) established a conceptual framework for studying the impact of elementary mathematics specialists on teachers and the overall school mathematics program. In their framework, Campbell and Malkus (2011) presented a model that incorporated coaches and various forms of professional development that were distinct from coaching. The framework identifies variables that may explain the effect of elementary mathematics coaches or that may interact to influence the effect of elementary mathematics coaches. The framework shows that elementary mathematics coaches may also provide programmatic leadership beyond co-planning, co-teaching, observing, demonstration teaching, and mentoring to impact the overall school mathematics program. Through the various forms of professional development along with coaching for content instruction, the framework model presumes that improvements in student learning are tied to instructional change. During that study, Campbell and Malkus (2011) found a significant positive impact on student achievement when teachers interacted with an elementary mathematics coach. However, the positive effect only occurred with experienced coaches. They stated, “A coach’s positive effect on student achievement develops as a knowledgeable coach and the instructional and administrative staff in the assigned school learn and work together” (p. 451). The Campbell and Malkus (2011) framework does not directly address teacher knowledge, beliefs, or dispositions and does not directly address instructional practice. The framework also does not take into consideration the ways that an elementary mathematics specialist, or coach, is positioned within a school. Since specialists are utilized in different ways depending on a school, it is important to know if their

utilization aligns with the model for effective mathematics coaching and how specialists are positioned to contribute to the overall mathematics program.

In a study designed to evaluate the success of mathematics coaching in a rural school district, Luebeck and Burroughs (2017) found that there was a disconnect between what teachers believed was beneficial about their mathematics coaches and what they desired from a mathematics coach. The teachers felt that the benefit of having a mathematics coach was that the coach could lighten their workload by engaging in work with little instructional impact, such as making copies, locating resources, and gathering student data. The teachers also felt that coaches helped with pacing and managing student behavior. However, when asked what teachers desired from the mathematics coach, they specified that they wanted the coach to provide feedback on classroom observations of mathematics lessons, to work with teachers individually, and to model effective teaching strategies for mathematics. Different expectations about the role from classroom teachers, administrators, and specialists themselves often lead to confusion about the role that the mathematics coach plays in the school environment (Chval et al., 2010; Hull et al., 2009; Luebeck & Burroughs, 2017).

Having clarity regarding the role and the expected contributions of the elementary mathematics specialist as a coach could lead to more effective interactions, which would likely increase teacher knowledge of mathematical content, improve mathematics instruction, and improve student learning (Giancola et al., 2018). Administrator perception of the role of the coach contributes to how successful the coach is in the school environment, and the coach's effectiveness is dependent on having school leadership that shares responsibility for improving mathematics instruction (Cobb & Jackson, 2011). There must be a shared understanding of the expectations for the role of the coach so the working relationship can be built on trust and

support. In many cases, there is not a consistent understanding of how the elementary mathematics coach can help administrators shape the vision for mathematics instruction in the school environment and effectively facilitate teacher learning to influence classroom instruction (Luebeck & Burroughs, 2017). When the school community understands how a mathematics coach can contribute to school improvement, coaching time can be protected, and coaches can engage in productive coaching activities (Cobb & Jackson, 2011)

Therefore, this study will explore the perceptions that school leaders, teachers, and specialists have regarding the role of the elementary mathematics specialists as coaches and the contributions the specialist is expected to make in support of the overall mathematics program. How a mathematics specialist is positioned within the elementary school community based on those perceptions and expectations may determine the types of interactions the specialists will have with members of the school community. Whether or not a mathematics specialist is effective in supporting the school's mathematics instruction may be related to their positioning by others.

Purpose Statement and Research Questions

The purpose of this qualitative case study is to investigate how school-based elementary mathematics specialists participate in and contribute to the mathematics program in the school environment. The following research questions guide the investigation into the role of elementary mathematics specialists in schools in North Carolina.

Research Question 1: How do school leaders, teachers, and the school-based mathematics specialist perceive the role and contributions of the elementary mathematics specialist in the school community?

Research Question 2: How is the school-based elementary mathematics specialist positioned within the school community?

Research question one examines the perceptions that are held regarding the role of the elementary mathematics specialist. Data to answer this question was collected primarily through interviews of participants to determine their understanding of the role of the specialist. Research question two examines how the elementary mathematics specialist and school personnel interact in professional situations. Data for this question was primarily collected through observations of interactions in coaching environments.

Positioning Theory

This study utilizes positioning theory as a lens for investigating the role of the elementary mathematics specialist in a school community. Positioning theory describes the way that different individuals interact with each other within a context to create a narrative in which each individual has a role (Barnes, 2004). This theory emerged from the work of Harré and Moghaddam (2014) and is based on social constructionism. The theory of social constructionism examines the process by which individuals interact and develop their knowledge and understanding of the world, and how those constructed meanings are sustained, negotiated, and modified (Nickerson, 2021; Walker, 2015). Within differing storylines in positioning theory, individuals participating in an interaction may position themselves in different ways knowing that certain rights and duties are associated with each position (Barnes, 2004; Harré, 2012).

Positioning theory has been used in analyzing ways that teacher-leaders shift their identities as they position themselves in differing ways, including as teachers, instructional leaders, content experts, or colleagues (Leander & Osborne, 2008). Using positioning theory to examine literacy coaching allowed researchers to see how a coach could function as a social

actor, constructing the meaning of coaching acts through interactions with others (Mangin & Dunsmore, 2013). To my knowledge, positioning theory has not been used as a theoretical framework to study the utilization of elementary mathematics specialists.

Positioning theory provides a lens to investigate how elementary mathematics specialists position themselves with regard to administrators and teachers and how the school community positions the specialist. Understanding the perceptions the school community holds regarding the elementary mathematics specialist, along with a description of the positioning interactions within the school community, may provide an understanding of how the contributions of the elementary mathematics specialist are utilized and valued.

Significance of the Study

While there is some research on the roles, responsibilities, and impact of elementary mathematics specialists (Campbell & Malkus, 2011; 2013; 2014; Chval et al, 2010; Polly et al., 2015), the research on positioning of coaches has centered on literacy coaches (Hunt & Hansfield, 2013; Rainville & Jones, 2008). Positioning of the elementary mathematics specialists is different from the role of the specialist. Role refers to the responsibilities and expectations of the job. Position refers to how a person interacts with others based on context (Ribeiro, 2007). The factors that determine positioning in a school community could have implications for how a specialist is prepared for the role and how the specialists could be utilized in the future. Implementing elementary mathematics specialists in schools involves cost and logistical implications for schools (Mudzimiri et al., 2014), including determining the qualifications and roles for the specialist (Brobst & Markworth, 2019).

Previous research has shown that student achievement increases by improving the instructional practices of teachers (Polly et al., 2013), and one of the main roles of the

elementary mathematics specialist is to support teachers in improving their pedagogical content knowledge. In addition, previous research indicates that teachers' mathematical knowledge is significantly related to student achievement (Hill et al., 2004), and another major focus of the work of the elementary mathematics specialist is to enhance the mathematical content knowledge of classroom teachers. Since the specialist supports teachers in improving pedagogical and content knowledge, the mathematics specialists could impact a school's achievement in mathematics. The perceptions of the school community regarding the role and contributions of the elementary mathematics specialist could have implications for whether funds are spent to hire a specialist and whether coaching time is prioritized and protected.

Definitions of Key Terms

- **Elementary Mathematics Specialist:** In this study, the elementary mathematics specialist is a content coach who works with teachers in a school community to support effective mathematics instruction and improve student learning of mathematics (Association of Mathematics Teacher Educators, 2013; Association of Mathematics Teacher Educators et al., 2010; Hull et al., 2009). Since much of the research regarding mathematics specialists is in the role of content coach, the terms specialist and coach will be used interchangeably and refer to the same role.
- **School community:** The school community refers to the atmosphere within the building and how school leaders, teachers, staff, and students within the building interact with each other (Great Schools Partnership, 2019).
- **School mathematics program:** The school mathematics program encompasses the teaching and learning of mathematics. The mathematics program includes the curriculum, tools, and resources utilized for instruction. In addition, the school mathematics program

addresses the expectations for all students in mathematics (National Council of Teachers of Mathematics, 2014).

Summary

Using the lens of positioning theory, this qualitative case study investigates the positioning and perceptions of the role and contributions of elementary mathematics specialists. Since the roles of elementary mathematics specialists vary, this study focuses on the mathematics specialists who work primarily with teachers in an elementary school setting. Mathematics specialists should contribute to the overall school mathematics program but need their roles to be defined to meet the expectations of school administrators and teachers. Studying the interactions between members of the school community can bring light to how a mathematics specialist is positioned and perceived within the school community.

In Chapter 2, the literature review addresses the research related to the necessary skills and knowledge an elementary mathematics specialist needs to interact with the school community. The review also describes how positioning theory frames the current study. Chapter 3 includes an explanation of procedures used to collect and analyze data, a description of participants and instruments designed and used to collect data, and a discussion of trustworthiness and limitations. Chapter 4 includes the findings from the interviews, reflections, and observations. Chapter 5 summarizes the main findings and includes an interpretation of the findings and implications for policy and practice.

CHAPTER TWO: REVIEW OF LITERATURE

The purpose of this study is twofold. One purpose of the study is to examine the perceptions that school administrators, teachers, and the elementary mathematics specialist hold regarding the role and contributions of the specialist. Another purpose is to determine in what ways the elementary mathematics specialist is positioned within the school community. The positioning of the specialist could affect the perceptions that the school community holds regarding the role and contributions of mathematics specialists. It is also possible that the perceptions held by the school community could affect how the specialist is positioned.

The review of literature begins with an overview of the positioning theory as the theoretical framework guiding this study. I will then provide an overview of content coaches and the development of the role of elementary mathematics specialists. I will continue with a description of the elementary mathematics specialist as a content coach, outlining the necessary knowledge and skills a specialist needs to take on the role. This review will summarize the literature that supports best practices for elementary mathematics specialists to support teachers and contribute to the school mathematics program.

Theoretical Framework

Positioning Theory

Positioning theory studies the explicit and implicit patterns of reasoning that are recognized in different ways that people act towards others (Harré et al., 2009). Through the study of interactions, normative frames emerge that illustrate how people carry on their lives against standards of what is considered “correct” based on the position they take on in an interaction. The position a person holds determines the rights and duties they are afforded in their interactions with others (Harré et al., 2009; Harré & Moghaddam, 2014). Rights and duties are

taken up and put down, ascribed and appropriated, refused and defended based on social interactions, and positioning theory studies how people utilize the rights and duties. Rights are what is owed to a person because of their position, and duties are what a person owes because of their position. Shared assumptions about rights and duties influence social interactions (Harré & Moghaddam, 2014).

Positioning takes into account the personal characteristics, histories, preferences, and capabilities of the individuals involved in the interaction, as well as the context and community values where the interaction takes place (Barnes, 2004). Positioning differs from the identification of roles. When talking about roles, there is an assumption of an a priori context and identity of the participants, while positioning recognizes that there is an interactional context in which people “do identity” (Ribeiro, 2007).

Positioning Triangle

It is helpful to think of positioning theory as a triangle, with each point of the triangle representing the background conditions (Figure 2.1). Harré and Moghaddam (2014) explain that the background conditions consist of the varying positions, which include rights and duties, the illocutionary forces, and the storylines that are being acted out. These conditions mutually determine each of the others.

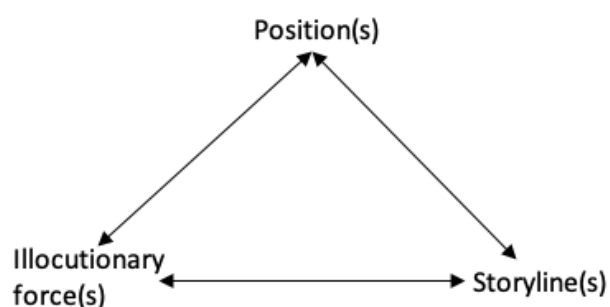
A position is “a cluster of short-term disputable rights, obligations, and duties” (Harré, 2012, p. 194). Positions determine the distribution of rights and duties during an episode of interaction. Positions are assigned, acquired, or seized through a variety of acts, which may be implicit or explicit and based on personal characteristics (Harré, 2012; Harré et al., 2009; Harré & Moghaddam, 2014). Being positioned in a certain way carries duties and expectations about

how a person should behave. Positioning can also put constraints on what a person can meaningfully do (Barnes, 2004).

The illocutionary forces consist of admissible social acts and the meanings related to the acts. The forces are significant because it is the interpretation of what is said and done at the time it is said and done (Harré, 2012; Harré & Moghaddam, 2014). The narratives that are being acted out are the storylines. Positioning happens during an interaction, and any positioning act can be challenged. As people engage in actions, the rights and duties assigned may also change. Shifts in position can change the meaning of people's actions, as beliefs about positions influence the illocutionary force of those actions. Changes in meaning can reshape the storyline, progress along with the storyline, or support multiple storylines simultaneously (Harré et al., 2009).

Figure 2.1

Positioning Triangle



Note. Adapted from Positioning Theory by R. Harré and F. Moghaddam, 2014, *The Discursive Turn in Social Psychology*, p. 134.

A study by Rainville and Jones (2008) illustrates how a coach can be positioned and how the positioning may change in different interactions. The researchers observed a literacy coach change from being a social colleague with a teacher to the role of literacy expert and professional

colleague. At the beginning of the coaching session, both teacher and coach acted as friends and joked with each other. During the coaching interaction, the coach took control of the conversation, asked clarifying questions, and even spoke for the teacher. During the interaction, the teacher yielded power and positioned the coach as the more knowledgeable person in the conversation. In an interaction with another teacher, the coach attempted to position herself as the more knowledgeable person, but the teacher positioned himself as more powerful and positioned the coach as an outsider who did not have a knowledge base he respected by consistently interrupting her and questioning her expertise. These examples demonstrate how the positioning of a coach can be fluid and how the way a coach is positioned influences what is said and done in a coaching interaction.

Applications of Positioning Theory

Positioning theory has been utilized as a lens in various research studies. Studies utilizing positioning often explore narratives that people use to position themselves and to position others (Harré & Moghaddam, 2014). Studies of particular interest for this research study have to do with content coaching, mentoring, and utilizing teacher leaders as reform agents.

Hunt and Handsfield (2013) investigated literacy coaching through the lens of positioning theory. In their research, they observed the interactional moves that coaches and teachers used as they worked together in the moment, moving beyond role identity. As mentioned by Ribeiro (2007), role identity depersonalizes and decontextualizes the social interactions that occur between the coach and the teacher. The research of Hunt and Handsfield (2013) also determined that literacy coaches' identities are constructed not only through social interactions but also through forces of policy initiatives and dominant ideologies. Literacy coaches must find a balance between supporting teachers through trusting, collaborative relationships and

demonstrating knowledge and expertise. How a content coach positions themselves and how others position them can directly shape the conversations and resulting activities. Rainville and Jones (2008) found that when a literacy coach shapes a conversation, it directly affects the thinking and actions in a particular context. As a coach engages with classroom teachers, position and power are operating as each participant navigates the situation. Position and power shift throughout interactions and are dependent on context and expectations (Hunt & Handsfield, 2013; Rainville & Jones, 2008).

Leander and Osborne (2008) studied teachers as agents of curricular and pedagogical reform. Their study focused on teachers as facilitators with their peers. In their research, they found that one type of positioning evident in their participants' descriptions of their work was the general and specific teaching practices and ideologies that shaped how teachers constructed their roles as facilitators and leaders. Categories of positions are created through systems of power and knowledge. This relates to other research regarding positioning theory in that the beliefs regarding roles determine what rights and duties are afforded to the positions.

In research regarding mentoring, Tan (2013) found that how teacher mentors positioned themselves was shaped by how they positioned beginning teachers. Mentors who were frustrated by their mentoring experiences often were placed with beginning teachers who challenged the way they were positioned by their mentor, and the mentor was usually reluctant to reposition the beginning teacher. The challenging and counterchallenging of each other's positioning caused tension. This study contributed insight into how challenges and struggles can emerge when a person is placed in a specific position by another person. Having roles clearly defined may help to diffuse the challenges involved in positioning, but since positioning is a social act developing along storylines, there may always be points of contention.

This research study focuses on the interactions between elementary mathematics specialists, teachers, and administrators. How each population perceives the role of the elementary specialist could have an influence on how the specialist is positioned and the actions and storylines that develop.

Who are Content Coaches?

The primary focus of a content coach is to improve teachers' instructional strategies in a specific content area, such as mathematics or literacy. Through content coaching, a specialist has the opportunity to build instructional capacity and produce outcomes that will likely improve instruction (Neufeld & Roper, 2003a). The utilization of content coaches has shown positive outcomes for improving teaching practice, collegiality, teacher reflexivity, and student outcomes (Bean et al., 2003; Chval et al., 2010; Miller et al., 1991; Ross, 1992).

Content coaches can contribute to the school environment in several ways. Content coaching can occur at the classroom and school level. Classroom content coaching involves creating a safe environment where teachers practice new strategies and work toward improving practice without fear of negative criticism or evaluation. The coach works one-on-one with teachers to provide support in lesson planning and lesson delivery with follow-up feedback (Mudzimiri et al., 2014). At the school level, coaches often deliver targeted school-based professional development that addresses the learning needs of teachers and helps teachers carry over the learning into classroom practice to improve the overall school program. Instructional improvement is driven by achievement data. Coaches may focus on areas where student achievement scores are low. To raise achievement scores, coaches may present teachers with instructional ideas and strategies to utilize in the classroom (Hopkins et al., 2017). Coaches help keep discussions focused on instruction and guide teachers in reflecting on their practice and the

impact classroom instruction has on students. Content coaches often have a willingness to collaborate with teachers, look for learning opportunities from among their peers, and join in accepting the collective responsibility for student learning (Neufeld & Roper, 2003a).

Content coaching also comes with a variety of challenges, including the high cost of hiring a qualified coach, scheduling constraints on the coaches, lack of administrative support, lack of direction, teacher resistance, inconsistent messages about expectations, role confusion, and conflicting responsibilities (Neufeld & Roper, 2003a, 2003b). These challenges will be discussed further in relation to the roles and responsibilities of the elementary mathematics specialist.

History and Development of the Elementary Mathematics Specialist Role

The role of the elementary mathematics specialist is not new. Fennell (2017) describes the historical context of the mathematics specialist. He explains that the mathematics specialist role began to emerge as early as the 1920s ensuring that content-focused teachers taught all the classes in that subject area at a particular grade. This typically occurred in the intermediate elementary grades. Departmentalizing elementary schools became popular in the 1960s and early 1970s. In 1981, the National Council of Teachers of Mathematics recommended that states provide teaching credentials for elementary mathematics specialists. In 1987, the ExxonMobil Foundation began a mathematics education program with a major goal to support using mathematics specialists in primary grades to improve mathematics teaching. It was the belief that students' mathematics performance was shaped in the early grades where historically mathematics instruction was not strong because teachers lacked the content and pedagogical knowledge to effectively teach mathematics (Miller et al., 2000).

In 1989, The National Research Council released a report, entitled *Everybody Counts*, that stated:

The United States is one of the few countries in the world that continues to pretend—despite substantial evidence to the contrary—that elementary school teachers are able to teach all subjects equally well. It is time that we identify a cadre of teachers with special interest in mathematics and science who would be well prepared to teach young children both mathematics and science in an integrated, discovery-based environment. (National Research Council, 1989, p. 64)

Recommendations for specialist-related models as a way to enhance students' mathematical experiences and guarantee the mathematical expertise of educators continued through the 2000s when the National Council of Teachers of Mathematics published *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000). The Conference Board of the Mathematical Sciences first published a report in 2001 that called for the utilization of mathematics specialists. With the implementation of No Child Left Behind (NCLB) in 2003, schools and districts began to identify elementary mathematics specialists in an effort to increase student performance on the state mathematics assessments. NCLB and the subsequent legislation, Every Student Succeeds Act (ESSA), enacted in 2015, required that summative assessment data for mathematics and reading be reported annually. Student achievement data in elementary schools showed that schools were not meeting mathematics standards and the need for additional instructional support for teachers was necessary (Fennell, 2017).

In 2008, the National Mathematics Advisory Panel (NMAP) also recommended that elementary schools have access to mathematics specialists. In their report, the NMAP states that “the use of teachers who have specialized in elementary mathematics teaching could be a

practical alternative to increasing all elementary teachers' content knowledge (a problem of huge scale) by focusing the need for expertise on fewer teachers" (p. 44).

Following the NMAP (2008) report, in 2010, the Association of Mathematics Teacher Educators created a set of standards for elementary mathematics specialists, which were revised in 2013 (Association of Mathematics Teacher Educators, 2013). In the standards document, the Association of Mathematics Teacher Educators calls for states to establish an elementary mathematics specialist license, certificate, or endorsement citing the "urgent need to increase the mathematical knowledge and expertise of elementary school staff" (p. 1). The primary purpose of the standards document is to outline the knowledge, skills, and leadership qualities that specialists in elementary mathematics need to be effective. This document also serves as an outline for state agencies to establish certification guidelines and guides universities in the development of preparation programs for elementary mathematics specialists (Association of Mathematics Teacher Educators, 2013). Currently, 22 states offer elementary mathematics specialist certification or credentials, but there are notable program differences in credentialing programs, including the number of course hours, course emphases, and practicum experiences (Association of Mathematics Teacher Educators, n.d.; Myers et al., 2020). The state included in this study has an established university-based credentialing program aligned to the standards set forth by the Association of Mathematics Teacher Educators (2013). While some states do not have a credentialing program, nearly every state calls on experienced teachers to fill the role of mathematics specialists at the elementary level (Association of Mathematics Teacher Educators, 2013).

In response to the creation of the Standards for Elementary Mathematics Specialist by the Association of Mathematics Teacher Educators (2013), the Association of Mathematics Teacher

Educators (AMTE), the Association of State Supervisors of Mathematics (ASSM), the National Council of Supervisors of Mathematics (NCSM), and the National Council of Teachers of Mathematics (NCTM) released a joint position statement recommending the use of elementary mathematics specialists to “enhance the teaching, learning, and assessing of mathematics in order to improve student achievement” (p. 1) In their position statement, these organizations advocated for every elementary school to have access to an elementary mathematics specialist. Since the role of the elementary mathematics specialists could include a variety of roles, there are benefits to elementary mathematics specialists completing a credentialing program designed to prepare them for the role (Reys & Fennell, 2003; Swars et al., 2018). An effective program of study for producing mathematics specialists should develop their knowledge of mathematics content, effective pedagogies, students, and curriculum while strengthening coaching and leadership skills (Polly et al., 2013). An effective program would include mathematics content courses and coaching courses, which potentially influence the positive impact an elementary mathematics specialist could have (Campbell & Malkus, 2013). Interrelated benefits of a credentialing program include changes in mathematical beliefs, specialized content knowledge, and changes in pedagogy (Swars et al., 2018). While there is some research on university credentialing programs, the research on the professional development of coaches is evolving and growing (Toker & Aksoy, 2024).

This brief history shows that the idea of a mathematics specialist at the elementary level is not new. Districts and schools have employed elementary mathematics specialists but have not always been clear on what the specialist should be able to do. While there is some consensus, the role of the specialist is still broad, and expectations for the role vary.

Role of the Elementary Mathematics Specialist as a Content Coach

The role of the elementary mathematics specialist has been defined in different ways; however, there is some agreement on what the elementary mathematics specialist can do in a school or district (Association of Mathematics Teacher Educators, 2013; Reys & Fennell, 2003). As defined earlier, elementary mathematics specialists are knowledgeable teachers, teacher leaders, and coaches who support effective prekindergarten through sixth grade mathematics instruction and student learning (Association of Mathematics Teacher Educators, 2013; Association of Mathematics Teacher Educators et al., 2010). The fundamental roles of an elementary mathematics specialist may include being a content expert, a promoter of reflective instruction, a professional development facilitator, and a supporter of the school-wide learning community (Polly et al., 2013). The elementary mathematics specialist often has a role in the community of practice at a school (Campbell & Malkus, 2014). Having an elementary mathematics specialist on staff can have many positive effects, including improving school culture, sharing teaching knowledge effectively among teachers, and encouraging staff collaboration (Mudzimiri et al., 2014). Depending on how a school or district defines the role of the elementary mathematics specialist, the specialists can work directly with teachers providing professional learning as a coach or could work directly with students (Association of Mathematics Teacher Educators et al., 2010; McGatha et al., 2015). For this research study, I will focus on the specialist as a coach.

Chval et al. (2010) describes four identities that mathematics specialists working as coaches develop as they transition from being teachers: coach as supporter of teachers, coach as supporter of students, coach as learner, and coach as supporter of the school at large. Each of

these categories fits with the research of Neufeld and Roper (2003a) regarding the expectations, benefits, and challenges of content coaching.

Chval et al., (2010) found that in the role of the coach as a supporter of teachers, coaches had specific expectations for their role. Coaches wanted to have the opportunity to support teachers in improving mathematics instruction by interacting with teachers in their classrooms and co-planning and co-teaching. The coaches wanted to create a school environment that emphasized mathematics instruction and wanted to be invited to classrooms to observe how teachers were instructing. They thought they would be welcomed into classrooms. What Chval et al. (2010) found was that the coaches faced several challenges when supporting teachers. The coaches were not always welcomed into classrooms, and teachers were resistant to the support that was being offered. The coaches also found that other functions of their role were taking up too much time, and they did not have time to interact with teachers in the ways they had expected.

In the role of coach as supporter of students, Chval et al., (2010) found that the coaches expected that they would support students through their work with teachers, but many coaches found themselves working with students directly during classroom observations or while they supported classroom instruction. While this did not seem to be a challenge, it did challenge coaches in letting go of their teacher identity and understanding their role as a coach.

Coaches are often aware of their own limitations in mathematical knowledge and understand there is a need for deepening mathematical content knowledge to support teachers. Coaches also need professional learning on how to work with adults rather than students (Association of Mathematics Teacher Educators, 2013; Chval et al., 2010). Beyond coaching, the elementary mathematics specialist, as a coach, needs to understand the components of school

improvement. They need to learn how to deal with conflict and personality types. Some of the challenges that elementary mathematics coaches have faced include feeling guilty for not being in classrooms offering teachers support at all times. Some coaches struggled with taking time during their workday for their professional learning. Many coaches were unsure of themselves as a coach and did not know how to focus conversations and challenge thinking regarding mathematics instruction (Chval et al., 2010).

When taking on the role of elementary mathematics specialist, many specialists were expecting to become school leaders who would lead the school in developing a shared vision for mathematics instruction. What many specialists found was that they became overwhelmed with performing administrative duties and hyper-focused on school-wide mathematics scores. While trying to support the school at large, the specialists were asked to engage in tasks they perceived as unrelated to their role and they were caught between supporting the school and supporting teachers (Chval et al., 2010). The study by Chval et al. (2010) provides important information regarding how coaches felt about their role in the school community. Their research provides context for my study by describing four roles of elementary mathematics coaches but does not examine the perceptions of teachers and school administrators or the ways the coach was positioned by members of the school community.

Required Skills of an Elementary Mathematics Specialist

In the second report on the mathematical education of teachers, the Conference Board of the Mathematical Sciences (2010) stated that an increasing number of school districts are utilizing elementary mathematics specialists, and in many schools, the specialist is regarded as the expert in mathematics education. This report also showed that administrators and teachers depend on the specialist for a variety of needs related to teaching and learning mathematics,

including guidance in selecting a curriculum, making instructional decisions, analyzing data, and mentoring.

In the research regarding elementary mathematics specialists, there has been agreement on the specific skills and knowledge base needed to be effective. Elementary mathematics specialists require a deep understanding of mathematical knowledge for teachers, understanding of the elementary context, expertise in supporting others in using effective instructional practices informed by mathematical learning trajectories, ability to work with adult learners, and leadership skills to support initiatives to improve teaching and learning (Association of Mathematics Teacher Educators, 2013; Association of Mathematics Teacher Educators et al., 2010; Polly et al., 2015). An elementary mathematics specialist needs to be well versed in pedagogical content knowledge (knowledge of content and students and knowledge of content and teachers), and should have specialized content knowledge (Ball et al., 2008). Campbell and Malkus (2013) also found that elementary mathematics specialists had to have time to collaborate with teachers in non-evaluative ways.

Building from research regarding elementary mathematics specialists and research regarding the teaching and learning of mathematics, the Association of Mathematics Teacher Educators developed a set of standards for elementary mathematics specialists (Association of Mathematics Teacher Educators, 2013). Within the standards, the Association of Mathematics Teacher Educators names the major areas in which elementary mathematics specialists should have expertise. These areas include content knowledge for teaching mathematics, pedagogical knowledge for teaching mathematics, and leadership skills and knowledge.

Content Knowledge for Teaching Mathematics

Elementary teachers tend to be generalists and often lack the in-depth knowledge needed to effectively teach mathematics (Association of Mathematics Teacher Educators, 2013; Association of Mathematics Teacher Educators et al., 2010). In most elementary classrooms in the United States, the teacher is responsible for teaching all subjects. Teacher preparation programs for elementary education majors focus on all subjects, and mathematics is often given inadequate attention. Learning mathematics to teach mathematics is a considerable undertaking, and elementary pre-service teachers are often inadequately prepared to teach mathematics. This lack of in-depth content knowledge can impact students' conceptual understanding and student achievement in mathematics (Association of Mathematics Teacher Educators et al., 2010; Polly et al., 2013). Since teacher preparation and quality are factors that influence student achievement, teachers must receive focused professional development to effectively teach mathematics (Myers et al., 2020). One way teachers can receive focused professional learning is through working with an elementary mathematics specialist who serves in the role of a coach and possesses a deep understanding of mathematics content.

Elementary teachers need to see and understand how mathematical concepts progress and develop throughout the elementary grades. Elementary mathematics specialists can be utilized to help teachers recognize how mathematical concepts in one grade connect to previous and subsequent grades (de Araujo, 2017). For elementary mathematics specialists to effectively coach teachers, an elementary mathematics specialist must have a deep understanding of mathematics for prekindergarten through sixth grade. They need to understand how mathematics topics progress across grade levels and how those topics develop in middle school (Association of Mathematics Teacher Educators, 2013). According to Wu (2009), "mathematics in elementary

school is the foundation of all of K-12 mathematics and beyond” (p. 12). Expertise in mathematics content is essential.

Content knowledge for teaching goes beyond having mathematical knowledge for functioning in everyday life (de Araujo et al., 2017). Hill et al. (2005) define mathematical knowledge for teaching as “the mathematical knowledge used to carry out the work of teaching mathematics” (p. 373). Content knowledge for teaching includes knowing how to create or select appropriate representations of mathematical concepts during instruction, understanding whether solution strategies will work in general, understanding differences in word meanings when used in mathematical contexts, and understanding differences in mathematical explanations and mathematical justifications (Ball et al., 2008). Noticing student responses and making sense of children’s mathematical thinking is not a skill that most adults possess but is a skill that can be learned through professional development and teaching experience (Jacobs et al., 2010). An elementary mathematics specialist should have the skills necessary to recognize the mathematical ideas of students, evaluate if a student’s ideas move them toward their learning goals, and construct a plan of action to engage students in ways to move their thinking forward (de Araujo, 2017; Sutton et al., 2011). The Association of Mathematics Teacher Educators (2013) standards put forth the expectation that elementary mathematics specialists use mathematical practices such as “precision in language, construction and comparison of mathematical representations, conjecturing, problem solving, reasoning, and proving” (p. 4). In addition, elementary mathematics specialists need to be able to apply the practices in the domains of number and operations, algebra and functions, geometry and measurement, and data analysis and probability (Association of Mathematics Teacher Educators, 2013).

There is some evidence that shows that deep understanding of mathematical content knowledge for teaching is related to student learning (Campbell & Malkus, 2011, 2013; Hill et al., 2004; Polly et al., 2013). Hill et al. (2004) noted that teacher mathematics content knowledge positively predicted student gains in mathematics. The researchers found that positive effects even appeared in early elementary grades, suggesting that teacher content knowledge plays a role in student achievement in the early grades. Other research studies have shown that teachers' instructional practice improved when they engaged with coaches in practices such as using student data to inform instruction while encouraging students to reason mathematically (McGatha, 2008), increasing the use and variety of instructional formats (Race et al., 2002), and engaging students in higher-order thinking with quality mathematics tasks (Polly, 2012).

Pedagogical Knowledge for Teaching Mathematics

Pedagogical content knowledge is the ability to translate mathematical content knowledge into pedagogical practices that result in meaningful learning (de Araujo et al., 2017). Pedagogical content knowledge can be categorized by knowledge of content and students, knowledge of content and teaching, and knowledge of content curriculum (Ball et al., 2008). The Association of Mathematics Teacher Educators (2013) calls these categories learners and learning, teaching, and curriculum and assessment.

Knowledge of content and students allows educators to build on what learners already know and understand, along with their conceptions and misconceptions, to move student learning forward (Association of Mathematics Teacher Educators, 2013; de Araujo et al., 2017). Developing the skills necessary to examine representations of student thinking, recognize the mathematics ideas in the representations, and evaluate the thinking about learning goals takes practice. Educators need time to practice the pedagogical skills in teaching situations with

students, with time to reflect on practice (de Araujo et al., 2017). When working with teachers, elementary mathematics specialists must be able to help teachers understand learning trajectories, understand cultural differences and how to utilize that knowledge, and create engaging social learning contexts (Association of Mathematics Teacher Educators, 2013).

Knowledge of content and teaching means that an elementary mathematics specialist will be able to introduce mathematical tasks, facilitate mathematical discussions, provide appropriate scaffolding, respond to student thinking, and assess formatively (de Araujo et al., 2017; Sutton, et al., 2011). Elementary mathematics specialists should help teachers design and select high-level mathematics tasks aligned to learning goals. They will support teachers in teaching and utilizing appropriate vocabulary and representations to facilitate discussions. In addition, elementary mathematics specialists should be well versed in developing probing questions that can be used in mathematical discussion and to determine mathematical understanding. Modeling problem-solving strategies and mathematical practices for teachers and students is also imperative (Association of Mathematics Teacher Educators, 2013).

Knowing curriculum and assessment is important for an elementary mathematics specialist. Understanding mathematics standards, curriculum resources, learning progressions, and how decisions regarding curriculum and standards are made will help an elementary mathematics specialist in making decisions about the mathematical content students are supposed to learn (de Araujo et al., 2017). This includes being able to evaluate the alignment of state mathematics standards with curriculum and the instruction happening in classrooms to recommend appropriate adjustments to address gaps (Association of Mathematics Teacher Educators, 2013).

Leadership Knowledge and Skills

Elementary mathematics specialists should have the skills and knowledge necessary to work effectively with adult learners. As Campbell and Malkus (2013) noted in their research regarding the impact of elementary mathematics coaches and the Association of Mathematics Teacher Educators (2013) included in their standards, non-evaluative leadership roles and collaboration with teachers are imperative for elementary mathematics specialists. It is often assumed that effective teachers are also effective coaches, but the transition from an expert teacher to a novice coach can be quite challenging as they shift from the role of teacher to the role of educator of teachers. This shift can cause discomfort as the coach moves from being a successful classroom teacher to feeling displaced in the school environment because they no longer belong to a classroom (Chval et al., 2010; Fennell et al., 2013). Elementary mathematics specialists may take on responsibilities that contribute to the professional growth of teachers and need to draw on skills to support and facilitate effective mathematics instruction (Association of Mathematics Teacher Educators, 2013).

Elementary mathematics specialists need to develop relationships with teachers and administrators that build trust. The relationship between the specialist as a coach and teachers should allow for teachers to practice new learning in a safe environment without fear of evaluation from an administrator. The specialist also has to create a relationship with an administrator that allows for space for teachers to meet the principals' goals while helping the principal understand the work of teaching (de Araujo et al., 2017; Neufeld & Roper, 2003a).

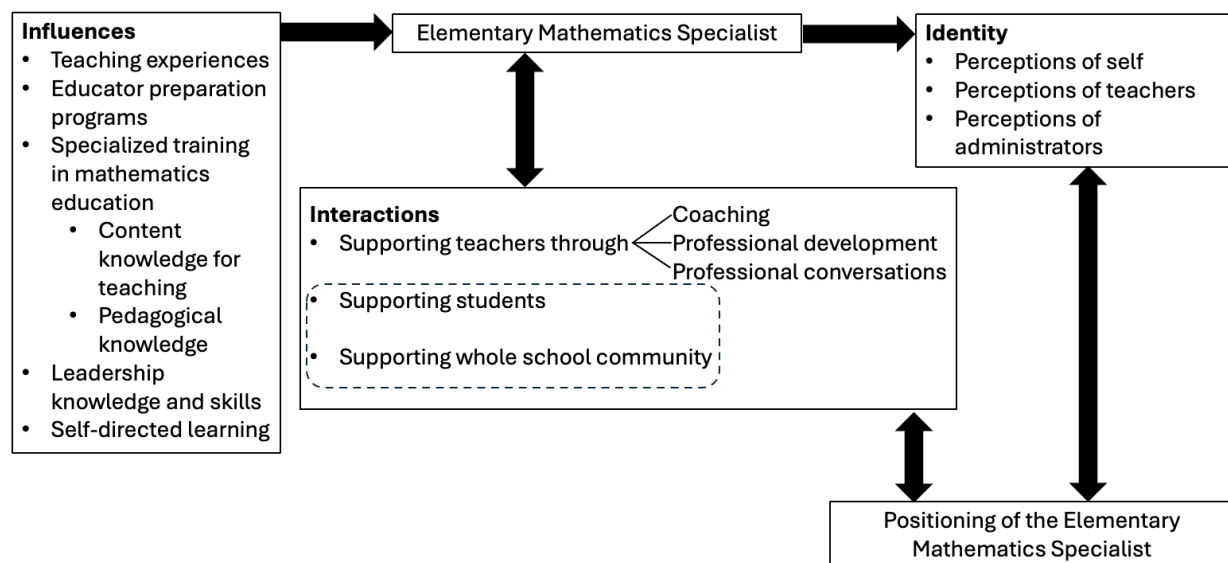
Conceptual Framework

This study is focused on determining how the school community and the specialist perceive the role of the elementary mathematics specialist and how the school community

positions the specialist in interactions. The interactions the specialist has with the teachers, through coaching, professional development, and other professional conversations, may influence the perceptions the specialist has about themselves. Those perceptions could influence how a specialist positions themselves in the interactions. At the same time, the interactions could also influence the perceptions of the school community and may determine how the community positions the specialist during interactions. Figure 2.2 illustrates the factors that may influence elementary mathematics specialists as they develop their identity through perceptions of self and perceptions of others. The figure also illustrates how interactions play a role in perceptions, which could influence the positioning of the specialist.

Figure 2.2

Conceptual Framework for Studying Perceptions and Positioning of Elementary Mathematics Specialists in School Communities



Before becoming an elementary mathematics specialist in a coaching role, the specialist usually engages in a variety of learning opportunities that influence who they are as a coach. A specialist's influences may include previous teaching experiences and self-directed learning opportunities. The specialist may have attended an educator preparation program that influenced

how they taught mathematics and how they think about mathematics instruction. Specialized training in mathematics education, particularly training in content knowledge for teaching and pedagogical knowledge for teaching mathematics, can also influence how the specialist views mathematics instruction. The specialist may also gain leadership knowledge and skills that influence mathematics instruction.

Chval et al., (2010) found that elementary mathematics specialists in the role of a mathematics coach developed four identities: supporter of teachers, supporter of students, learner, and supporter of the school at large. This study focuses on the elementary mathematics specialist being a supporter of teachers. While in the coaching role, the specialist also supports students and the school community; the focus of the study is on the support of the classroom teacher.

Examining perceptions about and positioning of the elementary mathematics specialist is important when determining how to prepare specialists to be coaches both before becoming a coach and while the coach is developing relationships with the school community. Through this study, several different stories emerged that were dependent on the interactions that were observed and the interviews with school personnel. Understanding how perception and positionality are intertwined provides information on how to prepare specialists for the interactions they will encounter and how to navigate their development as specialists in the coaching role.

Summary

Elementary mathematics specialists may work in various capacities. For this study, I researched specialists who serve in the capacity of content coach. This study differed from previous studies by investigating perceptions of the role of the elementary mathematics specialist

through the lens of positioning. Previous research has investigated the knowledge and skills necessary for mathematics coaching and the positioning of literacy coaches within school environments. This study adds to the research regarding positioning and coaching by examining the perceptions of mathematics specialists and their interactions with others.

Chapter 3 describes the methodology of the study. A description of the participants, data collection, and the procedure for data analysis is included in the next chapter.

CHAPTER THREE: RESEARCH METHODOLOGY

Research Design

The purpose of this qualitative case study was to determine the perceptions the elementary mathematics specialist, school administrators, and teachers had regarding the role of the specialist in the school community and to investigate how the elementary mathematics specialist was positioned within the school context. The research questions guiding this study are: 1) How do school leaders, teachers, and the school-based mathematics specialist perceive the role and contributions of the elementary mathematics specialist in the school community, and 2) How is the school-based elementary mathematics specialist positioned within the school community? The methodology section of this study begins with a statement of my positionality. Next is a description of the participants, the procedures for data collection, and an explanation of how data was analyzed. Methodological integrity, limitations of the study, and ethical issues that arose conclude this chapter.

Qualitative research allows researchers to study how people construct understanding of different phenomena through their lived experiences and is interpretive (Merriam, 1998; Stake, 1995). Data collection and analysis are completed by the researcher, and much of the data collection is through fieldwork that does not cause major disruption to participants' natural settings (Merriam, 1998). My research questions were best answered through qualitative research methods because the data needed to answer the questions was collected through observations and interviews, providing me with a window into their lived experiences.

Case study research is a qualitative approach that investigates real-life, contemporary phenomenon within a bounded system (Merriam, 1998; Yin, 2018). The bounds of the system are the defining parameters, such as location or time. In some instances, the people involved in

the case could be a defining parameter (Creswell & Plano Clark, 2018; Merriam, 1998). Selecting cases may be purposeful to show differing perspectives of the problem (Merriam, 1998; Stake, 1995). A case study is utilized when a researcher wants to acquire an in-depth understanding of the complexity of a situation and how the participants in the situation develop meaning (Merriam 1998; Stake, 1995). In this study, a case was defined as an elementary mathematics specialist serving in a public, district-run school within the state of North Carolina. This case involved an experienced elementary mathematics specialist with more than five years in the role.

Case studies require detailed, in-depth data collection that involves multiple sources of information that triangulate to develop themes and provide a holistic description (Merriam, 1998; Yin, 2018). In this study, data was collected through interviews of the elementary mathematics specialist, teachers, and school and district leaders; observations of interactions between the specialist and members of the school staff; and a reflective summary from the elementary mathematics specialist.

Positionality Statement

At the time of this study, I was a state-level elementary mathematics specialist working primarily with district-level curriculum leaders. Before working at the State Education Agency (SEA), I was a district instructional coach based in two elementary schools in a rural district. As the instructional coach at those schools, it was my responsibility to ensure teachers understood the content they were to teach and that they possessed the required pedagogical skills to teach the content in all subject areas. In my time as an instructional coach based in schools, I found teachers open to learning new pedagogy and content and teachers who were closed to new

learning. While I was not classified as an elementary mathematics specialist because the district had not defined that role, my primary focus was on mathematics.

My experiences in school districts and at the state level should help me build rapport with all participants. While as a state mathematics specialist, my work differed from the work of district and school-based elementary mathematics specialists. My work focused on academic standards and not instruction, while district and school specialists may focus on both standards and instruction. Since my focus was different, I did not believe I would be viewed as a supervisor despite working at the state department of education. I believed the collaborative relationships I had developed with the district-level mathematics specialists in the school district translated to my work with the school-based mathematics specialists. I did not believe there would be any major power dynamics to contend with based on my position, but I did wonder if some people chose not to participate based on their biases against the state department of education.

I needed to be reflective during the interview and data analysis process because I did come into this research with specific ideas of how an elementary mathematics specialist should be utilized in the school mathematics program. Since I knew I was entering the research process with these specific ideas, I engaged in memoing throughout the data collection process to address my own biases that may arise.

Participants

The focus of this study was on elementary mathematics specialists who work in public, district-run schools within the state of North Carolina. This excluded charter schools and private schools from the study because these types of schools may have different programs of study than the public school and may not align with the NC Standard Course of Study. Public magnet

schools could have been included in the study if there was a school-based elementary mathematics specialist serving the school. Since mathematics is a core content area in the NC Standard Course of Study, it is included in the standard curriculum of public magnet schools. Those schools are responsible for ensuring students are taught the mathematics standards.

This study explored perceptions about elementary mathematics specialists in one school district. The district selected employs elementary mathematics specialists at the school level, and the specialist's primary duty is mathematics coaching. The school included in the study employed one experienced school-based mathematics specialist.

There were four groups of participants in this study: elementary mathematics specialists, classroom teachers, school administrators, and a district-level administrator. The elementary mathematics specialist was a school-based specialist whose primary role was supporting the mathematics program by working with teachers. Elementary mathematics specialists may be identified by other titles, such as instructional coach or lead teacher, but the primary role should be in supporting the school mathematics program. Classroom teachers were certified elementary teachers with a K-6 teaching license. The school administrator was a certified school principal. To add additional context to the role of the school-based elementary mathematics specialist, a district-level administrator who oversees mathematics instruction was interviewed (Appendix E). This was a curriculum specialist who supervised the K-12 mathematics specialist for the district. The district-level participant knew the specific vision for the role of the elementary mathematics specialist in schools.

Recruitment Process

For this study, a school district was purposefully selected. A purposeful sample allowed me to select participants who had experienced the phenomena I am studying (Creswell & Plano

Clark, 2018). The district selected for this study utilized school-based elementary mathematics specialists for many years. Within the district, there was a range of experience, from novice to experienced specialists, which is part of the criteria of the participant sample selection.

To identify participants, I asked district leadership via a face-to-face conversation for a listing of school-based elementary mathematics specialists who fit the case criteria. Once that list was generated, I contacted each specialist to determine if they would be willing to participate in the study. I also spoke with school administrators via Zoom to explain the research focus and asked if they were willing to participate in the interview process. At that time, I also asked school leadership if I would be able to interview teachers and observe teacher and specialist interactions. Once I had specialist and school administrator confirmations, I asked teachers about their willingness to participate in observations and interviews during a faculty meeting. Initially, two schools were willing to participate in the study. When the study began, I engaged with both schools with the intent of completing a comparative case study. However, one set of participants did not follow through with the entire process. I also asked the district-level leader who oversees elementary mathematics to participate in an interview.

Data Collection

Data was collected in the fall of 2023 and spring of 2024 and included several sources: semi-structured interviews, reflective summaries from the specialists, and observations of interactions between the specialist and other members of the school staff. Semi-structured interviews were conducted with the participating elementary mathematics specialists, teachers, school administrators, and a district-level mathematics leader. The mathematics specialists also completed reflective summaries. Observations of interactions included professional learning

community meetings and informal conversations. Following the interviews and observations, I wrote memos to document my initial thoughts regarding what I had heard or seen.

Research question 1 about perceptions was answered primarily through the interviews, the reflective summary from the mathematics specialist, and my memos. Research question 2 regarding positioning was answered primarily with the data from observations, my field notes, and my memos. Table 3.1 provides a list of my data sources and what I anticipated gathering from those sources. When collecting data, I paid attention to what I believed I would gather but was also open to data that I was not anticipating.

Table 3.1

Data Collection Sources

Research question	Data Source	Anticipated data from the source
RQ1: How do school leaders, teachers, and school-based mathematics specialists perceive the role and contributions of the elementary mathematics specialist in the school community?	Interviews Reflective summaries memos	Individuals' perceptions (in their words) of roles and contributions Basis for perception (could include background, experience, working relationship)
RQ2: How are school-based elementary mathematics specialists positioned within the school community?	Observations Field notes memos	Paralinguistic data (facial expressions, body language, volume) Dialogue and interactions between participants that allude to position (illocutionary forces and storylines)

Mathematics specialists participated in two interviews: one at the beginning of the research process and one follow-up interview after administrator and teacher interviews were completed. The initial interview with the mathematics specialist focused on gathering information regarding the professional background of the specialist, the ways the specialist was prepared for the role, the everyday duties and responsibilities of the specialist in the school, and

their overall perception of how the specialist felt they contribute to the school community (Appendix B). The initial interview took close to one hour. The interview was in person and was audio recorded.

Following the first interview, the specialist completed a reflective summary (Appendix F). The purpose of the reflective summary was to provide the specialist an opportunity to share information she may have left out of the interview because of limited time or to address information she remembered later. The summary also asked her to chart a typical week of duties and responsibilities to further examine the contributions of the specialist to the school community. The reflective summary should have taken approximately one hour to complete. The specialist completed the summary in a document and handed me her completed form.

The specialist participated in a closing interview. The closing semi-structured interview took place following the interviews with school leaders and teachers. The purpose of the final interview was to ask follow-up and clarifying questions regarding information heard from school leaders, teachers, and the district-level administrator (Appendix B). The purpose of the interview was not to share what others have said but to ensure that the specialist had the opportunity to respond to any new information. In addition, in the final interview with the elementary mathematics specialist, I explored the role of the relationships that exist between the school personnel and the specialist. The purpose of this exploration was to determine if an existing relationship influenced the perceptions and/or positioning of the specialist. This interview lasted approximately 45 minutes. This interview was over Zoom with an audio recording.

Teachers participated in semi-structured interviews. The purpose of the teacher interviews was to gain the perceptions of teachers regarding the role and contributions of the elementary mathematics specialist and to determine how teachers position the specialist during

interactions (Appendix D). The teacher interviews consisted of teachers from the school the elementary mathematics specialist serves. To identify teacher participants, I asked the principal if I could attend a faculty meeting to describe the study and ask for volunteers to participate in the interviews. I wanted to have a variety of perspectives from teachers. Ideally, I wanted to interview at least one teacher per grade level. However, since participation was voluntary, I understood that I might not get representation from each grade. Three teachers volunteered to take part in the interviews. The teachers were all from different grade levels, so I was able to get some differing perspectives. The teacher interviews took approximately 45 minutes and took place during the school day. The interviews were in person and audio recorded.

The school administrator participated in a semi-structured interview. The school leader interview focused on determining what he believed the role of the mathematics specialist was in the school mathematics program, how he viewed the contributions of the specialist to the mathematics program, and how the specialist was utilized by school leadership (Appendix C). This interview with the school leader lasted approximately one hour. The interview took place over Zoom and was audio recorded.

A district administrator participated in a semi-structured interview. The district administrator was the mathematics coordinator for the K-12 program and supervised the mathematics specialists. The purpose of the interview was to determine how the district believed the mathematics program should be structured, the role of the mathematics specialist in the school community, and if there was a common expectation for all mathematics specialists in the district. This interview lasted approximately one hour. The interview was conducted in person and was audio recorded.

The elementary mathematics specialist was observed interacting with teachers. Observations of interactions included professional learning community meetings, one-on-one sessions with a teacher, and informal hallway conversations. The purpose of the observations was to gather data regarding how the specialist positioned herself in interactions and how others positioned the specialist. Meetings were audio recorded, and I utilized field notes to document paralinguistic data. Each of the professional learning community meetings was approximately 35 minutes long. Every grade level (K-5) participated in PLC meetings, and the meetings occurred on the same day of the week.

Table 3.2

Data Collection Summary

Data Type	Participants	Time
Interviews	Elementary Mathematics Specialist	~ 60 minutes
	Elementary Mathematics Specialist (follow up)	~ 45 minutes
	District Mathematics Coordinator	~ 60 minutes
	School Principal	~ 60 minutes
	3 Classroom Teachers	~ 135 minutes (45 min/teacher)
Observations	6 Professional Learning Communities	~ 480 minutes (12 meetings)
	Informal Interactions (walking the halls)	~ 150 minutes

During the observations, I focused on collecting interaction data. This included paralinguistic data and data on illocutionary forces at play during the interactions. The paralinguistic data and the illocutionary forces worked together to help form the storyline that the elementary mathematics specialist is engaged in with the teacher. I utilized field notes during the observations and memoing directly after the observation to reflect on what was observed.

Table 3.3*Collection Methods for Interaction Data*

Interaction Data	Collection Method
Paralinguistic Data	Field notes of observations during coaching meetings (one-on-one, small group, PLC) <ul style="list-style-type: none"> • What facial expressions do participants exhibit as they interact? • What does the body language imply about the interaction? Is it passive? Aggressive? • How do participants speak to one another? What is their tone of voice? Analytic memos following the observation
Illocutionary forces	Field notes of observations during coaching meetings (one-on-one, small group, PLC) <ul style="list-style-type: none"> • Do questions/statements appear to imply something beyond what is said? • What types of questions/statements are given by participants? Are they giving opinions, predictions, and promises? Are they issuing orders or asking for permission? Analytic memos following the observation

Data Analysis**Procedures**

Once the interviews were conducted, they were transcribed verbatim using Otter.ai, a transcription company. Using this transcription company, I was able to verify that research data was handled securely and with confidentiality. I notified participants that the data collected in the interviews would be shared with a transcription service team. I cleaned the transcripts to ensure accuracy. Using atlas.ti, a qualitative software package, the data was analyzed and sorted. I used constant comparative analysis to generate initial codes and broad themes (Corbin & Strauss,

2015). Constant comparative analysis occurs as data are compared and categorized, which leads to the generation of a viable interpretation of the findings collected (Anfara et al., 2002).

Following every interview and observation, I engaged in writing analytic memos. An analytic memo serves to document reflections on various parts of the research process (Saldaña, 2021). The purpose of my reflections on the observations and interviews was to document what I had observed and heard in interviews. The memos also served as a place to make connections to existing literature and to identify any emerging themes. The memoing process continued throughout the data analysis. Memoing and coding are processes that work together to understand a phenomenon (Saldaña, 2021). By utilizing analytic memos during data analysis, I documented the decisions I was making regarding how I conducted the analysis.

My initial coding of the interviews for research question 1 regarding perceptions of the mathematics specialist's role began with using the mathematics specialist identities: coach as supporter of teachers; coach as supporter of students; coach as learner; coach as supporter of school-at-large (Chval et al., 2010) to organize data. While this study was focusing on the specialist as a supporter of teachers, I thought that it would be useful to determine if any of the other identities were also present in the perceptions that different members of the school community held. I began with analyzing the mathematics specialist's interview to determine what she thought her role entailed. This initial organization of the data helped me reflect on the role of the specialist and her contributions. However, these categories were much too broad.

I decided to include in my coding the Domains of Mathematics Coaching Knowledge: assessment, communication, relationships, student learning, teacher development, teacher learning, teacher practice, and leadership (Sutton et al., 2011). I used the definitions of each of the domains and grouped a domain with one of the coaching identities from Chval et al. (2010).

Using these domains along with the identities created categories that provided more structure to my comparison of perceptions across participant groups but were still too broad, and the interview data did not fit into the descriptors very well. The domains of mathematics coaching knowledge described what a specialist should know and be able to do but did not fully capture what participants were saying about their perceptions of the mathematics specialist's role. I used the data from interviews to create in vivo and descriptive codes to better capture the spirit of the participants' comments (Table 3.4).

Beginning with the elementary specialist's interview data, I applied the in vivo and descriptive codes. Next, I applied the codes to the school and district administrators' interview data and followed the same process with the teacher interviews. Not all the codes were applied across all three participant groups, and some additional codes appeared in the administrator and teacher groups. Some of the codes that I created crossed domains of coaching knowledge and specialist identities dependent on the context in which participants discussed the specialist's role. Initially, I grouped the in vivo and descriptive codes with the domains of mathematical coaching knowledge. While these codes helped organize the multitude of ways the mathematics specialist was perceived, it was not as helpful in looking for larger themes. To look for patterns and themes, I removed the domains and collapsed the codes that overlapped across the domains. I left the specialist identities from Chval et al. (2010). I also removed any codes that did not appear across all three participant groups. Since "learner" did not appear across all groups, I removed that as an overall category as well. I then looked for patterns and themes across the codes that remained (Table 3.5).

Table 3.4*Initial Coding for Interview Data-Includes Specialist Identity and Domains of Mathematics Coaching Knowledge*

From Research		Interviews-Perceptions of the Specialist Role		
Specialist Identity (Chval et al, 2010)	Domains of Mathematics Coaching Knowledge (Sutton et al., (2011)	Perception of Self (Specialist)	Perceptions of Teachers	Perceptions of Administrators
Supporter of Teachers	Assessment	<i>Analyze the data</i>	<i>Analyze the data</i>	<i>Analyze the data</i>
	Communication	<i>Collective Dialogue</i>	<i>Collective Dialogue</i>	<i>Collective Dialogue</i>
		Expectations Validation	Expectations Validation	Expectations Validation
	Relationships	Relationship Builder	Relationship Builder	Relationship Builder
	Student Learning	<i>Student Learning</i>	<i>Student Learning</i>	<i>Student Learning</i>
		Curriculum Support Standards Support	Curriculum Support Standards Support	Curriculum Support Standards Support
	Teacher Development	Facilitator Observer	Facilitator Observer	Facilitator Observer
		<i>Teacher Growth</i>	<i>Teacher Growth</i>	<i>Teacher Growth</i>
	Teacher Learning	Facilitator Lesson Planner	Facilitator	Facilitator Lesson Planner
			<i>Teacher Growth</i>	<i>Teacher Growth</i>
Teacher Practice	Resource Provider Curriculum Support	Resource Provider Curriculum Support	Resource Provider Curriculum Support	
	Facilitator Lesson Planner	Facilitator	Facilitator Lesson Planner	
	Observer Standards Support	Observer	Observer Standards Support	
		Standards Support	Standards Support	
Supporter of Students		<i>Interventionist</i>	<i>Interventionist</i>	<i>Interventionist</i>
Learner		Learner		Learner
Supporter of the School at Large	Leadership	<i>Trust</i>	<i>Trust</i>	<i>Trust</i>
		Expectations	Expectations	Expectations
		Value	Value	Value
		Facilitator	Facilitator	Facilitator
		Observer	Observer	Observer
		Standards Support	Standards Support	Standards Support
		Curriculum Support	Curriculum Support	Curriculum Support
		Validation		Validation
		Supporter	Supporter Decision Maker	

Note: In vivo codes are listed in italics.

Table 3.5*In Vivo and Descriptive Codes Grouped by Specialist Identities and Perceptions of Participant Perceptions*

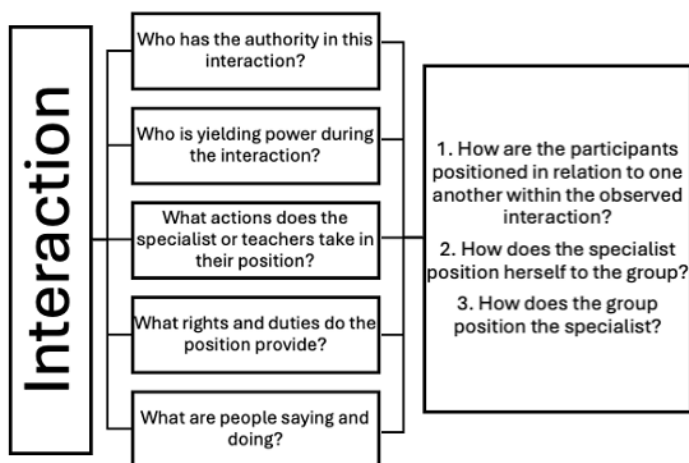
From Research	Interviews-Perceptions of the Specialist Role		
Specialist Identity (Chval et al, 2010)	Perception of Self (Specialist)	Perceptions of Teachers	Perceptions of Administrators
Supporter of Teachers	<i>Analyze the data</i>	<i>Analyze the data</i>	<i>Analyze the data</i>
	<i>Collective Dialogue</i>	<i>Collective Dialogue</i>	<i>Collective Dialogue</i>
	Relationship Builder	Relationship Builder	Relationship Builder
	<i>Student Learning</i>	<i>Student Learning</i>	<i>Student Learning</i>
	Curriculum Support	Curriculum Support	Curriculum Support
	Standards Support	Standards Support	Standards Support
	Facilitator	Facilitator	Facilitator
	Observer	Observer	Observer
	<i>Teacher Growth</i>	<i>Teacher Growth</i>	<i>Teacher Growth</i>
Resource Provider	Resource Provider	Resource Provider	
Supporter of Students	<i>Interventionist</i>	<i>Interventionist</i>	<i>Interventionist</i>
Supporter of the School at Large	<i>Trust</i>	<i>Trust</i>	<i>Trust</i>
	Value	Value	Value
	Facilitator	Facilitator	Facilitator
	<i>Student Learning</i>	<i>Student Learning</i>	<i>Student Learning</i>
	Curriculum Support	Curriculum Support	Curriculum Support
	Standards Support	Standards Support	Standards Support

In examining the codes, the context of the data, and the functions of the role that were described by the participants, I was able to group the codes into categories based on the perceived functions of the mathematics specialist (Table 3.6). The four themes by which I grouped the codes were specialist as a developer, specialist as a facilitator, specialist as a provider, and specialist as a leader. While these themes are related to the identities of specialists, as explained by Chval et al. (2010), the themes overlap within the identities. Based on the perceived functions of the mathematics specialist, these themes emerged. The themes of developer, facilitator, provider, and leader will be explained in detail in Chapter 4.

Table 3.6*In Vivo and Descriptive Codes Grouped by Theme*

Theme	Code
Specialist as Developer	Relationship Builder
	<i>Trust</i>
	<i>Teacher Growth</i>
	Observer
Specialist as Facilitator	<i>Analyze the data</i>
	<i>Collective Dialogue</i>
	Facilitator
Specialist as Provider	Curriculum Support
	Standards Support
	Resource Provider
	<i>Interventionist</i>
Specialist as Leader	<i>Student Learning</i>
	Value

To analyze the observation data for research question 2, I utilized three-level positioning analysis (Bamberg, 1997) when analyzing the transcripts. As an analytic framework, three-level positioning analysis combines textual analysis (level 1) and attempts to describe what is happening in the context of the interactions (level 2) while orienting towards analytic endeavors to determine a sense of self (level 3). In three-level positioning analysis, three major questions were considered: (a) How are the participants positioned in relation to one another within the interactions? (b) How does the specialist position herself to the group? and (c) How does the group position the specialist? (Bamberg, 1997). I examined how the specialist navigated identity spaces by analyzing her linguistic and paralinguistic communication. Paralinguistics refers to the parts of communication outside of the spoken words, including volume, speed, intonation, and non-verbal cues. Finally, I examined how the specialist attempted to address who she was to herself and others (Bamberg, 2020).

Figure 3.1*Data Analysis Framework for Interaction Data*

In my field notes and memos, I documented paralinguistic data such as facial expressions, body language, and tone of voice as teachers and the mathematics specialist interacted. I also noted when illocutionary forces—statements or questions that appear to imply something beyond what was said—were expressed. Interaction data was analyzed differently than perception data. To analyze interactions, I asked myself several guiding questions based on positioning theory (Harré et al., 2009; Harré, 2012; Harré & Moghaddam, 2014): a) Who has the authority in the interaction?, b) Who is yielding power during the interaction?, c) What actions do the specialist or teachers take in their position?, d) What rights and duties do the position provide?, and e) What are people saying and doing? These guiding questions provided insight into the positioning of the mathematics specialist during professional interactions. Utilizing these questions along with paralinguistic data allowed me to dissect the interactions and apply positioning theory, as well as make connections to three-level positioning analysis (Figure 3.1).

I used the transcripts of the meeting recordings and combined what I had in my field notes with the written transcripts to construct a picture of the interactions that took place during

the meetings. As I analyzed the interaction data, I divided the transcripts into smaller segments, or scenes. Each scene began with either an action or dialogue from the specialist or other participant. For each scene, I used the guiding questions to determine how the participants were interacting with each other and the catalyst for the positioning of the specialist in the interaction (Figure 3.2). If the interaction continued in the same manner in the transcript, the analysis of the scene stopped. I continued through the transcripts locating areas where the scene shifted based on an action or dialogue.

Figure 3.2

Interaction Data Analysis Example

Meeting Begins	<p>Who has the authority in this interaction?</p> <ul style="list-style-type: none"> Coach <p>Who is yielding power during the interaction?</p> <ul style="list-style-type: none"> Teachers <p>What actions does the specialist or teachers take in their position?</p> <ul style="list-style-type: none"> Coach begins the meeting and sets the agenda; teachers wait for direction to determine what they need to contribute; Coach tells the group that the meeting is starting with her words and by showing them a copy of the shared agenda by projecting it on a screen <p>What rights and duties do the position provide?</p> <ul style="list-style-type: none"> Coach determines the conversation focus for the meeting ensuring the focus is on student learning and setting expectations <p>What are people saying and doing?</p> <ul style="list-style-type: none"> Ms. S “here are my thoughts for today” to get the meeting started; coach states that she provides background on the topic for discussion (CGI strategies); tone is not authoritarian or aggressive; she speaks just as she was previously when having friendly conversation Teachers are settling in, sitting in various spaces in the room, shuffling work samples When the specialist signifies the start of the meeting, they all turn and look at the agenda and listen to her describe the purpose of the meeting 	<p>How are the characters positioned in relation to one another within the observed meeting?</p> <ul style="list-style-type: none"> Coach is positioned as leader of the meeting-leading the meeting and the direction of the agenda and priorities Teachers are positioned as listeners/followers <p>How does the specialist position themselves to the group?</p> <ul style="list-style-type: none"> Specialist positions herself as the meeting leader and her authority is not challenged <p>How does the group position the specialist?</p> <ul style="list-style-type: none"> The group follows her direction; meeting did not begin until the specialist made a move to start the meeting.
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During a professional learning community meeting, the specialist engages in multiple interactions with teachers. I was interested in determining if the specialist was positioned the same way throughout the meeting or if there was a shift in positions during the meeting based on the context of the interaction.

Methodological Integrity

I used several strategies to ensure the trustworthiness of the findings. Internal validity of qualitative research questions refers to whether or not conclusions drawn from data are trustworthy and if the conclusions are consistent with reality (Anfara et al., 2002; Merriam, 1998). Concerning internal validity, I utilized member checks, triangulation, and peer examination. I clarified my assumptions and biases throughout the research process through the use of memos.

Member checks involved taking data that was collected from participants and the preliminary interpretations of the data to the participants to determine if the interpretations were believable (Merriam, 1995). Once the data was collected and organized, I asked the mathematics specialist and the district mathematics leader to review my initial analysis to determine if they believed the data to be accurate and relevant. I was unable to conduct member checks with teachers because of some issues with timing and scheduling. However, there was consistency across participant groups regarding the big themes that emerged. Triangulation of data (Krefting, 1991) occurred through the use of multiple sources of data, such as interviews, participant observations, and analysis of reflective summaries. Perception data was included in the findings when the data appeared in all three participant group types: the mathematics specialist, teachers, and administrators. Peer examination involved asking colleagues to comment on the research findings as they emerged. I shared perception and positioning data with a colleague in education research and asked her to comment on my analysis of data, particularly the positioning data. The data that was shared had no identifying characteristics, and participant identities remained confidential. Positioning data was more difficult to triangulate because different PLCs may have positioned the specialist in different ways, but their storylines were just as compelling.

Therefore, it was important to determine if my interpretations were understood in the same way by a colleague.

Triangulation of data and the acknowledgement of my positionality also contributed to the dependability of the research. Dependability of research refers to whether the results make sense based on the data collected (Merriam, 1998). Another way that I ensured that the research was dependable was to create an audit trail, which explained how data were collected, how categories were derived, and how decisions were made throughout the study (Krefting, 1991; Merriam, 1998). To contribute to the transferability of the research, I utilized rich, thick descriptions to provide enough information for readers to determine if the findings can be transferred to their situations (Merriam, 1998).

Delimitations and Limitations

This study focused on the perceptions that school personnel hold regarding an elementary mathematics specialist and how school personnel positioned the specialist in professional interactions. I specifically chose to investigate a school-based elementary mathematics specialist because a school-based specialist is part of the school staff and community. Schools with specialists that are district-based may have different perceptions and relationships with school personnel than a specialist that is at a school daily. I wanted to center this study on elementary mathematics specialists who are part of the school community. This study also focused on public, district-run schools. This parameter excluded charter schools and private schools. The reasoning for this delimitation was that public, district-run schools (including magnet schools) are required to follow the same Standard Course of Study and teach the same mathematics standards as other public, district-run schools in the state. Charter schools and private schools may have different expectations and, therefore, have different perceptions and expectations for a

mathematics specialist. The study was intended to focus on elementary mathematics specialists whose primary role is supporting the mathematics program by working with teachers rather than students. However, it was difficult to find a school-based elementary mathematics specialist who did not also have to serve in the role of interventionist.

In this study, I gathered information regarding perceptions and positioning during a specific time. A limitation of this study was that I was not able to determine how a school community perceives and positions a specific coach over time. Since I investigated one school with an experienced coach, I was able to draw some conclusions regarding the perceptions about the specialist's experience but was not able to determine if the perceptions of her role or the expectations set for her were because she was experienced or if there were other contextual factors. School leaders, teachers, and specialists were able to choose whether they would participate in the study, which may have led to selection bias, which could limit the conclusions I could draw from the data.

Scheduling proved to be limiting in this study. The location of the school and my full-time work schedule made it difficult to be at the school regularly. Therefore, interactions were limited to those that were previously scheduled. I was unable to attend impromptu meetings between teachers and the specialist, and therefore, interaction data was provided through observations of professional learning communities and informal conversations on scheduled days.

Ethical Issues

Biases that cannot be controlled should be discussed (Merriam, 1998). I ensured that my positionality was known by all participants and discussed any biases that were present during the research process. I made efforts to establish a relationship with participants so they felt

comfortable sharing information without feeling as if their privacy was invaded. I ensured that the data provided by participants was not used in a manner other than what the participants agreed to at the onset of the research.

CHAPTER 4: FINDINGS

This study examined the perceptions that members of a school community held about the roles and contributions of a school-based elementary mathematics specialist in the school mathematics program. The study further examined how teachers, administrators, and the mathematics specialist positioned the specialist in professional interactions. The research questions guiding this study are: 1) How do school leaders, teachers, and the school-based mathematics specialist perceive the role and contributions of the elementary mathematics specialist in the school community? 2) How is the school-based elementary mathematics specialist positioned within the school community? The data for this study were collected by conducting interviews with mathematics specialists, teachers, and school and district administrators in a district that employed school-based elementary mathematics specialists. This chapter provides a description of the participants as well as a school and district profile. A summary of the findings is organized by the study's research questions and highlights the key themes and insights that emerged from the data collection and analysis.

Summary of Methods

This study was a qualitative case study investigating how a school-based elementary mathematics specialist is positioned within the school community. The study also examined the perceptions that various members of the school community had about the role and contributions of the elementary mathematics specialist.

For this study, the case was defined as an elementary mathematics specialist serving in a public, district-run school within the state of North Carolina. This case involved an experienced elementary specialist with more than five years in the specialist role. The participants in this qualitative case study included an elementary mathematics specialist who served at one

elementary school, regular classroom teachers from the elementary school, the school principal, and the district mathematics coordinator. Three teachers participated in one-on-one semi-structured interviews, and 26 regular classroom teachers participated in grade-level professional learning community (PLC) conversations.

Data for research question 1 regarding perceptions of the school community was collected through interviews with the elementary specialist, teachers, principal, and district mathematics leaders. The specialist also completed a reflective summary that focused on the elaboration of professional interactions and time allocation for duties. Data for research question 2 regarding the positioning of the specialist was collected through observations of professional interactions, specifically interactions in professional learning communities.

Interview data to answer research question 1 was transcribed verbatim and cleaned to ensure accuracy. Data were analyzed and sorted in atlas.ti, a qualitative software package. Using constant comparative analysis, I generated codes and broad themes (Corbin & Strauss, 2015). I began sorting data into large buckets based on specialist identities from Chval et al. (2010): supporter of teachers, supporter of students, learner, and supporter of school-at-large. To provide more structure to my analysis, I also grouped data using the Domains of Mathematical Coaching Knowledge (Sutton et al., 2011). However, these domains were not helpful for the organization of perception data because they focused on what a coach should know and be able to do and not what participants were expecting from the mathematics specialist. Beginning with the mathematics specialist's interview, I created in vivo and descriptive codes based on what she shared in her interview. I then applied those codes where applicable across the teachers' and administrators' interviews. From there, I was able to collapse code categories based on the context of the interview data and the functions of the role as described by participants. The four

major themes that emerged from the interview data were specialist as a developer, specialist as a facilitator, specialist as a provider, and specialist as a leader. Within these major themes are related functions of the role.

For research question 2 about positioning, I was able to use the three level positioning analysis framework (Bamberg, 1997) which allowed me to answer three questions: a) How are the participants positioned in relationship to one another?, b) How does the specialist position themselves to the group?, and c) How does the group position the specialist? Using field notes and memos, I was able to document paralinguistic data and illocutionary forces as the mathematics specialist and teachers interacted. In the analysis of interaction data, I used guiding questions based on positioning theory: (Harré et al., 2009; Harré, 2012; Harré & Moghaddam, 2014): a) Who has the authority in the interaction?, b) Who is yielding power during the interaction?, c) What actions do the specialist or teachers take in their position?, d) What rights and duties do the position provide?, and e) What are people saying and doing? These guiding questions provided consistency in analyzing how the mathematics specialist was positioned throughout multiple professional interactions.

Participant and School Profiles

The study involved 29 participants: one district mathematics coordinator, one school administrator, one school-based elementary mathematics specialist, and 26 teachers. Three of the teachers participated in interviews, as well as the district mathematics coordinator, school administrator, and mathematics specialist. The participants were purposefully selected. Since the study was focused on elementary mathematics specialists who were based at schools, the participant pool was extremely limited. There are very few districts that employ mathematics specialists who are based at a school. The district included in the study was closest in proximity.

This study was conducted in a suburban district. The district serves close to 7,000 students in 13 schools. There are seven elementary schools, seven middle schools, and three high schools. This district was selected for inclusion in the study because the district employs school-based mathematics specialists in elementary schools. Each elementary school has one or two full-time elementary mathematics specialists.

The district mathematics coordinator provided the names of school administrators who were willing to have the study completed in their schools. After speaking with the administrator and receiving permission to be in the school, I spoke with the mathematics specialist to get their consent and then with the teachers to gain consent. Teacher interviews were voluntary. All grade-level PLCs were included.

School Profile

The school included in this study is a traditional K-5 elementary school. This school has over 500 students and 28 classroom teachers. The school has is rated as an average school from the past year's accountability reports. In this state, every school receives a grade based on the school's achievement score and students' academic growth. The grades are reported on a 15-point scale. While the school has an average rating, the rating for the mathematics program is higher and exceeds the school's rating for literacy. The school exceeded expected growth in mathematics and met or exceeded growth in every subgroup reported. Historically, the school has met or exceeded expected growth in mathematics over the past decade. Last year, the school performed significantly higher than district and state percentages of students at grade level proficiency and students at career and college ready status.

The classroom teaching staff at the school is effective, with 87% of the staff rated as effective and 10% of the staff rated as highly effective. The state reports on the effectiveness of

teachers using an educator evaluation system that engages teachers and principals in discussions that recognize educators' individual strengths and areas of improvement. Educator effectiveness is based on ratings on observational standards and expected growth on the growth measure. To be classified as effective or highly effective, educators must receive ratings of proficient, accomplished, or distinguished on the observational standards and must meet or exceed expected growth. Most of the teaching staff was female, with three of the 28 classroom teachers being male.

Participant Biographies

Ms. S

Ms. S is an elementary mathematics specialist with 14 years of experience in education. She has been an elementary classroom teacher with experience in multiple grade levels before becoming a mathematics specialist. She has served as a mathematics specialist for five years. All her experience as an educator has been in the same school district. She knew early on in her career that she potentially wanted to be a mathematics specialist, and she purposefully asked her principal to allow her to teach in different grade levels to gain experience across the kindergarten-grade five span. Ms. S has earned a master's degree in teaching with an emphasis on mathematics. She also earned an add-on license as an elementary mathematics specialist. When she began as an elementary mathematics specialist, she served two schools, and for the last two years, she has served only the school included in this study.

Ms. D

Ms. D was the K-12 Mathematics Coordinator for the school district. In this role, she supervised the work of the school-based mathematics specialists. Her work included ensuring the district's adopted mathematics curriculum was aligned to the state mathematics standards,

ensuring that teachers were provided with appropriate resources and assessments, and supporting the work of the mathematics specialists through direct support. Ms. D also worked directly with the district leadership to ensure that the school-based specialists' work was aligned with the district's vision and mission. Ms. D has 21 years of experience in education. She was an elementary classroom teacher for over 10 years. She worked at the district level for nine years in a variety of roles. Ms. D was an elementary mathematics interventionist and an elementary mathematics specialist (coach) before taking the position as the district's Mathematics Facilitator.

Mr. P

Mr. P is the principal of the elementary school included in this study. He has 18 years of experience as an educator. He was a middle school mathematics teacher, teaching eighth grade mathematics and algebra. He served as an elementary school assistant principal for approximately three years before taking an assignment as a principal in an international school. Mr. P has served as an elementary school principal for six years in the district. Mr. P had experience working with a mathematics coach while he was an assistant principal. When he first became a principal in the current district, mathematics specialists (coaches) were not available at the elementary level. He advocated for mathematics coaches at the elementary schools because of his prior experience.

Ms. T

Ms. T is an elementary classroom teacher with over 26 years of experience. She has taught at the school included in this study for 15 years. She also has experience teaching middle school science. Ms. T has taught in several elementary grades, and the bulk of her experience has been in the intermediate (third through fifth) grades.

Ms. E

Ms. E is an elementary classroom teacher with 22 years of experience as an educator. She has been at the school included in this study for 11 years and taught in a different school district before joining the staff. Much of her teaching experience has been in first and second grade.

Ms. C

Ms. C is an elementary classroom teacher with five years of experience as a teacher. Before teaching, Ms. C was a teacher assistant for 21 years. In her work as a teacher assistant, Ms. C worked in various grades across K-5. Her teaching experience has been limited to first grade, and she began her teaching career in the school included in this study.

Table 4.1*Summary of Participant Characteristics*

	Years of Education Experience	Role	Gender
Ms. S	14	Mathematics Specialist	F
Ms. D	21	District Mathematics Coordinator	F
Mr. P	18	Principal	M
Ms. T	26	Teacher	F
Ms. E	22	Teacher	F
Ms. C	5	Teacher	F

Professional Learning Communities

Professional Learning Communities at this school were formed by grade-level teams. There are six grade level PLCs at the school, and each PLC has four to five classroom teachers. In fourth and fifth grade, the teachers were paired, and some taught mathematics and some taught reading, so the PLC meetings in those grades usually only included two to three teachers. PLCs met every other week to discuss mathematics. Meetings occurred in a teacher's classroom

during the grade-level planning period. During the observations for this study, the school administration did not attend PLC meetings.

Findings

The findings of this study provide an analysis of the data collected and are presented in alignment with the research questions presented earlier. This section provides an overview of the themes and patterns that emerged from the data and provides insight into the perceptions regarding elementary mathematics specialists and how a specialist may be positioned in professional interactions, such as professional learning communities. The findings are organized by the themes that emerged for each research question. The subsections highlight relevant evidence that contributes to the theme and is accompanied by contextual interpretation to support a deep understanding of the findings of the study.

Research Question 1: Perceptions

The purpose of research question 1 is to examine the perceptions that members of the school community hold regarding the role and responsibility of the elementary mathematics specialist as a coach. The purpose of this research question was to gain some clarity into what the school community felt the mathematics coach should be doing day-to-day and whether they thought the contributions of the elementary mathematics coach were valuable.

Data for this research question was gathered through interviews with members of the school community. Several themes emerged as the interview data was analyzed. From the interviews, it became apparent that teachers, administrators, and the specialist had overlapping perceptions of the role of the specialist in the overall mathematics program. In this case, the elementary mathematics specialist who serves as a coach was expected to serve a variety of functions. The perceived functions of the role fit into larger themes: mathematics specialist as a

developer, mathematics specialist as a facilitator, mathematics specialist as a provider, and mathematics specialist as a leader.

Mathematics Specialist as a Developer

One of the most prominent themes related to the perception of the role of the elementary specialist was the view that the specialist served as a developer. Within this theme, the specialist's functions were to develop relationships with other members of the school community by establishing trust and providing validation and to develop the growth of teachers through goal setting, observations, and coaching cycles.

Develop Relationships. The development of relationships emerged as a significant function of the role of the mathematics specialist. All groups of participants within the school community had an expectation of professional relationship development with the specialist. While the nature of the relationships varied, all participants perceived the specialist as a key to the development of professional relationships.

School leadership placed significant emphasis on the development of relationships. When looking for a specialist for the school, Mr. P took into consideration the interpersonal skills the potential specialists had. He asked potential specialists how they built close-knit trust and vulnerability because he wanted to be certain that the teachers and the specialist could work together and build a relationship of trust. He also tried to determine if the specialist would have the right mindset for working with a variety of teachers and if the specialist would be “willing to continually put energy into a relationship with a teacher.”

District leadership also stated that relationship development was essential to the role of the specialist as a coach. From her experience with mathematics specialists, Ms. D noted:

I have emphasized relationships significantly to the math coaches; any new ones that come in, I talk a lot about relationships. And I think that's because I had a couple of coaches who had some conflicts with teachers. And you can't go back from those conflicts. So, like, the first thing is, I want to see a positive relationship between the teacher and the coach, and the PLC and the coach.

The emphasis on positive relationships as a role of the mathematics specialist from the district leader and school administration shows that there is a belief that relationships are an essential foundation for successful coaching. According to Mr. P, the development of relationships stems from a place of trust, vulnerability, and validation. He noted that it was difficult to find the right specialist because the specialist had to have relational skills while also possessing the content knowledge to be effective.

Teachers discussed their relationships with the mathematics specialist, emphasizing the interpersonal skills she used to build meaningful connections and relationships. Ms. T reflected on the positivity and professionalism of the specialist, stating, "I think as a teacher, knowing how professional and positive she was, and she wasn't judgmental, and she wasn't the type to go tattle." Similarly, Ms. C also appreciated the specialist's demeanor, saying, "She just makes you feel like you can come to her with anything, and you don't feel small, or you don't feel like it's a dumb question. Even though you may think it. She just empowers you to be better." Ms. E remarked on the specialist's ability to relate to teachers, saying, "I think she doesn't forget what it's like to be a classroom teacher. So, she really, I think, works well with teachers." The experiences of these teachers illustrated how the specialist built trust and rapport with teachers, aligning with the administrator's expectation for the specialist to cultivate relationships. These

connections highlight the commitment of the mathematics specialist to empower teachers and foster connections.

The mathematics specialist acknowledged the complexities of building and maintaining professional relationships in the coaching role. She understood that not every teacher is receptive to a coaching relationship or comfortable with having a coach in their classroom. The specialist explained that when first taking on the role of coach, she wanted to take the time to cultivate supportive, collaborative relationships. She stated:

I started working with teachers who were super proficient at a skill or were most comfortable with me coming into their rooms so that they could then share the positive experiences that we had, and more teachers would want to open their doors up to work with me.

The specialist's approach to coaching helped establish trust and encouraged teachers to be open to a coaching relationship. However, she also described a challenging situation where a teacher was resistant to receiving support. Based on student outcome data and observational data from the administrator, it was apparent that the teacher needed coaching support. The specialist had to take time to develop a relationship that assured the teacher that the coaching observation data was only going to be used to work collaboratively to meet the needs of students. As the specialist slowly integrated herself into the classroom and focused on developing a collaborative relationship, the teacher became more comfortable with the suggested strategies and with allowing the specialist in the room. The specialist noted, "Building a relationship with this teacher was critical in creating a shift from our negative start to a collaborative partnership." This experience reinforces the role of trust in fostering meaningful relationships.

In this study, the mathematics specialist had previously been a classroom teacher in the school. Despite the challenges she faced with some teachers, her prior connections with teachers provided a foundation of trust that she could build on during her transition to a mathematics specialist. She explained, “I’ve taught a lot of these teachers’ children, and they recognize me as their colleague. And so, they already had some of that trust built in, which was a different kind of really cool way to enter into coaching.” The trust that she had built was essential to her role as she collaborated with teachers to support their mathematics instruction. She emphasized, “I recognize the value of that relationship and the impact it can have on students.”

The specialist recognized that the development of professional relationships was not limited to her work with teachers. She also understood the importance of having a positive, trusting relationship with the school administrator dependent on open communication. She reflected, “I’m thankful that we have that relationship where he can see what’s happening in our building and talk to me about it.” Building a relationship of mutual trust between the specialist and the principal ensured a unified approach to fostering a community of growth.

Develop Teachers’ Growth. Another perceived function of the mathematics specialist as a developer was the development of teachers through goal setting, observations, and coaching cycles. Participants all stated that one of their beliefs about the role of the mathematics specialist is that her purpose is to help teachers improve their classroom instruction. Ms. S stated, “I support teachers’ learning to improve student learning” when asked how she would describe her role. This statement is in alignment with the district’s vision for mathematics specialists. Ms. D, the district mathematics leader, pointed out that a major part of the specialist role was “helping teachers improve their practice.”

Goal Setting. One way that participants saw the specialist engage in the function of developing teacher growth was through goal setting, which promoted reflection and accountability. Ms. D highlighted what she felt was an important role of the specialist, stating, “The coaches are setting goals for the teachers. And as they're setting goals, they're monitoring those goals and seeing if students are making, or teachers are making progress.” This approach was evident in Ms. T’s collaboration with the specialist. She reflected on an instance where she sought support with teaching a concept in her classroom. Rather than providing immediate solutions, the specialist encouraged her to reflect on what she wanted to accomplish with her students. Ms. T recalled:

I came to her saying I really need your help. And she said, “Okay, well, what are your goals? What are the goals for students?” And I was like, “I don't know, can you just tell me?” She was like, “No, I want you to think about it. What are your goals? This is about you and your growth and you helping your students. So, first, you're gonna think about it, and then come back to me, and we will come up with a plan. But I want it to be your plan.” So, she was definitely giving me that ownership and challenging me to really think about it, which was good.

Ms. T felt that her growth as a teacher was strengthened through the specialist’s efforts in helping her identify her goals so that the process was more meaningful, empowering, and effective.

Mr. P, the principal, also recognized the role of the specialist in goal setting as a component of teacher growth. He described how the specialist actively worked with teachers, stating:

A lot of that work goes back to spending time in classrooms being a part of instruction and classrooms, having collaborative cycles of support for teachers, where you're developing goals for them to improve their practice and strengthen their practice. And then providing them with encouragement and also feedback to help them improve.

Developing teacher growth through collaborative and reflective goals-setting processes is a perception shared across participant groups. The specialist role is perceived as one that will create opportunities for teachers to engage in reflection to set goals that will foster their growth.

Classroom Observations. Observations and feedback were perceived as essential components of the mathematics specialist's function as a developer of teacher growth. The specialist described her approach to supporting teachers in improving their practice, explaining, "I have to get in classrooms and be able to observe instruction, not just as a snapshot, but like, ideally, a couple of times to see what's really going on." She goes on to explain how she engaged in conversation with teachers following classroom observations, stating:

I typically will do that first; observe in a classroom and then meet with a teacher to talk about some of the things I've observed or some of the things that they felt went well, what I observed students learning, what they observed the students learning, which is sometimes interesting to compare, and then what shifts we can make to support student learning.

The specialist felt that one of her roles in supporting teachers is to provide them with insights into their instructional practice. Ms. C reflected on the support she received from the specialist, stating, "When she, you know, watched me teach it and she could, you know, pinpoint, you know, this was good....it was just her having the feedback for me, so I can become better at

teaching the math.” Providing teachers with feedback to help teachers refine their methods and grow as professionals is an instrumental role of the mathematics specialist.

Ms. D, the district mathematics leader, described the district’s perspective on the mathematics specialist’s role in observations. She emphasized the expectation that the specialist would observe in classrooms in several ways—individually, alongside other teachers, and with school administrators. The observations would serve as a foundation for collaborative coaching discussions with groups of teachers and would aid school administrators in understanding what high-quality mathematics instruction should look like to support teacher improvement. Ms. D explained:

They [the coaches] have time for going in with a classroom observation.... they may go observe other classrooms with teachers. Like in fourth grade here, the teacher went and observed another fourth-grade teacher, and the coach went in, and they scripted together and talked about what instruction should look like.

The district expectation is that the specialists will engage teachers in a collaborative process to foster peer learning and self-reflection regarding classroom instruction. Additionally, Ms. D highlighted the importance of the mathematics specialist working with school administrators, stating, “They’re also the ones that are doing walkthroughs with principals and showing different school’s [administrators] ‘look at what this student is doing. Look at what this teacher is doing. This is really good math instruction.’” In this capacity, there is an expectation that the mathematics specialist works to build the administrator’s capacity for recognizing effective mathematics instruction so that the administrator, in turn, can help build teacher understanding of quality mathematics instruction.

Coaching cycles. Another perceived essential component of the function of teacher growth was coaching cycles. Coaching cycles were described as beginning with a meeting with the teacher to discuss the goals and anticipated outcomes. Following the meeting, there would be an observation of the teacher, modeling of a lesson or strategies by the specialist, or a co-teaching session. The cycle continues with a post-meeting to discuss feedback, what occurred during the lesson, strategies and suggestions, and next steps. Ms. S felt that a large part of her role as the mathematics specialist should focus on “completing coaching cycles focused on teacher growth.”

The school administrator also felt that coaching cycles were integral to the specialist supporting teachers in their instructional growth. He stated,

Doing coaching cycles with teachers to help strengthen their practice, modeling instruction, and co-teaching if, if that's needed. Just having a gradual release model of, you know, help helping support teachers to become better at specific aspects of math instruction, whether it's a component of our curriculum, or like, you know, how do we lead small groups after we after we had the mini-lesson?

Teachers also perceived coaching cycles as an important component of professional growth because the specialist was able to provide targeted support to improve instructional practices. Ms. T shared her experience working collaboratively with the specialist during a coaching cycle. She shared that she had gone to the specialist to request coaching support, stating, “So I said, ‘I really need your help... Can you come in and model some constructive math talk and some mathematical conversations’ and [she] helped me with the couple of goals I had in mind.” The coaching cycle that the specialist and coach engaged in included a continuous

process where the specialist modeled strategies to engage students. Ms. T reflected on the experience, stating,

It's great for me to be able to hear what she's saying and see what she's doing with the students. It was more than just two or three visits into the classroom where I got to observe her and how she was working and talking with the students.

The coaching cycle provided Ms. T with the opportunity to see and implement strategies with the support of the mathematics specialist, helping her to grow professionally. She concluded her explanation of the cycle by acknowledging the impact the specialist has on her growth, stating, “She’s been an excellent mentor in showing me different ways to improve my instruction.”

The perceived function of the mathematics specialist as a developer of teachers’ growth as professionals stems from the expectations set by the district and school administration, as well as from the experiences shared between the specialist and teachers. Ms. E emphasized the importance of having a mathematics specialist to support teacher growth, stating, “I feel like we all have strengths and weaknesses as teachers. And I feel like having a math coach will help us continue to grow and try new things.” She further remarked, “Sometimes teachers, especially teachers that have been teaching for so long, just kind of get stuck in a rut and are teaching, you know, what they are used to teaching.” The role of the specialist provides the opportunity to engage in innovative strategies to improve mathematics instruction. Ms. T agreed with the sentiment that teachers needed opportunities to engage with the mathematics specialist because “oftentimes, it’s a need for a paradigm shift.” The expertise that the mathematics specialist brought to the role contributed to the perception that the specialist should guide teachers to make a shift in their teaching. Ms. S reflected on a culmination of collaborative experiences with teachers, saying, “Open communication about instruction was able to positively impact both

teacher growth and student achievement.” She concluded by noting, “The experience we had created was valuable for their own personal growth and development as a teacher.”

The mathematics specialist as a developer is a pervasive theme among all participants. The role functions of developing relationships and developing teacher growth within this theme are seen as critical to the continuous improvement of the mathematics program. There is an expectation among all participants that the specialist will build trust and collaboration while guiding teachers through collaborative and reflective practices.

Mathematics Specialist as a Facilitator

A key theme regarding the perception of the role of the mathematics specialist is the specialist as a facilitator. Within this theme, there are several functions of the role. Mathematics specialists are perceived as instrumental in guiding professional learning communities (PLCs), facilitating collaborative dialogue, and facilitating data analysis and interpretation.

Facilitate Professional Learning Communities. In the theme of the mathematics specialist as a facilitator, a recurring perception is that one of the main functions of the specialist is to lead the PLC work. This role includes leading discussions, analyzing data, and driving a collaborative problem-solving process. The mathematics specialist, Ms. S, described PLC facilitation as a function of her role, stating,

Part of my work is to work professionally with PLCs to support the work of unpacking the curriculum and our standards, utilizing formative assessment data, analyze that data together, and make shifts in our instruction. I'm facilitating a lot of those conversations. She also emphasized that her role in the school community involved “working within a PLC to analyze our instruction and the instructional choices that we’re making.” It was apparent that the

mathematics specialist perceived leading PLC discussions as a key component to her role, which helped to ensure teachers had the necessary information to make instructional improvements.

Teachers also perceived the role of the mathematics specialist as a facilitator of PLC meetings. Ms. C shared:

I think when we have our meetings, it's like they will lead. They will talk to the leadership and then, you know, say, "This is what we want to talk about for the next PLC." They'll say, "We need to bring this up." So, they'll collaborate on what they feel the team needs to hear. So, she'll run those, which is really awesome.

This perception highlights what teachers may believe is the specialist's role in planning, organizing, and guiding PLC discussions based on the team's needs and the school leadership's expectations. Similarly, Ms. E, the leadership representative for her grade level, noted that agenda setting for PLC was collaborative. She shared, "She'll come to me and say, 'Well, this is what I'm thinking for our agenda. What else do we need to add on here?' or she'll send an email to the whole team asking if there's something specific we need to talk about." Teachers perceived that the mathematics specialist set the agenda to address team priorities and instructional goals. The facilitation of PLC by the mathematics specialist serves as a bridge between school leadership and classroom teachers.

The district and school administrators also emphasized that PLC facilitation was an expectation of the role of the mathematics specialist. Ms. D explained that the specialists were expected to work closely with PLCs, stating, "The coaches serve in that role and make sure PLC meetings are happening." She went on to say that in some schools, the specialists were tasked with the responsibility of preparing the agenda and the materials. Ms. D stated, "They are supposed to be working with PLCs on a regular basis. In some spaces, they lead PLC meetings.

In a lot of cases, it becomes they do all the work to prepare it.” In this school, the school administrator emphasized the importance of having a specialist with high levels of content knowledge and facilitation skills, stating:

A lot of the work goes back to having a rich content knowledge and knowledge of the standards so that they can help fill in gaps in those conversations with PLCs. They help keep them [PLCs] on target and focused in their work, figuring out how to solve problems together, not just talk about students that might be struggling, but looking at a problem and figuring out the solution.

Mr. P’s perspective highlights the perception that the mathematics specialist should have the appropriate skills for facilitation and the mathematics content knowledge necessary to lead teachers in productive and solution-oriented conversations.

Across participant groups, the mathematics specialist’s role is perceived as a facilitator of PLC work, guiding teams to deepen their understanding of standards and curriculum, analyzing student data effectively, and engaging collaborative conversations to solve problems.

Facilitate Collaborative Dialogue. Another perceived function of the mathematics specialist role is the facilitation of collaborative conversations and dialogue. This function goes beyond facilitating PLC meetings and extends into one-on-one meetings, coaching cycles, and informal hallway conversations. The mathematics specialist is perceived as playing a key role in fostering an environment that allows for open and meaningful conversation. Ms. S shared, “From a space of being more comfortable, they [teachers] are able to have that collective dialogue and work more collaboratively from the beginning.” As a facilitator of collaborative conversations and dialogue, the mathematics specialist must be able to balance her role between guiding discussion and allowing teachers to take the lead. Ms. S shared an experience she had with a

grade-level teacher as they worked through how the teachers could support each other in meeting the needs of all students. She came to the meeting prepared with purposeful questions, but the meeting shifted to teacher-led conversation. She reflected:

Teachers led most of our discussion throughout their collaborative conversation, which was amazing to witness. I ended up facilitating the discussion and highlighting important instructional practices that I hoped to build across the grade level, such as strategic math talk moves, appropriate pacing, and high student expectations.

As the mathematics specialist, Ms. S embraced the role of facilitating discussion to ensure the conversation was focused on effective instructional strategies but also empowered teachers to share their perspectives, allowing them to take ownership of the conversation.

As stated earlier, a key theme is the perception that the mathematics specialist is a developer with the function of developing relationships. That function intertwines with the function of facilitating collaborative conversations. Ms. S reflected on the importance of relationships in facilitating conversations, stating, “I was welcomed into a space where we’re ready to collaborate together. And they can include me in those conversations and dialogue.” Mutual trust enabled productive dialogue that supported teacher growth and instructional improvement. Ms. E noted, “It’s letting teachers be able to talk about what we want to talk about, not just always being told what we’re expected to do. I feel like there’s a lot of open communication with our math coach.”

Administrators also emphasized their perception that the specialist should be fostering an environment that allows for open, supportive dialogue. Ms. D emphasized that the mathematics specialist should enter interactions with teachers with respect as a way to influence teacher growth, stating:

I don't want a coach coming in and like, taking over and being overbearing because I don't think you change instruction that way. So, when I see the interactions, they should be listening. There should be the collaborative environment, not like, I am the coach, you are the teacher.

Similarly, the school administrator, Mr. P highlighted the significance of collaboration in ensuring student success. He stated that the specialists are “working directly with teachers and collaborative teams to ensure that ensure that our students are learning grade level standards, to a level of mastery that we expect by the end of the year.”

The mathematics specialist is perceived as a facilitator of collaborative conversations and dialogue, fostering open communication while supporting teachers in their instructional practices. This function of facilitation is perceived as a key component of their role.

Facilitate Data Analysis. Being able to help teachers analyze and interpret student data is another perceived function of the role of the mathematics specialist. The mathematics specialists are perceived as key in helping teachers make sense of student data, identify areas of student need, and guiding instructional shifts when appropriate. Ms. S explained that data analysis is part of her current work stating that she worked with teachers “unpacking the curriculum and our standards, utilizing formative assessment data, analyzing that data together, and making shifts in our instruction.” Data analysis was generally a part of a PLC meeting, and the specialist’s role in ensuring that data was understood was part of her facilitation duties.

Teachers also commented on the role of the specialist in data analysis and helping them make student data actionable. Ms. T explained that her data analysis experiences with the specialist included asking the question, “How can we utilize that data in order to make sure that we're really providing instruction and intervention that will help our students grow where they

need to?” She elaborated on her experience with the specialist’s role, stating, “The math coach will meet with our PLC for math to have instruction-driven conversation, and we look at data.” She acknowledged that the specialist played a role in focusing the instructional conversations, sharing, “they [coaches] have definitely been working on crunching the numbers and making some reports so that we can have really focused conversation.” Teachers appreciated the support the mathematics specialist provided in organizing and interpreting data to inform interventions. Ms. C highlighted the value of this support, stating:

It’s just helping us, like with the testing and generating who needs the interventions, having everything in place. Help us order the groups, get the data together, put the kids where they need to be. I think that’s very important; helping us to see where the need is.

The teachers perceive the mathematics specialist as a support in helping them translate data into actionable steps, such as grouping students and planning for targeted intervention.

The district and school administrator also emphasized that the mathematics specialist should be facilitating data discussions with teachers, emphasizing the use of student data to determine student progress toward the mathematics standards. Ms. D explained, “Take everything back to standards and focus on our expectation for students in looking at data. So, I would hope that I’ve seen them [coaches] actively planning and looking at data and thinking about those instructional shifts.” She also noted that it was an expectation that the specialists “analyze a lot of the data and talk about what it means. They kind of go through and identify concerns.”

Mr. P perceived the mathematics specialist as a bridge between data and instructional change. He stated, “We want them [coaches] to help pull together the student data and build the capacity of the teachers to be able to do that on their own as well; to quickly assess how students

are doing and then respond.” He views the specialists as instrumental in supporting teachers’ use of data to guide their instructional practice. He added, “We want more of a focus on their CFA [common formative assessment] data from you know what they're teaching. And then what are they going to do with that data to actually guide their instruction that day, and the days to come.”

Across participant groups, the mathematics specialist is viewed as a facilitator of data analysis. The specialist is a vital to helping teachers bridge the gap between student data and instructional change.

Mathematics Specialist as a Provider

Another emerging theme regarding the perception of the role of the mathematics specialist is the specialist as a provider. Within this theme, the mathematics specialist is viewed as someone who supports teachers by providing standards and curriculum support, providing instructional resources, and providing mathematics intervention through student intervention and providing intervention strategies to teachers. These perceived functions for this theme highlight the participants’ view that the specialist should be providing tools and support for effective instruction that meets the needs of all learners.

Provide Standards and Curriculum Support. A perceived function of the mathematics specialist’s role is providing support in understanding the academic standards and the adopted curriculum. The mathematics specialists are viewed as essential to ensure that instructional practices align with grade-level expectations and that teachers have a clear understanding of how to effectively implement the mathematics curriculum. Ms. S explained that as part of her role, teachers often “rely on my opinion a lot about the curriculum and the lessons and the way they're structured.” She emphasized that in her role she was able to help teachers “look deeply at standards and the way in which our instruction aligns or doesn't align with that.” Providing this

type of standard and curriculum support helps teachers understand how to bridge the standards and instructional goals with the chosen curriculum.

Teachers also noted that they believe part of the specialist's role was to provide support on standards and curriculum. Ms. E reflected on how teachers could easily revert to familiar instructional practices even if those practices are not proving to be effective. When discussing the role of the specialist in supporting curriculum implementation, Ms. E stated, "I feel like she's always giving us ideas or helping us find ideas." Similarly, Ms. C shared how critical the mathematics specialist was in helping her get acclimated to the curriculum and navigate her first years as a teacher. She shared:

I wouldn't have made it through [the curriculum] if I didn't have my math coach. She helped me with implementing the centers. She taught for me so I could observe how to teach this, like what to do. She set up the stations. She helped me so much because it wasn't very clear. She was there for me.

Ms. T shared that mathematics specialists were integral to ensuring that the academic standards and the adopted curriculum we aligned. In describing attributes of the mathematics specialists, she emphasized that their "expertise centers in our standards and in the curriculum and how to bridge the two when they don't meet." She noted that current curriculum had some areas that fell short of what teachers needed to effectively teach concepts. She explained that in those areas, the mathematics specialists helped them bridge gaps, stating, "Some incredible things that the math coaches have been doing in the last few years is really trying to take a look at where are the shortfalls in [the curriculum] and how we can adjust for that." These experiences illustrate how the mathematics specialist has provided guidance in the curriculum implementation, but also hands-on support to ensure teachers are confident in their instructional practice.

School and district administration also emphasized the importance of the mathematics specialist's role in guiding teachers' understanding of standards and curriculum. Mr. P, the school principal, highlighted the value of the specialist's expertise, explaining that when teachers attend PLC meetings or other professional interactions with the specialist, he expects that:

Having them [coaches] within the PLC is going to add value, strengthen their [teachers'] work, not pull them away from you know, their planning work. So, making sure that they [coaches] have knowledge of standards, so they can kind of fill in gaps if people are unclear or confused about something or just have a misconception about what the goal of a particular unit is or what they want students to learn and be able to do.

Mr. P also noted that the mathematics specialist has a role in "helping teachers and PLCs to implement our curriculum and strengthen our curriculum and teach students at multiple levels." This focus by the specialist on the standards and curriculum supports students in achieving grade-level standards. Ms. D emphasized that the district had an expectation that the mathematics specialist should be providing essential support in understanding standards saying, "They should be unpacking standards. They are the experts in the curriculum and knowing kindergarten through fifth grade, what that [instruction] looks like."

Provide Instructional Resources. Another function of the role of mathematics specialist as a provider was to support teachers by providing instructional resources. This perception was evident among all participant groups, which emphasized the view that a part of the role of the specialist in supporting the mathematics program is to identify, share, and implement a variety of resources.

Ms. S highlighted this aspect of her role, stating, "They're not afraid to reach out for resources. I feel like I provide a lot of that work there." She added, "They're looking to me a lot

of the times and part of that might be like I know that more of the resources that we have available here.” The specialist acknowledged that part of her current role was to connect teachers with tools and materials they need to implement quality instruction.

Teachers also acknowledged the role that they felt the mathematics specialists played in providing instructional resources. Ms. E pointed out what she felt was the role of the specialist, stating, “I feel like their responsibility in supporting teachers is just being able to have resources available, being able to have an open ear to be able to listen and good communication.”

Similarly, Ms. T emphasized the need to have the specialist provide teachers with effective resources and strategies, saying she needed the specialist to “bring in resources that are high yield strategies that keep the kids engaged, that keep them moving, that keep them thinking, keep them talking.” She further explained that it was essential to have the specialist’s input regarding instructional resources, stating, “There are many times where we were looking for resources; she's really knowledgeable about what we have.” Beyond just providing resources, teachers perceived the mathematics specialist’s role was to ensure that the resources provided were well-matched to students’ diverse needs.

The perspective of the district and school administration is similar to how the specialist and the teachers viewed the role. Administrators also felt that providing materials and resources for teachers was a significant part of the role of the mathematics specialist. Ms. D commented on the current work of the mathematics specialists, saying, “They are creating curriculum and resources and materials. If resources need to be created, they have them created in a flash.” Mr. P explained that he believed that providing resources was not enough. His expectations went beyond the function of providing materials to ensuring that teachers had the knowledge and skills to use the materials in effective ways. He stated,

Sometimes, people just want the resource, like, just give me something that I can take and use. And that's important. We want to help provide resources but also make sure that we're not just providing a resource without building their [teachers'] capacity to know how to use it intentionally.

The perception of the mathematics specialist as a provider of instructional resources was consistent across all participant groups and highlights that the specialist is pivotal in ensuring teachers have what they need to implement quality mathematics instruction.

Provide Intervention. The purpose of this study was to focus primarily on the role of the mathematics specialist as a coach, meaning the specialist's focus was on supporting teachers. However, to secure funding for school-based mathematics coaches in the elementary schools, the specialists also had to serve in the role of interventionist, supporting students who need intensive intervention instruction. Therefore, a function of the theme of the mathematics specialist as a provider was the specialist as a provider of student intervention.

Ms. S described the balance she must maintain between being a mathematics coach and an interventionist. She explained, "Outside of coaching, part of my responsibilities are facilitating some of the interventions, specifically for some of our Tier 3 [intensive] students." She elaborated, "I think I have four intervention groups right now that are 20 to 30 minutes each. So that's two hours of my day." Ms. S emphasized that in her role she juggles her time to meet the needs of teachers and students. She shared, "I'm basically bouncing between my intervention groups to support classroom as best I can."

Classroom teachers perceive the role of the specialist as a provider of interventions as critical support. Ms. E pointed out that the specialist supports schoolwide intervention, stating:

I have a couple students in my class that the math coach does come in to pull out in small group. And I know that across, I think, schoolwide she does work with several groups throughout the day in all grade levels.

Ms. T emphasized that while the specialist provides intensive intervention to students with the highest levels of need, she also works with teachers to provide intervention strategies for students needing some targeted, but less intensive, support. She highlighted the collaboration she had with the specialist to ensure that classroom interventions were appropriate. She also noted that the specialist modeled classroom interventions stating, “She’s done some interventions for me, which is really interesting to see how it works.” Teachers noted that the mathematics specialist had to figure out how to balance her time so that she could provide support to teachers and students. One teacher noted, “She can juggle a lot more than I would have predicted.”

Administration also acknowledged the need for mathematics specialists to take on the role of interventionist. Ms. D pointed out that to meet the needs of all students, the specialists in all of the district’s elementary schools needed to serve in the role of interventionist. She explained, “Most of them have three to four intervention groups; some have as many as four or five intervention groups. They usually do intervention for the students that have the most severe needs; just because they have that expertise.” There is an expectation that the role of the specialist extends beyond intervention delivery. The specialists are also tasked with determining structure and content. Ms. D added, “They’re determining what interventions students would receive, not only helping determining groups of interventions, but also determining content.”

Mr. P acknowledged the challenges of having the specialist serve in the dual roles of coach and interventionist. He stated, “It’d be great if they could spend 100% of their time working with adults, but we just don’t have enough people to provide the additional intervention

at the right intensity for what students need.” Mr. P emphasized the value of having mathematics specialists that had the expertise to provide quality intervention for students needing intensive instruction, saying, “We really need someone that is an expert in quickly identifying what the student needs.”

The perceived role of the mathematics specialist as a coach and a provider of student intervention highlights the need for specialists to possess content expertise and the skills to work with a flexible schedule.

Mathematics Specialist as a Leader

The mathematics specialist is perceived as a leader in the school community. Research Question 1 focuses on the perceptions that members of the school community hold about the role and contributions of the elementary mathematics specialist. Across participant groups, it is apparent that they believe the mathematics specialist should provide leadership and value. The mathematics specialist should lead the mathematics program by setting expectations that focus on student learning.

Lead Through Value. The mathematics specialist is perceived as a leader that contributes to the school community in valuable ways. The specialist should bring expertise, guidance and support that positively impacts students, teachers, and administrators. As she reflected on her role in shaping classroom instructional practices, Ms. S shared that she felt that her principal “values my opinion and the math expertise that I bring to the table. I think that he recognizes the impact that we’re [coaches] having on classrooms.” She further explained that during PLC meetings, teachers also “rely on my opinion a lot about the curriculum and the lessons and the way that they’re structured.” In describing a coaching experience she had with a teacher, Ms. S noted, “She valued the knowledge that I possess as a math coach and she

acknowledged the ways in which I support students and staff.” Teachers also shared in this sentiment. Ms. C noted, “I know they [coaches] have a lot to offer and a lot to give and I respect their expertise, and I respect their knowledge.” Ms. T also emphasized that she felt it “was very helpful that she knows what she’s doing. She’s going to be positive and she’s going to be helpful.” She went on to express the importance of the specialist being knowledgeable and supportive, stating, “She is a well-loved member of our community.”

The district administration also views the mathematics specialists as leaders in their school communities. Ms. D described the mathematics specialists as “the heart of the program,” and explained that the specialists are “the voice that drives the math programs and drives the decisions that are made” with regards to how support is provided for elementary mathematics. She also acknowledged that the district’s assistant superintendent had the same perceptions about the value that the mathematics specialists contribute to the mathematics program in their schools as well as district-wide. She stated, “He knows the expertise in the room and people value that expertise in the room.” The school district expects the mathematics specialists to be leaders who work to maintain cohesion in the elementary mathematics program. The school administrator emphasized the value the mathematics specialist should bring to the school community. He attributes the success of the mathematics program in his school to the leadership of the specialist, saying, “I think a lot of that [success] has to go back to the work that we’re doing with our teachers directly through the math coach.”

Lead by Focusing on Student Learning. The mathematics specialist is perceived as a leader in the school’s mathematics program who maintains a strong focus on student learning. This focus was evident in how the specialist collaborated with administrators and teachers to ensure instructional practices were aligned with the needs of students. Ms. S emphasized the

collaboration, stating, “We [coaches] meet with administrators, to discuss not particular teachers, but math instruction in the building, and ways to support the work of teachers to affect student learning.” Through the facilitation of these conversations, the mathematics specialist ensures the goal of the school-wide mathematics program centers on improving student outcomes. Ms. S also explained how she used her roles as a developer and facilitator to foster collaboration among teachers to analyze data and identify trends in student performance. She stated:

I, as a coach, am working to support math instruction within our school. I'm focused on student learning. I help teams collaborate and communicate about data, to identify trends, and make shifts appropriately each week to think through the lens of how we can support student learners the best.

She further explained that through the facilitation of PLC meetings, collaborative conversations, and data analysis, she led with intentionality, stating, “I’m just ensuring that the conversations that we're having are focused on student learning.” Teachers also recognize that the specialist leads the school in improving student outcomes. Ms. E reflected on the specialist’s work, noting, “It's always, ‘How can I help with this? What can I do to help in your classroom for you to be supported? For your students to feel successful?’ That kind of thing.” This type of interaction underscored the perception that the specialist continually focused on student learning and positive student outcomes.

Administrators also perceived the work of the mathematics specialist as being student-centered. Ms. D noted, “The interactions should really be focused on the students. When it's geared more towards students and student performance, it gives an easier playing field to have a conversation.” Similarly, Mr. P emphasized the student-focused nature of the specialist’s role, stating, “It comes back to the benefit it has for our students. You know, it's not just about the

teachers. It's about the kids.” These statements highlight the belief that the specialist’s leadership of the school community focuses on making decisions and providing supports that positively impact students.

Summary of Themes for Research Question 1

The findings for Research Question 1 revealed four key themes in how the school community perceives the role of the elementary mathematics specialist: specialist as developer, specialist as facilitator, specialist as provider, and specialist as leader. Within each of the themes, the mathematics specialist performs a variety of functions that are essential to the success of the specialist and the school-wide mathematics program. As a developer, the mathematics specialist is perceived as someone who cultivates professional relationships through trust and validation and nurtures teachers’ growth in their instructional practice through goal setting, observations, and coaching cycles. When the mathematics specialist is viewed as a facilitator, the specialist facilitates the professional learning communities by setting the agenda and directing the meeting, facilitates collaborative dialogue, and facilitates data analysis. The mathematics specialist is perceived as a provider of standards and curriculum support, instructional resources, and student intervention. As a leader, the mathematics specialist is perceived as providing value to the school community through their interactions. The specialist also leads the school mathematics program by maintaining a consistent focus on student learning. The contributions of the mathematics specialist are multi-faceted and are viewed as significant to building a cohesive and effective school mathematics program that provides for teacher and student growth.

Research Question 2: Positioning

The purpose of research question 2 is to examine how the members of the school community position the elementary mathematics specialist in professional interactions. From this

research question, I hoped to gain some insight into how the school community interacted with the specialist to determine how positioning affected the relationships that were built, the conversations that were had, and the power dynamics that were in play. The first research question centered on how the role of the mathematics specialist was perceived by the school community. The mathematics specialist is perceived as a developer, facilitator, provider, and leader. Within those themes, the specialist's role had some perceived functions, such as developing relationships and teacher growth; facilitating PLC, collaborative dialogue, and data analysis; providing curriculum and standards support, resources, and intervention; and leading the school community by contributing value and focusing on student learning. Since her role is multi-faceted, I was interested in observing her professional interactions to determine if she was positioned in ways that enabled her to meet the perceived expectations of the role.

During the observations of interactions, I analyzed the different exchanges teachers had with the mathematics specialist. To better understand the positioning of the specialist in these professional interactions, I asked myself several guiding questions based on positioning theory (Harré et al., 2009; Harré, 2012; Harré & Moghaddam, 2014): Who had the authority in this interaction? Who was yielding power during the interaction? What actions did the specialist or teachers take in their respective positions? And finally, what rights and duties were implied or explicitly granted by those positions? These observations allowed me to explore how dynamics of authority and power shaped the role of the mathematics specialist in the school community.

Several themes emerged from the observation data—the mathematics specialist was positioned as a navigator, as a collaborative colleague, and as an instructor. Within professional interactions, the mathematics specialist and the teachers were able to transition from one position into another seamlessly.

Specialist Positioned as Navigator

During meetings of the Professional Learning Communities, the specialist was often put in the position of a navigator. A navigator is generally a person who directs the route of a vehicle, like a ship or a car, by providing directions or reading a map. The navigator may allow for a change in direction but will bring the vehicle back on course before veering too far off course. Similarly, in the position of navigator, a person would guide or lead others through tasks, such as data analysis or discussion, helping to direct them toward school priorities. A person in this position could allow for discussion to move in a direction that was not initially anticipated but could direct the meeting participants back to the agenda.

While observing the specialist and teachers in PLC meetings, teachers consistently positioned themselves in a space where they were awaiting direction, and the specialist provided them with an agenda to get started. Every PLC meeting began with friendly conversation among the teachers and with the specialist. The conversations ranged from events in their personal lives to something that happened on the playground. Sometimes, the conversation was professional, with a teacher asking about an email they had received or a student who needed support. The start of the meeting was always apparent. Ms. S, the mathematics specialist, would signify the start of a meeting by saying, “Here are my thoughts for today,” or something similar. In one PLC meeting, she began by saying, “Ok, so here’s what I did,” and she launched into sharing data analysis tools. In a different grade, she started the meeting, saying, “I’m hoping that we can have a data dive into the checkpoint now.” Her actions while she started meetings were to share an agenda on the screen or ask teachers to access the agenda so they could see the direction of the meeting. Ms. S’s tone of voice was never commanding or overly assertive, but her directions did

prompt compliance. So, while she never said, “Here is the agenda,” or “Let’s get this meeting started,” her words were understood to signify the beginning of the meeting.

Being positioned as the navigator provided the mathematics specialist the authority to shape the agenda and set the priorities and pace of the meeting. While positioned as the navigator, the mathematics specialist was able to guide PLC work in a way that was not overbearing but allowed for communication, which led to some transitions to other positions during the meeting. In some instances, it was apparent she had collaborated with a teacher to set the agenda, saying, “When I touched base with [teacher] this week, we were thinking about the post-assessment and potentially making some shifts. So, we’re gonna spend a little bit of time there and talk a little bit about intervention.” In another grade, she stated, “I reached out to him to talk about what he felt like PLC-wise would be most beneficial based on the math work that you guys are doing now.” Regardless of whether she referenced the collaboration before the meeting, the positioning of the specialist as navigator remained the same. Teachers waited for directions from her to start the meeting.

In some PLC meetings, the specialist remained in the position of navigator the majority of the meeting. In these meetings, she did ask for input from the teachers, asking, “How do you feel about that progression? Do you feel like that’s an appropriate place to go?” In another grade, she asked, “What are your thoughts on what you’ve had more success with in the past?” In these interactions, the direction of the meeting continued to remain with her. While teachers were providing answers to her questions, she was directing the course of the meeting. During my observations, I did not note anyone other than the specialist taking on the role of the navigator. There were instances where the specialist was shifted into a different position, like a collaborative colleague or instructor, but the navigation of the meeting always came back to her.

Specialist Positioned as Collaborative Colleague

A collaborative colleague contributes to group efforts and fosters a cooperative environment. A collaborative colleague would engage in sharing ideas, listening to others, and working toward a common goal. The mathematics specialist in the position of collaborative colleague meant that she conceded power in the relationship dynamic. In those instances, she became part of the group rather than directing the group. Teachers had control of the conversation, and the specialist participated in the conversation, asking questions when pertinent, but provided space for teachers to share strategies and ideas, contributing to their growth and the growth of their peers and allowing the specialist and the teachers to co-construct understanding.

This dynamic was observed several times. In one PLC meeting, the specialist began the meeting by providing some background on why teachers would be discussing specific strategies. Each teacher came to the meeting prepared to share student work and discuss their classroom practice. The specialist started the conversation with, “We haven’t had a chance to debrief on how it’s going yet, so I wanted to just take some time. We’ve been working on some of this stuff, and we’ve seen some critical shifts.” While the specialist did navigate the teachers to this discussion, as the conversation took form, the specialist transitioned to a peer who was listening to others share ideas. During this conversation, teachers shared how they were teaching a problem-solving concept, and the other teachers on the team provided feedback. As the teachers shared student work, they received more feedback from their peers. The teachers, along with the specialist, asked questions as their peers shared. In the position of the collaborative colleague during this meeting, the mathematics specialist conceded her power in leading the meeting, and the teachers took on the role of the leader. They assumed the responsibility of engaging each other in dialogue. The mathematics specialist asked questions, generally to individuals, only to

clarify her thinking, saying, “What do your pictures look like?” or “What strategies have you seen kids use?” so teachers could explain what was happening in their classrooms. During the conversation, teachers were passing student work around, leaning into each other to ask questions and listening to explanations. When the mathematics specialist asked questions, it did not stop the conversation or change the direction of the conversation. She participated as a colleague rather than the expert in the room.

In another PLC meeting, teachers were working on inputting data from the last assessment into the data analysis tool. As the group was working, a teacher began a conversation with the mathematics specialist. In that conversation, the specialist’s position shifted to being a collaborative colleague. The teacher shared what was going on in her classroom and where she believed students were getting stuck with solving addition and subtraction problems. The specialist listened to the teacher’s analysis of the student’s errors and responded by asking clarifying questions, such as, “Is that similar to the things you’re seeing with [student]?” She provided time for the teacher to look at her student data and express her ideas and only contributed when it helped push the teacher’s thinking forward by asking questions such as, “How can we ensure that the standard algorithm is introduced with conceptual understanding?” After asking the question, the specialist did not provide the answer; she waited for the teacher to work through some strategies, allowing the teacher time to figure out what to do next. As the teacher reflected on her instruction, she stated, “This flexibility of thinking is going to help with their addition and understanding what’s going on. They really could not regroup with proof drawings, and I tried to take them back to that old strategy.” This interaction allowed for the specialist to take part in the conversation, not as a leader or director but as a listening peer.

In another grade, the meeting began with the mathematics specialist commenting on student work from one of the classes regarding a specific problem-solving task. In this grade level, the subject areas are departmentalized, and there are two mathematics teachers. The specialist asked the second teacher, “How did you feel about that task?” By asking this question, the specialist provides the opportunity for the two teachers to begin a discussion about the task that students completed. At this point, the teachers took control of the conversation, sharing their strategies for grouping their students to engage in the task. While this interaction was short, there was a shift from the mathematics specialist directing the flow of the meeting to the specialist opening the space for teachers to take the lead in the discussion while she listened to their experiences. In this position, the specialist did not attempt to solve any issues for the teachers but provided time for them to discuss the difficulties they were having with student groups.

When the specialist is positioned as a collaborative colleague, she no longer assumes the power over the direction of the conversation. In this position, other participants assume the leader role, while the specialist steps back. The duties and responsibilities for leading the conversation no longer rest with her. Instead, they are transferred to the participants engaging in the discussion. The shift into collaborative colleague can begin with a statement or question about a topic, making the specialist appear as a navigator, but the shift in the power dynamic and the resulting storyline to a group-led discussion is what positions her as a collaborative colleague.

Specialist Positioned as Instructor

There were times that the mathematics specialist was positioned as an instructor during professional interactions. In this capacity, the specialist was able to deliver mathematics learning for teachers, whether focused on pedagogy, mathematics content, or resources. In the instructor

dynamic, the specialist is an expert who provides information for teachers, and teachers are actively engaged in the learning. In some cases, they asked clarifying questions and took notes. This position differs from the navigator and the collaborative colleague. The navigator directs the flow of the interaction. The collaborative colleague allows for conversation where teachers take control of the direction of the discussion while the specialist is an active listener. In the position of instructor, the specialist teaches, creating a learning environment for teachers. In this position, the specialist often stood to write on the board or point out a chart in the room. Her actions mirrored those of a classroom teacher when they might be instructing their class.

This positioning dynamic was observed multiple times over several grade levels. Usually, the specialist transitioned into the position of instructor during a meeting based on a question that was asked or on the data that was being analyzed. In one grade, the meeting was initially focused on data analysis and preparing progress reports. As the specialist pointed out some numeracy standards that students were stuck on, she shifted the discussion to provide instruction on how to teach those numeracy standards, providing teachers with examples while they asked clarifying questions. In this position, the specialist assumed the duty to provide content and pedagogical information that teachers needed so they could better understand why their students were not grasping the numeracy skills and how to change instruction to meet students' needs. She stated, "One of the things that I would like to bring to y'all to look at is this idea around number families." By making this statement, she shifted the meeting into a learning environment and positioned herself into the position of instructor.

In another grade, the meeting focus was on problem-solving strategies. The conversation began to shift when the specialist said, "When you think about that strategy, a number rack or ten frames aren't really strategy. They're simple models. The model helps them solve problems, but

the strategies are the things that people do to get their answer.” This statement was followed up with a clarifying question from a teacher. The teacher asked, “So when they’re explaining how they use a model, that’s not a strategy?” From there, the meeting shifted into a learning space where the specialist took time to teach and provide examples of strategies and models. She then went on to provide further pedagogical content regarding the importance of appropriate questioning and the types of questions teachers should ask to elicit student thinking. Throughout this interaction, the specialist guided teachers through several strategies and models, showing them how each was used and providing them with an environment where they could learn new information and reflect on their teaching. In the position of instructor, the mathematics facilitator was the leader, and the duties and responsibilities in this position include offering learning opportunities to teachers.

The position of instructor did not always pertain to mathematics content or pedagogy. There were times that the mathematics specialist assumed the position of instructor and provided a learning environment centered on the use of resources. In one grade level PLC, teachers were learning how to use an online program that provided supplemental curriculum and intervention support. This meeting began with the specialist asking, “Are there any specific things that came to mind for [the program] that you wanted answered? That we haven’t yet learned?” With these questions, the specialist positioned herself as an instructor, opening the learning environment for teachers, and the teachers positioned themselves as learners in this interaction. As teachers explored the program, the specialist provided instruction on how to use the program, assign tasks, and read reports. She assumed the responsibility of ensuring the teachers in the room understood the supplemental program and that their questions were answered. When a teacher asked a question about an assignment in the program, the specialist answered, “That’s what I

want to go deeper with.” In the position of instructor, the mathematics specialist leads the teachers through their learning of a supplemental program that the school expects them to use.

The position of instructor is a position of leadership. This position differs from the position of navigator in the storyline that it produces. While a navigator directs a meeting, moving participants from task to task, the position of instructor opens a learning environment that provides participants with new knowledge or the opportunity to reflect on instructional practices.

Summary of Themes for Research Question 2

Throughout each interaction observed, I asked myself how the specialist positioned herself, how the teachers positioned the specialist, and how they all interacted together. I also observed what people were saying and whether their words matched their actions. The specialist positioned as a navigator allowed her to determine the direction of the meeting and set the priorities for the day. In the position of collaborative colleague, the specialist was able to have a discussion that allowed someone else to take the lead in the discussion. The specialist was able to engage in dialogue without needing to direct the conversation. The specialist in the position of instructor provided time for the specialist to deliver professional learning to teachers. In this position, she bestows knowledge on others. It was apparent through the interactions that while teachers may have positioned the specialist as a navigator, a collaborative colleague, or an instructor, the relationship they had previously built with her allowed the power dynamic to shift seamlessly.

Patterns and Transitions. The mathematics specialist was able to transition easily between positions throughout her interactions with teachers. Some patterns did emerge as I examined the interaction data. In meetings where the agenda was heavily focused on procedural

tasks, like recording data or completing report cards and progress reports, the specialist was primarily positioned as the navigator. She set the agenda and directed the meeting. There were some instances where she may transition into the position of instructor but rarely transitioned to the position of collaborative colleague. In meetings where teachers were interpreting data, the specialist was likely to alternate between the positions of navigator and instructor and was sometimes positioned as a collaborative colleague. I noted that one grade level tended to position the mathematics specialist as a collaborative colleague more often than other grade levels. The mathematics specialist previously taught that grade, and her background experience may have influenced her positioning in that grade. Of note, while each grade level may have positioned the mathematics specialist in a specific position, every grade level showed high levels of participation in the interactions. Participants engaged in the tasks on the agenda, asked questions, and participated in discussions. I did not note instances in the interactions where teachers appeared to be dismissive of the specialist. Any frustrations that surfaced appeared to be about circumstances outside of the meeting and not the relationship with the mathematics specialist.

Summary

This study examined the perceptions of school community members regarding the roles and contributions of a school-based elementary mathematics specialist to the overall mathematics program. Through interviews with mathematics specialists, teachers, and school and district administrators, the study uncovered themes and insights into the multi-faceted role of the mathematics specialist and her perceived impact. The findings for the research question centered on perceptions and highlighted four primary ways in which the mathematics specialist was perceived—as a developer, facilitator, provider, and leader. Within each of the themes, the mathematics specialist performed functions of the role while always maintaining a focus on

student learning. As a developer, the specialist focused on building relationships and fostering teacher growth. As a facilitator, she led Professional Learning Communities (PLCs), promoted collaborative dialogue, and guided data analysis. In the role of provider, she offered support with standards, curriculum, resources, and interventions. Lastly, as a leader, she added value to the school community while emphasizing student learning outcomes. The mathematics specialist is perceived as someone instrumental in building an effective and collaborative school-wide mathematics program.

This study also examined ways in which the specialist was positioned within professional interactions. By observing the mathematics specialist and teachers during professional interactions, I was able to see how members of the school community positioned themselves and the storylines that emerged from the positioning. I was able to witness the coach fluidly moving between positions, taking on authority, or conceding authority based on the context of a situation. The specialist was positioned as a navigator, collaborative colleague, and instructor, dependent on the needs of the teachers in an interaction.

In this study, I was interested in determining what perceptions the school community held about the role of the mathematics specialist and how that community positioned the specialist in interactions. Specifically, I was interested in examining the connection between perception and positioning and wanted to know if the specialist would be positioned in ways that would allow her to meet the expectations of the school community. Connections between the perceptions about the role of the mathematics specialist and the positioning of the specialist in professional interaction will be discussed in Chapter 5.

CHAPTER 5: DISCUSSION

This study examined the perceptions of school leaders, teachers, and elementary mathematics specialists regarding the role and contributions of the school-based elementary mathematics specialist to the school community. The study also explored the positioning of the mathematics specialist in professional interactions. The research questions guiding this study are: 1) How do school leaders, teachers, and the school-based mathematics specialists perceive the role and contributions of the elementary mathematics specialist in the school community, and 2) How is the school-based elementary mathematics specialists positioned within the school community?

This chapter presents a discussion of the findings presented in Chapter 4, interpreting them in the context of the study's research questions and existing literature. Connections between the findings and relevant conceptual and theoretical frameworks are examined, as well as the limitations of the study. Potential implications for policy and practice will be discussed, along with ideas for future research.

Summary of Findings

Research Question 1: Perceptions

The purpose of the first research question was to examine how the school community perceived the role of the elementary mathematics specialist and the contributions the specialist made to the school mathematics program. Analysis of the interview data uncovered four key themes regarding the perceptions that groups of participants held about the role and contributions of the elementary mathematics specialist. Within each of those themes, the school community also had expectations that the mathematics specialist would engage in specific functions that were essential to the mathematics program.

The key themes in how the school community perceives the role of the elementary mathematics specialist were: specialist as developer, specialist as facilitator, specialist as provider, and specialist as leader. Each of the key themes highlighted essential functions that were perceived as vital to her role and the overall effectiveness of the school mathematics program. As a developer, the specialist developed professional relationships and teachers' instructional growth. In the role of facilitator, the specialist managed the professional learning communities, encouraged collaborative dialogue, and guided the analysis of student data. As a provider, the specialist offered support in standards and curriculum implementation, distributed instructional resources, and administered student interventions. As a leader, the specialist strengthened the school mathematics program by maintaining a consistent focus on student learning. Her interactions with members of the school community were recognized as valuable and meaningful. Overall, the school community felt that the role of the mathematics specialist was needed, and her contributions were vital in ensuring the mathematics program supported teacher development and positive student outcomes.

Research Question 2: Positioning

The second research question examined interactions between teachers and the elementary mathematics specialist. The purpose was to determine how teachers and the mathematics specialist were positioned in professional interactions, such as professional learning community (PLC) meetings. Through observation data, I wanted to explore how the positioning of the mathematics specialist affected relationships, conversations, and power dynamics. I also wanted to determine if the specialist was positioned in ways that allowed her to meet the perceived functions of the role.

Several themes emerged from the observation data. In professional interactions, the elementary mathematics specialist was positioned as a navigator, a collaborative colleague, and an instructor. In each of these interactions, the specialist served in a different capacity, and the expectations of the interaction shifted. As a navigator, the specialist was in charge. She determined the course of the interaction, and teachers followed her lead. When positioned as collaborative colleague, teachers directed the conversation. The coach was available to help brainstorm or ask questions, but in this position, she was seen as a colleague and not the person with the answers. When positioned as an instructor, the specialist was in teaching mode. She provided professional learning in mathematics content knowledge or pedagogy. During these observations, the mathematics specialist was positioned in all three ways, and she shifted among the positions easily dependent on the needs of the teachers or the dynamics of the grade level.

Discussion of Findings

The findings from research question one, which examined the perceptions of the school community regarding the role and contributions of the elementary mathematics specialist, suggest four key themes or expectations of the role: developer, facilitator, provider, and leader. Teachers, administrators, and the specialist herself expected the mathematics specialist to fulfill these roles by carrying out specific functions designed to elevate the school mathematics program and promote teacher growth and positive student outcomes. Research question two focused on how the mathematics specialist was positioned in professional interactions. Observations revealed that she assumed the positions of navigator, collaborative colleague, and instructor, transitioning between these roles by conceding and assuming power while adopting the rights and responsibilities associated with each position, whether self-assigned or assigned by teachers. In this study, the mathematics specialist fluidly transitioned between the positions of

navigator, collaborative colleague, and instructor while balancing her perceived role as a developer, facilitator, provider, and leader.

Positioning refers to the explicit and implicit patterns of reasoning that shape how individuals act toward others, determining the rights and duties they are afforded in interactions (Harré et al., 2009; Harré & Moghaddam, 2014). Positioning plays a critical role in shaping relationships and interactions in school communities, particularly for content specialists who have to find a balance between asserting their expertise and fostering collaboration. The mathematics specialist in this study was positioned in multiple ways, as a navigator, collaborative colleague, and instructor, which aligns with existing research on how content coaches, particularly literacy coaches, are positioned in their professional interactions. The specialist in this study often transitioned between collaborative colleague and instructor, similar to the expectations described by Polly et al. (2013) and Campbell and Malkus (2014), who stressed the importance of coaching skills in supporting instructional improvement. Similar to the findings by Hunt and Hansfield (2013) on literacy coaching, the mathematics specialist in this study had to balance demonstrating knowledge and expertise while also maintaining trusting, collaborative relationships with teachers. How the specialist positioned herself and was positioned by others directly influenced the professional conversations in which she engaged.

The findings in this study align with the research of Polly et al. (2013), who identified the fundamental roles of an elementary mathematics specialist, including content expert, facilitator of professional development, promotor of reflective instruction, and supporter of a school-wide community. The mathematics specialist in this study was expected to be a content expert who supported teaching in implementing the academic standards and curriculum. She was expected to develop teacher growth through her interactions, including facilitating professional learning and

collaborative conversations and through instructional support. Rainville and Jones (2008) emphasized that when a coach shapes a conversation, it directly affects the thinking and actions of teachers, a dynamic that was evident in this study as the mathematics specialist engaged in PLC meetings as a navigator who could seamlessly transition into other positions. The ability to navigate authority and collaboration fluidly was essential for the mathematics specialist to foster teacher growth and instructional improvement effectively.

Similarly, the positioning of the mathematics specialist reflects the findings of Campbell and Malkus (2014) that specialists play a role in building a school's community of practice, a process that requires managing relationships with teachers and administrators to foster collaboration, facilitate professional learning, and focus on teacher growth and student learning. Mudzimiri et al. (2014) determined that having an elementary mathematics specialist positively influenced school culture, improved collaboration among staff, and facilitated the sharing of instructional strategies, which is how the mathematics specialist in this study was expected to function.

Position and power shift throughout interactions depending on context and expectations (Hunt & Hansfield, 2013; Rainville & Jones, 2008). This shift was evident in how the mathematics specialist transitioned between positions. There were times when she acted in the position of instructor, providing direct guidance regarding content and pedagogy. At other times, she was positioned as a collaborative colleague, working alongside teachers to refine instructional practices. This study reinforces existing research by demonstrating that mathematics specialists must transition between positions dynamically, responding to the expectations of teachers, students, and administrators while balancing their instructional leadership responsibilities with collaboration.

The positioning of the mathematics specialist in this study also reflects the findings of Chval et al. (2010), who determined that mathematics specialists assume multiple identities within a school community, including supporter of teachers, supporter of students, learner, and supporter of the school at large. The specialist in the current study supported teachers in their growth through instructional guidance and observing classroom instruction, although not all teachers were receptive to feedback. She also supported teachers by providing standards and curriculum support and resources while maintaining a focus on instructional improvements for student learning. The specialist supported students by working directly with them through intervention, which sometimes made it challenging for her to transition fully into a coaching role. As a learner, the mathematics specialist pursued opportunities to deepen her mathematical content knowledge to better support teachers while also engaging in professional learning on adult learning principles. As a supporter of the school-at-large, the mathematics specialist in this study demonstrated leadership and added value by continually focusing on student learning and continuous improvement. While the specific themes in this study differed slightly from the identities outlined in Chval et al. (2010), there were similarities in how mathematics specialists are expected to function within a school. Across studies, mathematics specialists were expected to balance multiple responsibilities, navigate complex professional interactions, and serve as instructional leaders while maintaining positive, collaborative relationships with teachers.

The need for mathematics specialists to balance leadership with collaboration was also emphasized by Campbell and Malkus (2013), who found that specialists must have the time and opportunity to collaborate with teachers in a non-evaluative capacity. The mathematics specialist in this study had to take on the role of supporter and guide rather than evaluator, especially when working with resistant teachers. This reinforces the idea that while specialists are perceived as

leaders, they must also be positioned in ways that allow for meaningful, trusting relationships with teachers.

In addition to role and position expectations, Polly et al. (2013) emphasized that an effective preparation program for mathematics specialists should focus on deepening their content knowledge, understanding of pedagogy, student learning, and curriculum while also strengthening coaching and leadership skills. The Association of Mathematics Teacher Educators (2013) and Polly et al. (2015) further asserted that mathematics specialists require expertise in mathematical knowledge for teachers, knowledge of the elementary context, skills for guiding effective instructional practices, and the ability to work with adult learners. These skills are essential for mathematics specialists to fulfill their expected roles and navigate professional interactions effectively. Ball et al. (2008) highlighted the importance of pedagogical content knowledge, which includes knowledge of content and students as well as knowledge of content and teachers. The specialist in this study was expected to demonstrate these competencies, particularly when facilitating professional learning and supporting teachers' instructional growth.

Overall, this study confirms and extends prior research by highlighting both the perceived expectations and the positioning of mathematics specialists in elementary schools. Much of the research I found on content specialists focused on literacy specialists. It is easy to assume that the positioning of a literacy specialist and a mathematics specialist would be similar. I was interested in examining the positioning of mathematics specialists because elementary teachers tend to be generalists rather than content area experts. Elementary teachers also tend to have more background in teaching literacy skills than mathematics (Association of Mathematics Teacher Educators, 2013; Association of Mathematics Teacher Educators et al., 2010; Miller et al., 2000).

I did not encounter any areas that I felt diverged from current research. My assumption for the lack of divergence is related to the background of the mathematics specialist and the vision for mathematics in the district included in the study. Since the mathematics specialist has an advanced degree in mathematics teaching and a license as an elementary mathematics specialist, she possesses the necessary knowledge and skills to engage with teachers as a coach. The district leader, Ms. D, who supervised the mathematics specialists, also has a background in teaching elementary mathematics and as a mathematics specialist.

While the school community perceived the specialist as a developer, facilitator, provider, and leader, her professional interactions required her to navigate the positions of navigator, collaborative colleague, and instructor. These findings align with existing research that emphasizes the complex, multi-faceted role of mathematics specialists in supporting teachers, students, and school-wide instructional improvement.

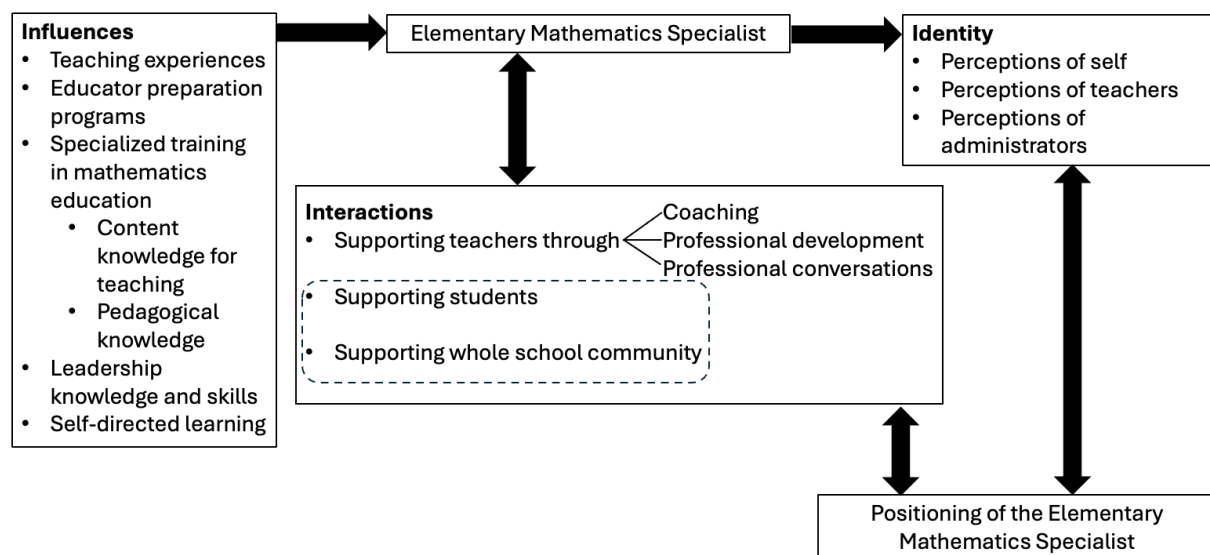
Reflections on Theoretical Framework

In developing this study, I used two frameworks to guide my thinking about the perceptions that the school community held about the elementary mathematics specialist and how the positioning of the specialist in professional interactions played a role in the overall mathematics program in a school. I developed a conceptual framework based on research relevant to elementary mathematics specialists that provided a lens for examining how prior influences affect interactions and the formation of the specialist's identity and, ultimately, interactions and positioning. I also utilized positioning theory from the research of Harré and Moghaddam (2014) as a theoretical framework, which provided me with a frame for examining how a mathematics specialist may be positioned and the storylines that accompany those positions.

The conceptual framework highlights the factors that affect how the mathematics specialist interacts with members of the school community and how they perceive themselves in their role. The specialist's prior teaching experiences, learning opportunities, and preparation programs influence how they taught mathematics and their views on mathematics instruction. A mathematics specialist who has undergone specialized training is influenced by their content knowledge, pedagogical knowledge for teaching mathematics, and leadership skills when interacting with the school community about mathematics instruction. Chval et al. (2010) found that elementary mathematics specialists in the role of a mathematics coach developed four identities: supporter of teachers, supporter of students, learner, and supporter of the school at large. This study focused on the elementary mathematics specialist being a supporter of teachers. While in the coaching role, the specialist also supports students and the school community; the focus of the study was on the support of the classroom teacher.

Figure 5.1

Conceptual Framework for Studying Perceptions and Positioning of Elementary Mathematics Specialists in School Communities



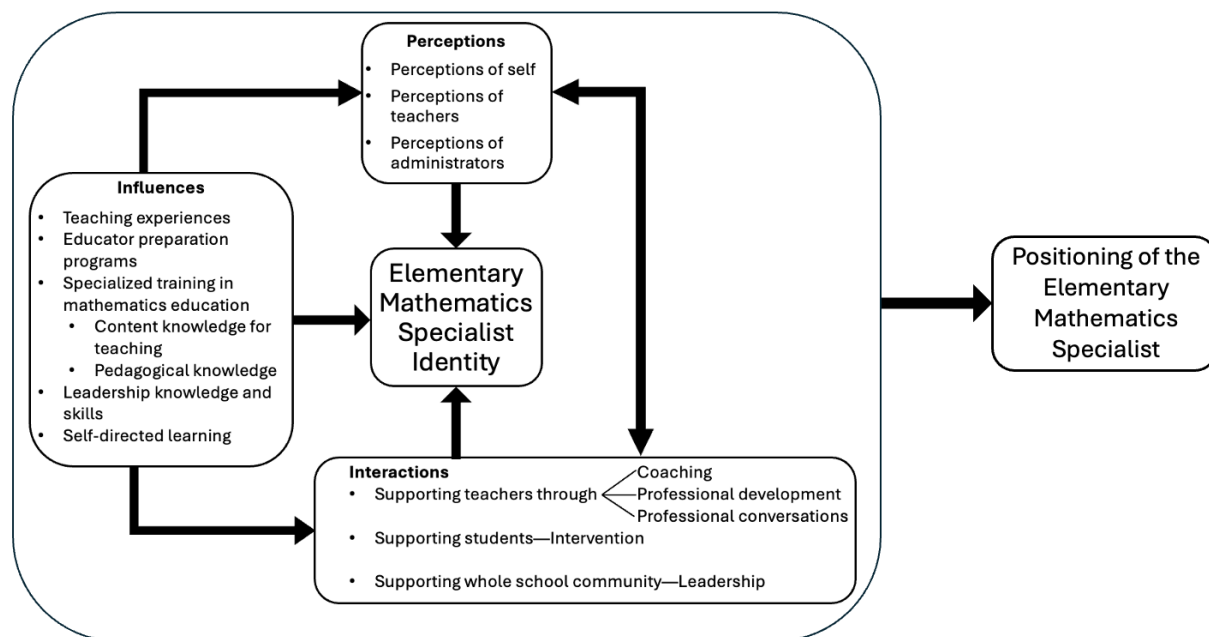
This conceptual framework helped determine how prior experiences played a part in the interactions, particularly when supporting teachers. These experiences influenced how the specialist engaged with teachers and how they positioned themselves within the school community. Examining the perceptions of the mathematics specialist from the point of view of teachers, administrators, and self was also helpful in determining how the specialist's identity may have been formed and how that identity affected the dynamics of collaboration and leadership. The interplay of influence, interactions, and identity determined how the mathematics specialist negotiated her role, balancing support, authority, and professional relationships within the school community.

I believe that the conceptual framework helped guide my thinking about the study; however, I would have modeled this differently. The mathematics specialist's identity was shaped by prior influences such as preparation programs, specialized training, and teaching experience, along with her self-perception and how others perceived her. Those influences, combined with her identity, influenced her interactions and how she was positioned in those interactions. However, the results of interactions also contribute to how she perceives herself and how others perceive her. So, interactions also play a role in the development of identity. Initially, I believed that the interaction types should focus on who she was supporting and how she supported those populations. Since the study was examining how the specialist supported teachers, I had not planned to address her support of students or the school community as a whole. However, separating these interactions was impractical because of the expectations of the school community regarding the role of the specialist. Overall, creating this conceptual framework helped me structure my thoughts and helped me filter the data collected. After

completing the research, I believe the framework should be reorganized to better illustrate how each component affects positioning (Figure 5.2).

Figure 5.2

New Conceptual Framework for Studying Perceptions and Positioning of Elementary Mathematics Specialists in School Communities



I also utilized positioning theory to frame the second research question. Positioning theory can be visualized as a triangle, with each point representing the background conditions of positions, illocutionary forces, and storylines (Harré & Moghaddam, 2014). A position involves a set of short-term rights, duties, and obligations that are distributed during an interaction. Positions can be assigned or acquired through explicit and implicit acts, influenced by personal characteristics or a person's identity (Harré, 2012; Harré et al., 2009; Harré & Moghaddam, 2014). Positioning carries obligations and expectations about behavior and can limit the actions a person can take (Barnes, 2004). Illocutionary forces refer to social acts and the interpretations of the acts. These forces are important because the meaning of actions and speech depends on how they are interpreted at the time of the interaction (Harré, 2012; Harré & Moghaddam, 2014).

Storylines are the narratives played out during the interactions. Positioning occurs throughout these interactions. Changes in positioning can alter the rights and duties, shift the meaning of actions, and modify or support multiple storylines (Harré et al., 2009).

During observations of professional interactions, I paid attention to how the specialist was positioning herself in the interaction, how teachers reacted to that position or if they positioned the specialist differently, and how they all engaged with each other. I was looking for paralinguistic data, such as facial expressions, body language, and tone of voice, as well as evidence of illocutionary forces through what participants were saying and the implications of their words. Based on positioning theory, I used these guiding questions to analyze the interactions teachers had with the mathematics specialist: Who had the authority in this interaction? Who was yielding power during the interaction? What actions did the specialist or teachers take in their respective positions? Finally, what rights and duties were implied or explicitly granted by those positions?

I found positioning theory to be useful as a framework for examining how power dynamics and roles within the school community are negotiated. When the mathematics specialist shifted positions, I was able to observe a shift in illocutionary forces, things she or the teachers did or said, that influenced how the story played out. For example, during a PLC meeting, the mathematics specialist, positioned as the navigator, stated, “Here are my thoughts for today.” While she did not say the meeting was beginning, her words signified the start of the meeting, playing out the storyline that the specialist sets the agenda and the priorities for the day. She chose the direction of the meeting for the group. By being in the position of navigator, she had the rights of the meeting leader and the duty to direct the group while the teachers followed her lead. The specialist would shift into other positions during meetings. For instance, the

specialist asked teachers to share a debrief on some work they had done with teaching strategies. She navigated to that part of the agenda, but she was shifted into the position of collaborative colleague. In that position, teachers were talking and collaborating, and the specialist contributed to the discussion by asking questions, not as the expert in the room or to push the agenda. She asked questions to clarify her thinking about what the teachers were presenting, saying to individual teachers, “What do your pictures look like?” or “What strategies have you seen kids use?” In that meeting interaction, teachers took the lead, and they had the duty to engage each other in dialogue while the mathematics specialist was able to engage as a colleague. Using the guiding questions derived from the theory, I was able to determine who had power during an interaction and how that influenced the conversation and outcomes of the interaction.

Discussion of Limitations

This study was initially intended to be a multiple case study of two schools with school-based elementary mathematics specialists. One case study would have been with an experienced specialist, while the second case study would have examined the perceptions and positioning of a novice specialist. However, there was difficulty getting participants of the second school to schedule interviews and follow through with completing the interviews and surveys. Though there were multiple attempts to collect the data, there was not enough participation from the second school to complete the case study and do a comparative analysis of the mathematics specialists.

Another limitation of this study is that I was not able to determine how a school community perceives and positions a specific coach over time. Data collection occurred over a school year. Since the specialist was already working in the school before the study beginning, it

was not possible to know if the perceptions members of the school community had changed over time.

Interviews of teachers were voluntary. While all of the teachers took part in professional learning community meetings, only teachers who volunteered for interviews were included in the interview data, which may limit the conclusions that can be drawn from the data regarding perceptions. There may have been teachers who perceived the role differently but did not express their opinions during interviews.

Scheduling limitations arose due to my need to continue working full-time and having to take vacation time for observations. The school was over an hour from my home, preventing me from conducting observations during impromptu one-on-one coaching opportunities. These sessions were often arranged at the convenience of the teacher and specialist rather than being pre-scheduled, making it difficult to accommodate the meetings in my travel and work schedule. Observations of interactions were limited to professional learning communities and informal hallway conversations on scheduled days.

Implications of the Study for Policy and Practice

Implications for Policy

The hiring of mathematics specialists at the school level is usually a local school district decision. However, there is an increasing amount of attention being placed on legislation or state board policy focused on improving early numeracy and mathematics performance in elementary schools. For example, the 2022 Alabama Numeracy Act mandated the placement of mathematics coaches in all elementary schools. Similar legislation in seven other states has focused on early numeracy and improving student performance in elementary mathematics. Policy recommendations from advocacy groups frequently emphasize the need for coaching support for

teachers. While I believe that effective elementary mathematics specialists can contribute to teacher growth in mathematics instruction and positive student outcomes, I am cautious regarding legislation and policy that mandate specialists. When a state implements legislation or school board policy that mandates coaching support, the support districts across the state put in place may not be equal or effective. Mandates for coaching support should also include adequate funding to recruit and retain quality mathematics specialists. It was challenging to find a district with school-based mathematics specialists in elementary schools. Funding for those positions is difficult, and the mathematics specialist in this study had multiple roles in supporting teachers and students.

This study highlighted that an elementary mathematics specialist should possess a specific skill set that enables effective engagement with the school community. If states allocate funding for mathematics coaches, schools and districts must carefully define the role and expectations of specialists to ensure they meet the needs of teachers and students. This study emphasized the need for the elementary mathematics specialist to have a combination of content expertise, pedagogical knowledge, and leadership skills to build productive professional relationships, collaboration, and teacher growth. The elementary mathematics specialist in this study had years of experience as an elementary classroom teacher and as a specialist. She had an advanced degree in teaching with a specialization in mathematics, and she completed an additional licensure program specifically for elementary mathematics specialists. Her district invested in ongoing professional learning for mathematics specialists. As policies increasingly advocate for coaching models, states and districts need to consider the necessary qualifications and training of mathematics specialists to ensure they are well-equipped to engage in meaningful interactions and sustained instructional support. Quality mathematics specialists need ongoing

professional learning opportunities to ensure they have content and pedagogical knowledge as well as coaching and leadership skills.

School districts may decide to employ elementary mathematics specialists for their elementary schools. If mathematics specialists are mandated by the district office, I would exercise the same cautions as with state-level mandates. While school-based mathematics specialists have the potential to positively impact teachers and students, districts need to ensure they are recruiting and retaining specialists who have the qualifications and skills to engage with teachers in effective and professional ways.

Implications for Practice

To strengthen mathematics instruction and support teachers in elementary schools, the role of the mathematics specialist must be clearly defined and aligned with the needs of teachers and students and the vision of the school community. Whether the mathematics specialist is based at the school or district level, establishing a well-defined role ensures that all members of the school community understand the expectations and responsibilities. Clearly outlining these expectations helps prevent misalignment of perceived responsibilities and actual responsibilities, fostering a shared understanding of the specialist's purpose. A well-defined role also influences how the specialist is positioned within interactions with teachers and administrators.

I encourage districts and schools to investigate the perceptions that teachers, administrators, and specialists have regarding the role. Findings from this study revealed that perceptions were mostly aligned, with the specialist's perceptions echoed by teachers and administrators. However, this may not be the case in every school. Misalignment of expectations could prevent the specialist from being effective in supporting instruction and professional growth.

To be effective in their role, mathematics specialists require specialized training in content, pedagogy, leadership, and coaching skills. Their professional learning should be ongoing and responsive to meet the changing needs of the school community, equipping them with the necessary skills to foster collaboration, provide instructional support, and lead improvement in mathematics instruction. The mathematics specialist in this study had specialized training in teaching mathematics. She also had training in the skills necessary to be a licensed mathematics specialist. Her training provided her with a lot of background knowledge, which helped her negotiate the relationships and interactions in her school. Not all mathematics specialists will come into the role with specialized training. Districts and schools need to be prepared to provide professional learning to increase the effectiveness of mathematics specialists.

Recommendations for Future Research

This qualitative case study focused on a single mathematics specialist within one school in a single school district. The insights gained offer valuable perspectives on how members of the school community perceive the specialist's role and contributions to the mathematics program. In addition, how the school community interacted with the specialist provided meaningful insights into the dynamics of leadership, collaboration, and the integration of the mathematics specialist in the overall mathematics program. Future research into content specialists in a variety of settings would add to the understanding of how specialists are perceived, what makes them effective, and how they are positioned to accomplish the functions of their role.

The mathematics specialist in this study was an experienced specialist who held an advanced degree in mathematics teaching, along with a license as a mathematics specialist. Future research involving a comparison of specialists with formal training versus specialists

without formal training could provide insight into the impact of specialized preparation on perceived effectiveness and positioning within the school community. Additionally, conducting a similar case study with a novice mathematics specialist would provide deeper insight into how experience influences the school community's perceptions and the specialist's position within the school.

This study specifically examined the perceptions and positioning of a school-based elementary mathematics specialist. In this state, very few districts employ mathematics specialists who are dedicated to an individual school. Some districts employ mathematics specialists who serve multiple schools, while other districts employ specialists covering multiple content areas. Investigating how the perceptions and positioning of the mathematics specialist vary between those serving individual schools versus multiple schools could reveal insights into the expectations and effectiveness of specialists, dependent on the population they serve. Additionally, examining the perceptions and positioning of elementary specialists who cover multiple content areas could provide insights into the best use of content specialists.

The district included in this study also employed school-based literacy specialists. In many states, elementary literacy instruction is regulated by state legislation and local policies. Elementary mathematics education has fewer policy directives shaping classroom instruction. However, some states are beginning to adopt and implement early mathematics legislation and policies. Research into how a school-based literacy specialist is perceived and positioned may provide additional insights into the effective utilization of content specialists, particularly when their presence is driven by policy and subject to specific guidelines.

Lastly, this study only investigated mathematics specialists in an elementary setting. Elementary teachers tend to be generalists who teach all subjects and not content area experts,

which often necessitates the role of content specialists. Investigating the perceptions and positioning of mathematics specialists at the middle or high school level could also provide insight into how a school community views the role and how they could leverage mathematics specialists to impact teacher growth and student outcomes.

Conclusion

The purpose of this study was to investigate the perceptions that teachers, administrators, and mathematics specialists held about the role and contributions of a school-based elementary mathematics specialist to the school community. The study was also focused on determining how the mathematics specialist was positioned in professional interactions. As more districts and schools are utilizing mathematics specialists in the coaching role to improve mathematics instruction, it was important to determine how the role of mathematics specialists is currently defined and utilized. How a mathematics specialist is positioned within the elementary school community based on perceptions and expectations may influence the interactions the specialists will have with members of the school community. The effectiveness of the mathematics specialist in supporting a school's mathematics program may also be influenced by how they are positioned.

This qualitative study was conducted in a suburban district serving close to 7,000 students in 13 schools, seven of which were elementary schools. The school selected for this study is a public, traditional K-5 elementary school with just over 500 students. The participants of the study included district and school administration, the school-based elementary mathematics specialist, and 26 classroom teachers who taught mathematics. The site was purposefully selected because it employed an elementary mathematics specialist full-time, and the specialist only had duties at this site.

This study highlighted both the perceived expectations and the positioning of mathematics specialists in elementary schools. Data regarding the perception of the role of the mathematics specialist was collected through interviews of the mathematics specialist, teachers, and school and district administrators. Perception data was analyzed through constant comparative analysis to reveal four key themes: specialist as a developer, specialist as a facilitator, specialist as a provider, and specialist as a leader. Perceived functions of the role of the specialist correspond to each of the key themes. Interaction data to determine positioning was collected through observations of professional interactions between the mathematics specialist and teachers. Field notes and memos were also kept throughout the data collection process. Positioning data was analyzed using guiding questions to determine how the participants were positioned in relation to each other, how the specialist positioned herself to the group, and how the group positioned the specialist. Positioning theory (Harré & Moghaddam, 2014) was applied. While the school community perceived the specialist as a developer, facilitator, provider, and leader, her professional interactions required her to negotiate the positions of navigator, collaborative colleague, and instructor. The findings emphasized the complex, multi-faceted role of mathematics specialists in supporting teachers, students, and school-wide instructional improvement.

In addition to descriptions of the key findings of this study, implications for policy and practice have been discussed. Recommendations for future research have also been offered. Elementary mathematics specialists have the potential to benefit school-wide mathematics programs. A well-qualified mathematics specialist, whose role expectations are clearly defined and who is positioned effectively, may contribute to teacher growth and positive student outcomes.

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APPENDICES

Appendix A

Consent Form

Title of Study: A Qualitative Case Study of the Perceptions and Positioning of School-Based Elementary Mathematics Specialists in the Public School Environment (eIRB # 25324)

Principal Investigator(s): Denise Schulz

Funding Source: None

NC State Faculty Point of Contact: Jennifer Ayscue

What are some general things you should know about research studies?

You are invited to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate, and to stop participating at any time without penalty. The purpose of this research study is to gain a better understanding of the perceptions that school administrators, classroom teachers, and elementary mathematics specialists have regarding the role of the school-based elementary mathematics specialist and how the specialist is positioned in professional interactions. I will do this through interviews and observations of professional interactions.

You are not guaranteed any personal benefits from being in this study. Research studies also may pose risks to those who participate. You may want to participate in this research because it could have positive implications for how elementary mathematics specialists are prepared for their role and how they are utilized in a school community. You may not want to participate in this research because there are no direct benefits to you.

Specific details about the research in which you are invited to participate are contained below. If you do not understand something in this form, please ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If, at any time, you have questions about your participation in this research, do not hesitate to contact the researcher(s) named above or the NC State IRB office. The IRB office's contact information is listed in the *What if you have questions about your rights as a research participant?* section of this form.

What is the purpose of this study?

The purpose of the study is to examine the perceptions that the school community has about the role of the elementary mathematics specialists and how the specialist is positioned in professional interactions.

How many people will be in the study?

There will be approximately 45-50 participants in this study.

Am I eligible to be a participant in this study?

In order to be a participant in this study, you must agree to be in the study and work at the district office or work at the school as a school administrator.

You cannot participate in this study if you do not meet the inclusion criteria or work at the school.

What will happen if you take part in the study?

If you agree to participate in this study, you will be asked to do all of the following:
Participate in at least one 60-90 minute audio recorded interview at your school or virtually via zoom. The total amount of time that you will be participating in this study is 60-90 minutes for the interview.

Recording and images

If you want to participate in this research, you must agree to be audio recorded. If you do not agree to be audio recorded, you cannot participate in this research. Audio recordings will be shared with a professional transcription service for the purpose of creating a transcript. Audio recordings and transcripts will only be shared with school and/or district leadership after personal identifiers have been removed.

Risks and benefits

There are minimal risks associated with participation in this research. There are no direct benefits to your participation in the research. The indirect benefits are developing knowledge that could aid other schools in utilizing elementary mathematics specialists and possible positive implications for how elementary mathematics specialists are prepared for their role.

Right to withdraw your participation

You can stop participating in this study at any time for any reason. To do so, just stop any research activity that you are doing or contact the student researcher, Denise Schulz. You can also contact the faculty advisor for this research, Dr. Jennifer Ayscue. If you choose to withdraw your consent and to stop participating in this research, you can expect that the researcher(s) will redact your data from their data set, securely destroy your data, and prevent future uses of your data for research purposes wherever possible. This is possible in some, but not all, cases.

Confidentiality, personal privacy, and data management

Trust is the foundation of the participant/researcher relationship. Much of that principle of trust is tied to keeping your information private and in the manner that I have described to you in this form. The information that you share with me will be held in confidence to the fullest extent allowed by law.

Protecting your privacy as related to this research is of utmost importance to me. There are very rare circumstances related to confidentiality where I may have to share information about you. Your information collected in this research study could be reviewed by representatives of the University for purposes such as quality control or safety. In other cases, I must report instances in which imminent harm could come to you or others.

How I manage, protect, and share your data are the principal ways that I protect your personal privacy. Data that will be shared with others about you will be de-identified.

De-identified. De-identified data is information that at one time can directly identify you, but that I will record this data so that your identity will be separated from the data. I

will have a master list with your code and real name that I can use to link to your data. When the research concludes, there will be no way your real identity will be linked to the data I publish.

Future use of your research data

Your information, even with identifiers removed, will not be stored or distributed for future research studies.

Compensation

There is no compensation for participating in this study.

What if you have questions about this study?

If you have questions at any time about the study itself or the procedures implemented in this study, you may contact the student researcher, Denise Schulz. You can also contact the faculty advisor for this research, Dr. Jennifer Ayscue.

What if you have questions about your rights as a research participant?

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact the NC State IRB (Institutional Review Board) office. An IRB office helps participants if they have any issues regarding research activities. You can contact the NC State University IRB office at IRB-Director@ncsu.edu, 919-515-8754, or [fill out a confidential form online](https://research.ncsu.edu/administration/compliance/research-compliance/irb/irb-forms-and-templates/participant-concern-and-complaint-form/) at <https://research.ncsu.edu/administration/compliance/research-compliance/irb/irb-forms-and-templates/participant-concern-and-complaint-form/>

Consent to participate

By signing this consent form, I am affirming that I have read and understand the above information. All of the questions that I had about this research have been answered. I have chosen to participate in this study with the understanding that I may stop participating at any time without penalty or loss of benefits to which I am otherwise entitled. I am aware that I may revoke my consent at any time.

Yes, I want to be in this research study.

Participant's printed name _____

Participant's signature _____

Today's Date _____

No, I do not want to be in this research study.

Thank you for your consideration.

Appendix B

Interview Protocol: Elementary Mathematics Specialist Interviews

Initial Interview:

1. Can you tell me a little about yourself and your background as a teacher?
 - 1.a. How many years of classroom experience do you have?
 - 1.b. What grade levels have you taught?
 - 1.c. Have you taught all subject areas, or did you focus on a specific subject area?

2. Can you talk to me about your background and experience as a mathematics specialist?
 - 2.a. How many years have you been a mathematics specialist?
 - 2.b. Which grade levels have you served as a mathematics specialist?
 - 2.c. Have you completed a state endorsement or certification program to be an elementary mathematics specialist?
 - 2.d. If so, can you provide a brief description of the coursework you had to complete for your endorsement or certification?
 - 2.e. If not, have you completed any coursework or training to prepare you for your role as an elementary mathematics specialist?
 - 2.f. Is there anything in your past experiences that you feel is valuable to performing your current duties as an elementary mathematics specialist?

3. What is your job description, as stated by your school or district?
 - 3.a. When you meet someone new and they ask what you do for a living, how do you describe your job?
 - 3.b. Please provide a brief overview of your typical daily roles and responsibilities.
 - 3.c. What do you see is the role of the elementary mathematics specialist?
 - 3.d. How do you see yourself contributing to the overall mathematics program?
 - 3.e. What have you done to define your role as a mathematics specialist to others?

4. In what ways do you interact with school leadership?
 - 4.a. What do you feel are the expectations for your role from school leadership?
 - 4.b. In interactions with school leadership, how do you think they perceive your role and contribution to the mathematics program?
 - 4.c. Please share some examples of your interactions with school leaders.

5. How would you describe your interactions/relationships with teachers?
 - 5.a. What do you feel are the expectations for your role from teachers?
 - 5.b. What do you view as your responsibility in supporting teachers?
 - 5.c. How do you determine which teachers to work with and what topics/skills to work on?
 - 5.d. What do you hope to accomplish when working with teachers?
 - 5.e. How are interactions with teachers initiated?
 - 5.f. In interactions with teachers, how do you think they perceive your role and contribution to the mathematics program?
 - 5.g. Please share some examples of your interactions with teachers.

6. What else would you like to discuss regarding your role as the mathematics specialist that we have not already discussed?

Follow-Up Interview:

1. In your first interview you shared.....What else would you like to share that we didn't discuss in the first interview?
2. In reading your reflective summary, you stated that.....Can you talk more about that?
3. In talking with teachers and school leaders, it was stated that.....What do you think about that?
4. Prior to becoming an elementary mathematics specialist at this school, what relationships, if any existed between you and the teachers and school leaders? How do you feel that those relationships shape how your role is perceived and how you interact with school personnel?
5. *Address any topics that need more clarification or triangulation.*

Appendix C

Interview Protocol: School Leadership Interview

1. Can you briefly describe your experience as school leader?
 - 1.a. Have you previously been an elementary administrator, middle school administrator, or high school administrator?
 - 1.b. What experiences do you have with elementary mathematics?
 - 1.c. What are your experiences working with content specialists in elementary school?
 - 1.d. How did you determine who was qualified for the elementary mathematics specialist job?
2. When you walk into a mathematics classroom, what do you hope to see?
 - 2.a. How would you describe an effective mathematics program?
3. What are your expectations regarding the roles and responsibilities of the elementary mathematics specialist?
 - 3.a. What do you see is the role of the elementary mathematics specialist?
 - 3.b. How do you communicate expectations to the elementary mathematics specialist?
 - 3.c. When the specialist interacts with teachers, what do you expect to see?
 - 3.d. When the specialist interacts with you, what do you expect to happen? How would you describe your interactions with the specialist?
 - 3.e. How do you see the specialist contributing to the overall mathematics program?
 - 3.f. How have you defined the role of the mathematics specialist to others?
 - 3.g. What do you view as the responsibility of the mathematics specialist in supporting teachers?
 - 3.h. What do you view as the role of the mathematics specialist in supporting school leadership responsibilities?
4. What else would you like to discuss regarding the mathematics specialist that we have not already discussed?

Appendix D

Interview Protocol: Teacher Interview

1. Please briefly describe your teaching experience (i.e. years of experience, years at this school, grade level, subject taught).
2. How would you describe the mathematics program at your school?
 - 2.a. What do you believe makes a mathematics program effective?
3. What are your expectations regarding the roles and responsibilities of the elementary mathematics specialist?
 - 3.a. What do you see is the role of the elementary mathematics specialist?
 - 3.b. How do you communicate expectations to the elementary mathematics specialist?
 - 3.c. How do you see the specialist contributing to the overall mathematics program?
 - 3.d. What do you view as the responsibility of the mathematics specialist in supporting teachers?
 - 3.e. What do you view as the role of the mathematics specialist in supporting school leadership responsibilities.
4. In what ways do you interact with the elementary mathematics specialist?
 - 4.a. What are your expectations for your interactions with the math specialist?
 - 4.b. What do you hope to gain from your time with the math specialist?
 - 4.c. Can you describe an interaction you have had with the specialist (PLC, one-on-one, whole school professional learning)?
5. What else would you like to discuss regarding the mathematics specialist that we have not already discussed?

Appendix E

Interview Protocol: District Math Leader Interview

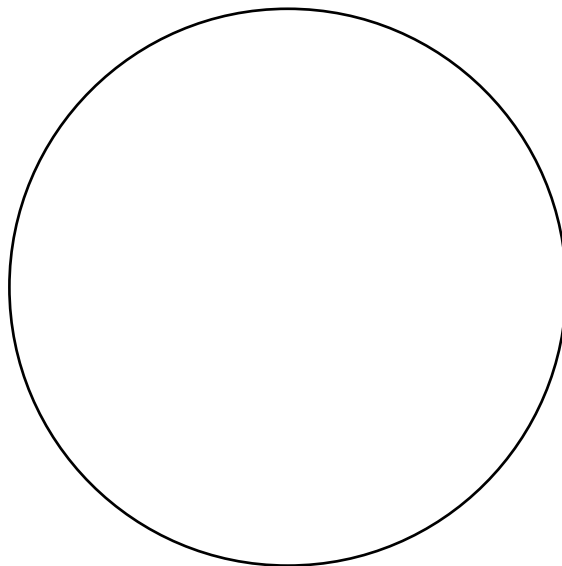
1. Can you briefly describe your experience as a district leader for elementary mathematics?
 - 1.a. Have you previously been an elementary administrator?
 - 1.b. What experiences do you have with elementary mathematics?
 - 1.c. What are your experiences working with content specialists in elementary school?
2. What are the expectations for mathematics instruction in this district?
 - 2.a. How would you describe an effective mathematics program?
 - 2.b. When you walk into a mathematics classroom, what do you hope to see?
3. What are the district expectations regarding the roles and responsibilities of the elementary mathematics specialist?
 - 3.a. What do you see is the role of the elementary mathematics specialist?
 - 3.b. How do you communicate expectations to the elementary mathematics specialist?
 - 3.c. When the specialist interacts with teachers, what do you expect to see?
 - 3.d. When the specialist interacts with you, what do you expect to happen? How would you describe your interactions with the specialist?
 - 3.e. How do you see the specialist contributing to the overall mathematics program?
 - 3.f. How have you defined the role of the mathematics specialist to others?
 - 3.g. What do you view as the responsibility of the mathematics specialist in supporting teachers?
 - 3.h. What do you view as the role of the mathematics specialist in supporting school leadership responsibilities?
 - 3.i. How do schools determine if they need a mathematics specialist? What are the hiring practices?
4. What else would you like to discuss regarding the mathematics specialist that we have not already discussed?

Appendix F

Elementary Mathematics Specialist Reflective Summary

Please take some time to reflect on the following questions. Note that in these questions, interactions refer to coaching sessions, professional learning community meetings, professional conversations, or professional development opportunities. Please be detailed in your response.

1. Describe an interaction with a teacher or group of teachers that you feel went well. How did the interaction unfold? How did you participate in the interaction?
2. Describe an interaction with an administrator that you feel went well. How did the interaction unfold? How did you participate in the interaction?
3. Describe an interaction with a teacher or group of teachers that you feel did not go well. How did the interaction unfold? How did you participate in the interaction?
4. Describe an interaction with an administrator that you feel did not well. How did the interaction unfold? How did you participate in the interaction?
5. Create a pie chart that represents how you spend your time in a typical week. Include an explanation of the sections of your pie chart. You can draw the pie chart or use a computer program to create it. Upload your document in the survey.



6. Is there any other information you would like to share that was not shared in the previous interview or in this reflection that you feel is pertinent to understanding your role, contributions, and how you interact with school community members?