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A SITUATED PERSPECTIVE OF RURAL ELEMENTARY SCHOOL MATHEMATICS TEACHERS' PLANNING PRACTICES

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I am submitting herewith a dissertation written by Ashley Paige Walther entitled "A SITUATED PERSPECTIVE OF RURAL ELEMENTARY SCHOOL MATHEMATICS TEACHERS' PLANNING PRACTICES." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Lynn L. Hodge, Major Professor

We have read this dissertation and recommend its acceptance:

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A SITUATED PERSPECTIVE OF RURAL ELEMENTARY SCHOOL MATHEMATICS TEACHERS' PLANNING PRACTICES

A Dissertation Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Ashley Paige Walther
May 2017

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DEDICATION

To my husband, Michael, for his love, support, patience, and encouragement. Even when I doubted myself, you always believed in my ability to succeed.

To my parents, Don and Patti, for raising me to be confident and courageous. Because of you, I know what it means to work hard and accomplish my goals.

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To my dissertation chair, Dr. Lynn Hodge: Thank you. This dissertation would not have been possible without your expert guidance and support. It is because of you I first entered the doctoral program. Thank you for taking the time to care about and invest in my education. Thank you for providing me with endless opportunities to learn and grow as a professional educator and researcher. The lessons I learned from you stretch beyond the classroom. I look to you as an example of what it means to be a purposeful and compassionate mathematics teacher educator.

To the rest of my doctoral committee: Thank you. Dr. Lauren Moret, thank you for showing me the beauty of qualitative research. You encouraged me to find my voice and challenged me to be my best academic self. Dr. Christopher Wright, thank you for pushing me to think deeply about the world. From my first research project as a new graduate student until now, you have provided invaluable insight and perspective. Dr. Stergios "Sterg" Botzakis, thank you for introducing me to education theory and the notion that professors can, indeed, be fun. You are a shining example of how I can be both an academic and a lore-loving gamer at the same time. Dr. Thomas Turner, thank you for nurturing my creative (and occasionally feisty) spirit. You always encouraged me to speak my mind.

To my family: Thank you. My parents, Don and Patti, you both have believed in me since day one. You are always proud of me and I am so thankful that I get to share this accomplishment with both of you. Mom, your faith, kindness, and love are invaluable. I learned what it means to work both passionately and hard from you. Dad,

your humor and independent spirit taught me that I can forge my own path and enjoy my work. My sisters, Emily and Chelsey, thank you both for being my cheerleaders and keeping me grounded. I take lessons from both of you. Emily, I value your creativity and free spirit. Chelsey, from you I have learned about loyalty and focused determination. My family, thank you all for your love and support.

Finally, to my husband, Michael: Thank you. At the end of the day, your support and encouragement kept me going. You are my biggest fan and my greatest supporter. You never failed to entertain my endless commentary on the status of mathematics education. (I am convinced that you are qualified to defend my dissertation at this point.) You inspire me each day with your character and strength. You are the best husband I could ever imagine. Thank you for your unwavering love and support. I cannot wait to venture into our next chapter of life together.

ABSTRACT

Rural areas are home to approximately 20% of the population in the United States. Schools that serve rural populations are geographically isolated and lack resources when compared to urban and suburban schools. Educators who serve students in rural schools are often born and raised in the same system in which they ultimately work. Elementary teachers are typically certified as generalists. As a result, many report a lack of confidence or proficiency in mathematics. This dissertation offers an analysis of the planning practices of rural elementary school mathematics teachers in a district located in the southeastern United States. The study sought to understand the factors that influence teachers' decision-making during the lesson planning process and the results of those influences. Additionally, the study aimed to understand the ways in which teachers plan for a lesson when they are out of their comfort zone.

This multiple-case study is qualitative and includes three participants. The analysis was conducted through the lens of a situated perspective—that is, the complex activity system of lesson planning is a minimally decomposable system that shares a reflexive relationship with the context in which it occurs. Findings indicate that more support is needed in rural schools with relation to purposeful lesson planning.

TABLE OF CONTENTS

Chapter One Introduction 1
Statement of the Problem 5
Purpose of the Study 6
Significance of the Study 9
Limitations 10
Delimitations 11
Definition of Terms 13
Organization of the Study 16
Chapter Two Literature Review 17
Theoretical Framework 17
Rural Teaching Context 23
Knowledge for Teaching Mathematics 25
Pedagogical Content Knowledge 26
Subject Matter Knowledge of Elementary Teachers 27
Instructional Decision Making 30
General Lesson Planning Practices 32
Elementary-focused Lesson Planning 34
Planning for Mathematics 35
Planning Connections 37
Summary 38
Chapter Three Methodology 40
Study Design 41
Study Context 42
Researcher's Role 42
District Context 45
Phase One: Survey and Participant Selection 47
Survey 47
Participant Selection 48
Phase Two: Instrumental Multiple Case Study 53
Data Collection Procedures 54
Access and Entry Procedures 54
Data Sources 56
Data Analysis Procedures 59
Listening, Reading, and Re-reading 60
Methodological Issues 62
Summary 64
Chapter Four Case Descriptions and Insights Gained 65
Case 1: Lori 66
Influences 68
Planning Decisions 79
Summary: Lori 82
Case 2: Bryan 85
Influences 86

Planning Decisions 91
Summary: Bryan 94
Case 3: Melissa 95
Influences 98
Planning Decisions 104
Summary: Melissa 107
Cross-Case Analysis 108
Significant Differences 109
Summary of Significant Differences 120
Findings in Relation to the Research Questions 121
Chapter 4 Summary 123
Chapter Five Discussion and Conclusion 126
Discussion 126
Theoretical and Practical Implications 130
Theoretical Implications 130
Implications for Practice: In-service Teachers 134
Implications for Practice: Pre-service Teachers 138
Lessons Learned 139
Conclusion 141
List of References 144
Appendix 155
Appendix A: Survey 156
Appendix B: Interview Protocols 160
Appendix C: Sample Analytic Memo Excerpts 161
Appendix D: Sample 4th Grade Content Standards 162
Appendix E: 4th Grade Testing Blueprint 163
Vita 164

LIST OF TABLES

Table 3.1. Low-confidence responses.....52
Table 3.2. Overview of case study participants 52
Table 4.1 Significant differences in influences.....110
Table 4.2. Findings and research questions 124

LIST OF FIGURES

Figure 1.1. Study's relationship to the reviewed literature 7
Figure 3.1. Elements and flow of the study 43
Figure 4.1. Lori's influences 84
Figure 4.2. Bryan's influences 96
Figure 4.3. Melissa's influences 109

CHAPTER ONE
INTRODUCTION

In 1986, May, a professor and researcher of teacher education, made the statement that, "The current emphasis on accountability in education presents a prescriptive and linear model of thinking about educational matters" (p. 6). Fast-forward 30 years and this is even more descriptive of the current educational climate. Policy makers and administrators are constantly looking for a one-size-fits-all approach to education and instead of encouraging innovation, restrictive policies tend to stifle out-of-the-box thinking (May, 1986). This mindset is disheartening. Teaching is a complex activity and it is illogical to assume that effective practices in one setting will automatically have the same result in another setting. Countless factors influence each decision and outcome.

As a mathematics and teacher educator, I have had the privilege of guiding many pre-service and in-service teachers in navigating the unpredictable path to effective mathematics instruction. Every journey is different, and every classroom is different. It is my experience that one-size-fits-all is rarely, if ever, true. However, there is still a lot to be learned from looking at the practices of others. Rather than accepting teaching "truths" at face value, my hope is that teachers learn to reflect, question, and make informed decisions about their practice. My experience tells me that the decisions teachers make during lesson planning have a profound impact on the mathematics students learn and the motivation they may develop, as well as, the overall learning environment. I have seen that—when teachers develop the skills required to plan coherent, engaging, and rigorous instruction—many of the typical classroom issues (e.g. classroom management, apathy)

are addressed intentionally and with positive consequences. It would be illogical to build a house without a blueprint, and it would be equally illogical to teach mathematics without a lesson plan. At the core of teaching is the necessity to make intellectual, informed decisions that impact the lessons students experience. Lesson planning can be viewed as representative of these decisions (Borko, Livingston, & Shavelson, 1990; Borko & Shavelson, 1990; So, 1997).

Initially studies in the area of lesson planning focused on the basic mechanics and methods for planning (McCutcheon, 1980; Peterson, Marx, & Clark, 1978; Sardo-Brown, 1988; Sardo-Brown, 1990; Yinger, 1980; Zahorik, 1975). During the mid-twentieth century, Tyler put forth a planning model that was based on logical, rational decision-making that encouraged teachers to consider the outcomes prior to considering the method of delivery (May, 1986; Sardo-Brown, 1990; Tyler, 1950; Zahorik, 1975). Even though other models have arisen, this remains the dominant model for teacher education (May, 1986; Sardo-Brown, 1990; Zahorik, 1975). More recently, researchers have built on Tyler's model. Wiggins and McTighe (2005) published a book titled, *Understanding by Design*, which is popular in many teacher education programs around the country. Like Tyler's model, the model put forth by Wiggins and McTighe (2005) recommends considering instructional goals prior to planning the activities and instructional methods a teacher will use to achieve the lesson goals. As a result of using this method, teachers are more likely to make logical, rational instructional decisions during the planning process. Unfortunately, studies repeatedly find that teachers do not plan the way they were taught to plan in teacher preparation programs (May, 1986; McCutcheon, 1980; Mutton,

Hagger, & Burn, 2011; Sardo-Brown, 1988; Sardo-Brown, 1990; So, 1997; Superfine, 2008; Yinger, 1980; Zahorik, 1975). Because of this, many researchers have set out to discover what planning actually looks like in the field.

Despite broad interest, studies about the general practice of planning have been the dominant source of knowledge about teacher's planning practices. The vast majority of studies look specifically at the structure of planning—what, where, when, how, and with whom or with what (McCutcheon, 1980; Peterson, Marx, & Clark, 1978; Sardo-Brown, 1988; Sardo-Brown, 1990; Yinger, 1980; Zahorik, 1975). In addition to that information, researchers have also gathered data on aspects that influence planning decisions (Borko, Livingston, & Shavelson, 1990; Borko & Shavelson, 1990; McCutcheon, 1980; Peterson, Marx, & Clark, 1978). This list includes topics such as district guidelines, student interest or skill level, and even national holidays. It is also common to find studies that examine "effective" instances of teaching (Borko & Livingston, 1989; Ladson-Billings, 1994) and planning (Leinhardt, 1989; Superfine, 2008). Although I understand much can be gained by studying effective teachers and practices, it can also set up a goal that appears unattainable. This has been especially true in my experience working with pre-service teachers. Often the teachers or practices that are deemed effective are many degrees removed from the practices and experiences of typical teachers. Even the evaluation system in the state in which I conducted this research attempts to recalibrate teachers' expectations. On a scale of one to five, the vast majority of teachers are expected to be satisfied with a "rock solid" three. Therefore, this study makes no attempts to qualify or quantify its participants as either effective or

ineffective. It simply looks at the planning practices of rural elementary school mathematics teachers. Little attention has been paid to special populations and specific instances of planning. Looking at the space where understudied populations and understudied sites of tension come together is the focus of this paper.

It has been noted that teachers teaching in rural school districts typically do not have the same resources a larger, urban or suburban district might have (Harmon, 2003; Harmon, Gordanier, Henry, & George, 2007; Roberts, 2004; Stern, 1994). The availability of research that looks specifically at the practices of rural teachers is thin. Most research suggests that there is a need for bridging the gap between rural districts and outside resources in order to attract, retain, and support teachers in this setting (Burton & Johnson, 2010; Roberts, 2004; Yarrow, Ballantyne, Hansford, Herschell, & Millwater, 1999). However, more research is needed to fill in the gaps on what it means to teach and learn in rural contexts. It is false to assume that, simply because rural districts are without some tangible resources, they lack strategies to compensate for or even improve what we know about teaching and learning in rural contexts.

Finally, attention has been paid to the subject-specific content knowledge of elementary teachers (Askey, 1999; Ball, 1990; Hill 2010; Simon, 1993). The grand narrative of non-specialized, content-deficient elementary teachers exists in many forms. For the purposes of this study, the focus is on mathematics content knowledge. Not only have studies documented an overarching discourse of mathematics anxiety and fear amongst elementary teachers (e.g. Cornell, 2012), but also one of only surface level understanding of mathematics (Ball, 1990; Simon, 1993). The perception that elementary

teachers lack content knowledge is likely a result of elementary educators receiving generalist certifications. They are not, typically, required to specialize in a specific subject the way secondary educators are required to do. Taking these things into consideration, the literature does not paint a pretty picture of elementary school teachers and mathematics. Surely there is more to the story.

In the remainder of this dissertation I will describe, in detail, a study that is situated at the intersection between lesson planning, rural teaching contexts, and elementary school mathematics teaching. I will begin by describing the purpose and significance of the study. After that I will provide a review of relevant literature and the study's methodology. Finally, I will engage in a detailed case description, discussion of findings, and recommendations for further research.

Statement of the Problem

Popular lesson planning models being used by teacher preparation programs are not representative of daily planning practices for in-service teachers (May, 1986; McCutcheon, 1980; Mutton, Hagger, & Burn, 2011; Sardo-Brown, 1988; Sardo-Brown, 1990; So, 1997; Superfine, 2008; Yinger, 1980; Zahorik, 1975). Rather, teachers develop methods that work for their individual context and routines. In addition, teachers in large, non-rural districts tend to have access to a variety of resources that smaller rural districts do not. This includes professional development activities and funding, physical materials (e.g. up-to-date textbooks, manipulatives), technology, and collaborative opportunities (Harmon, 2003; Harmon, Gordanier, Henry, & George, 2007; Roberts, 2004; Stern, 1994). The literature on rural education points to a challenging situation for rural teachers

attempting to provide educational outcomes equitable to urban or suburban counterparts (Harmon, 2003; Harmon, Gordanier, Henry, & George, 2007; Stern, 1994). Finally, due to the nature of elementary teaching certifications, most elementary teachers are not mathematics content specialists. Often elementary teachers struggle with the content they are being asked to teach (Ball, 1990; Simon, 1993) and suffer from some degree of math anxiety (Harper & Daane, 2012; Trujillo & Hadfield, 1999; Wood, 1988). It is also socially acceptable in the United States for people to take pride in saying, "I'm bad at math." This fact does not aid the perception or treatment of mathematics.

It is possible, and likely, that every elementary teacher, rural or not, encounters at least one topic in mathematics that he/she is either weak or perceive themselves to be weak. Despite these challenges, rural teachers plan for and teach mathematics. My study sits at the intersection of these three bodies of work—lesson planning, rural education, and elementary mathematics. The study examines the planning practices of three rural elementary school mathematics teachers. It seeks to understand what regular teachers do in order to plan for mathematics instruction on a daily basis and purposefully avoids portraying the image of the "Superteacher" (Farhi, 1999). Figure 1.1 visually depicts the study's relationship to the reviewed literature.

Purpose of the Study

This study combines several distinct lines of research to provide a more in-depth view of teacher practice. The purpose of the study is to examine the ways in which rural elementary school mathematics teachers navigate lesson planning for content that is outside their comfort zone. Rural elementary school mathematics teachers were

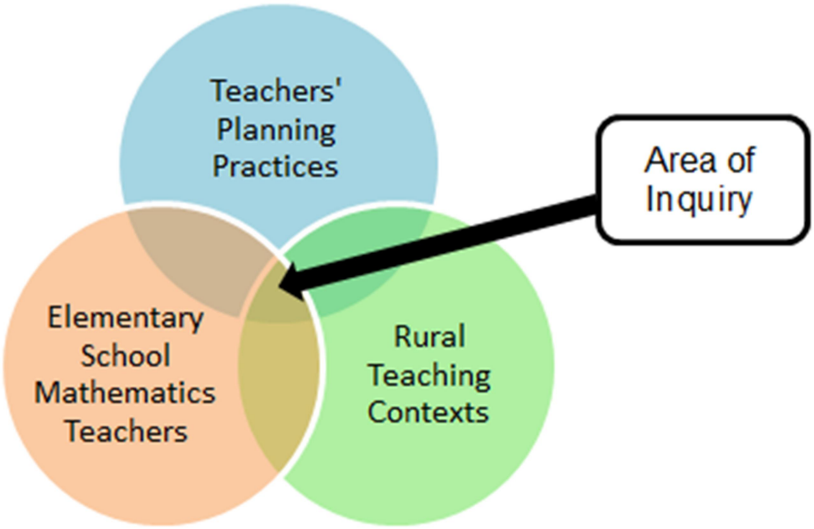

Figure 1.1 Study's relationship to the reviewed literature

purposefully selected for this study because there is an overarching discourse that portrays a deficit view of both elementary mathematics teachers and teaching in rural areas. The study aims to combat that discourse by providing an opportunity to examine rural teacher planning practices, resource discernment, and resource utilization. Additionally, this work provides insight into potential supports for teachers teaching in similar contexts. The study makes no effort to quantify the participants as either effective or ineffective. Rather, participants self-categorized as either being outside their comfort zone or not, while planning for and teaching mathematics.

The study focused on a group of rural elementary school mathematics teachers that participated in a multi-year professional development initiative provided through a Math and Science Partnership Grant (MSP). The label *elementary school* signifies teachers in grades k-5. Each teacher included in the study participated in some portion of the professional development prior to participating in the study. While the study does not seek to understand the effects of the professional development, the MSP institute does provide a foundation for the working-relationships I shared with the participants. That relationship will be explained in more detail in the methodology chapter. The research questions that guided this study are as follows:

(1) What are the ways in which rural elementary school mathematics teachers (REMTs) plan for mathematics lessons when they are outside their comfort zone?

(2) What influences REMTs' decision-making during the lesson planning process and what decisions are made as a result of those influences?

(3) How does the availability of resources impact REMTs decision-making during the lesson planning process?

These questions seek to understand the nature of factors that influence teacher decision-making during the lesson planning process and the decisions that are made as a result of those influences. Additionally, because the literature highlights a lack of resources in rural schools, the study seeks to understand the nature and extent of the resources to which each participant has access (Harmon, 2003; Stern, 1994).

Significance of the Study

This study serves three theoretical purposes. The first is to contribute to the picture of what it means to teach mathematics in a rural context. The limited availability of research on rural teaching practices makes this study significant. It supports a deeper understanding of rural teaching by examining the concrete practices in which teachers engage. The second purpose the study serves is to combat the deficit view that rural teachers are without strategies, resources, or the expertise to make key mathematics instructional decisions. Existing literature surrounding rural teaching implies that something needs to be done to correct the isolation effects (e.g. Burton & Johnson, 2010). While I am in support of intentional consideration and design of supports for teachers, I take the stance that teachers actually do the best they can with what they have available. Keeping that stance in mind, it would be fair to say that rural teachers have developed strategies worth noting and leveraging. Finally, most of the literature around teacher planning is outdated, as much has changed in the past fifty years in education. This study helps to update the literature on teachers' planning practices as they relate specifically to

mathematics. It will serve as an example of how teachers from one district reflect, or not, the current literature-base on teacher planning. Although the focus is on mathematics teaching, the findings may likely hold implications for lesson planning more broadly.

In addition to theoretical significance, the study also holds pragmatic significance. Literature shows that the majority of pre-service teachers do not feel adequately prepared to teach in rural contexts (Roberts, 2004; Yarrow, Ballantyne, Hansford, Herschell, & Millwater, 1999). Literature also indicates that many teachers do not make consistent use of the tools they learned in pre-service education training (May, 1986; McCutcheon, 1980; Mutton, Hagger, & Burn, 2011; Sardo-Brown, 1988; Sardo-Brown, 1990; So, 1997; Superfine, 2008; Yinger, 1980; Zahorik, 1975). Findings from this study can inform teacher preparation programs on how to best support teachers wishing to teach in rural contexts. Likewise, professional development for in-service teachers can leverage the study's results to provide improved, targeted support for rural teaching.

Limitations

As with any qualitative study, the results are limited to the context in which the data were collected. The results are not typically generalizable, but they may help form the basis for further research and, in this case, support suggestions for teachers teaching mathematics within a rural setting. It is up to the reader to decide if the results apply in cases other than this one. The small number of participants and the selection process for the case study participants (described in the methodology chapter) of the study also calls into question if the selected cases are representative of their group. The participants self-identified and self-selected to participate in the study.

Another limitation of the study is that I asked the participants for a decent amount of time and effort to dedicate to the study. Each participant dedicated between six and ten hours to his/her role in the project over the period of one month. Teachers are incredibly busy, and I am cognizant of that fact. However, in order to get a better understanding of planning practices, it is important to look at more than one instance of planning. The time commitment restricted the willing participant pool. However, I thanked the participants with a small gift card at the end of the study. They were not informed of the gift card prior to participation so that it did not unduly influence their choice to participate.

A final limitation of the study is my pre-existing relationship with many of the study's participants. This could certainly affect the study's results. As is discussed in chapter 3, I spent two summers providing professional development to many of the district's 3rd, 4th, and 5th grade mathematics teachers. This prior relationship may have impacted the participant's comments. My status as a professional development facilitator sends very specific messages about my beliefs on quality teaching practices. This could have influenced the decisions the participants made during the observed planning and lesson implementation process. Given that the population was purposefully selected because of the pre-existing relationship, I did not see a way to avoid the potential influence the relationship may have on the participants' responses to inquiries.

Delimitations

The goal of this study is not to make general, sweeping claims about the practices of REMTs. Therefore, I chose to limit my participants to three. This allowed me to focus on details that, otherwise, would have been lost in a larger data set. The small number of

participants permitted me to speak with each in-depth and to visit their classrooms multiple times. This resulted in a robust data set attached to each participant. I was also able to transcribe each interview myself—an added benefit of the small number of participants.

Additionally, the study does not take place in the county in which I live. Round trip, I drove a maximum of three hours to visit a single participant. Because of this, I chose to limit the number of times I traveled to interview or observe each teacher. Interview visits were limited to five and observations were limited to two. Even so, this is an incredible amount of time spent traveling to and from data collection sites. I attempted to schedule multiple events on the same day, but individual teacher schedules did not always afford that luxury. As elementary school teachers, each of the participants is responsible for planning, preparing, and teaching more than just mathematics classes. Even in the two cases in which the participants work in departmentalized schools, they are still responsible for science and social studies instruction in addition to mathematics.

Definition of Terms

Comfort Zone: Comfort zone is defined as a place or situation where one feels confident, comfortable, safe, at ease about, or without stress (Comfort Zone, 2016). In this study, participants defined this term for themselves.

Content Knowledge: The totality of knowledge in the mind of the teacher (Shulman, 1986). Content knowledge can be broken into distinct categories. Subject matter knowledge and pedagogical content knowledge (see definitions below) are two aspects of content knowledge that will be explored in this study.

Every Student Succeeds Act, 2015 (ESSA): A reauthorization of the Elementary and Secondary Education Act (1965). In short, the law is dedicated to providing equal opportunity for all students. Major provisions include accountability requirements, investments in early education, supporting innovation, and ensuring high-quality academic standards.

Individualized Education Plan (IEP): A document developed by an IEP team (educators, administrators, student, parents, and support staff) to support children in special education. IEPs are legally binding documents.

Isolation: This term refers to the expanse of geographic and cultural space between rural and non-rural areas. It also indicates the spread of the population within the rural area.

Lottery for Education Afterschool Program (LEAPs): An after school program provided through grant monies to students in at-risk schools in Tennessee. Programs are intended to support and reinforce the regular academic program. For

a full list of eligibility requirements, see: https://www.tn.gov/education/topic/extended-learning

Lesson Planning: "…the instructional decisions made prior to the execution of plans during teaching" (Sardo-Brown, 1996, p. 519)

Local Accountability: Defined in this study as the district or school rules and regulations in which teachers are expected to adhere.

Mathematical Self-Confidence: Defined in this study as a teacher's affinity for and perceived aptitude in mathematics.

Math and Science Partnership Grant (MSP): A nationally competitive grant designed to improve teacher content knowledge and student performance in mathematics and the sciences. For more information see: https://www2.ed.gov/programs/mathsci/index.html

No Child Left Behind Act, 2001 (NCLB): An updated, reauthorization of the Elementary and Secondary Education Act (1965). Commonly known to address the achievement gap and increase accountability requirements for educators.

Pedagogical Content Knowledge: Knowledge for teaching (Shulman, 1986)

State Accountability: Defined in this study as the rules, regulations, evaluations, and assessments imposed by the state in which teachers are required to adhere.

Subject Matter Knowledge: Knowledge of the facts and concepts of a domain. Understanding of domain specific structures, syntax, accepted truths, and forms of proof (Shulman, 1986)

Race to the Top: A national, competitive grant program designed to encourage and support educational innovation. See: https://www2.ed.gov/programs/racetothetop/index.html

Rural Elementary School Mathematics Teachers (REMTs): Defined in this study as k-5 teachers that work in a rural school or district and teach mathematics at some point during the regular school day.

Response to Intervention (RTI): A multi-tiered intervention program designed to identify and support students with learning and behavioral needs.

Rural: "Rural consists of all territory, population, and housing units located outside urbanized areas and urban clusters" (U.S. Census Bureau, 2012) *See definitions below for urbanized area and urban cluster.*

Urbanized Area: "…densely developed territory that contains 50,000 or more people" (U.S. Census Bureau, 2012)

Urban Cluster: "…densely developed territory that has at least 2,500 people but fewer than 50,000 people" (U.S. Census Bureau, 2012)

Organization of the Study

This study is organized into a total of five chapters—introduction, literature review, methodology, findings, and conclusion. The current chapter, introduction, provides both purpose and structure for the remainder of the dissertation. The sections in chapter one include an introduction to the study, the statement of the problem, the purpose of the study, the theoretical and practical significance of the study, limitations, delimitations, definitions of terms used in the study, and an overview of the organization of the study. The second chapter, literature review, discusses the study's theoretical framework and three main bodies of research as they relate to the study—rural education, elementary teacher knowledge, and lesson planning. The third chapter, methodology, explains the selection of case-study, the research context, data collection procedures, data analysis procedures, and methodological issues. The fourth chapter, findings, provides an in-depth description of each case and a cross-case analysis of commonalities and significant differences. The fifth chapter, conclusion, includes a discussion, conclusion, and recommendations for future practice and research. Several documents are included in the appendices at the end to support the reading of this text. All tables and figures are embedded within the text and referenced, following the table of contents.

CHAPTER TWO
LITERATURE REVIEW

In this chapter I provide a review and discussion of the literature that informed the study. I begin the chapter by explaining the theoretical framework. After that I discuss the content specific literature that informed the study's proposal. Three broad bodies of work were reviewed: rural teaching contexts, content knowledge, and lesson planning. An extensive review of the literature in these three areas is beyond the scope of this study. However, I have selected the most relevant work to include. The selected works are frequently cited, and relevant to mathematics teaching. Because this study is looking at how rural elementary school teachers plan mathematics lessons, these were all logical choices. After reviewing each category separately, I provide a summary of the insights gained from this review.

Theoretical Framework

Teaching is a complex process. Each decision made and action taken cannot be attributed solely to an individual's cognition. Teachers must consider countless factors when planning for instruction. Much like the criminal justice system's motto "innocent until proven guilty," I believe that teachers should also receive the benefit of the doubt. Therefore, it is my stance that teachers plan and execute the best lessons they know how to deliver, given the knowledge, tools, and resources they have at their disposal. This, of course, leads to more effective planning and instruction in some cases; but, nevertheless, teachers do not set out to plan or teach lessons that they know at the outset will be ineffective. Accepting that teaching is complex and that the knowledge, tools, and

resources available greatly influence outcomes harmoniously corresponds to the adoption of the situated perspective (Cobb & Bowers, 1999; Greeno, 1998; Lave & Wenger, 1991; Putnam & Borko, 2000; Saivyer & Greeno, 2009).

Before the 1980s, the cognitive perspective was prevalent in educational research (Saivyer & Greeno, 2009). The early cognitive perspective sought to understand teaching and learning as it related to an individual's thoughts and actions with little regard for context. Further iterations acknowledged that context played a role, but the focus was still primarily on the individual's thoughts and actions (Cobb & Bowers, 1999). The individual remained the unit of analysis. Methodologically, research rooted in the cognitive perspective examines internal cognitive processes of individual participants. The context is viewed as a result of each individual's cognition and action rather than a reflexive relationship.

In contrast, Saivyer and Greeno (2009) claim that this approach is reductionist and does not properly elevate the role context plays in knowing and learning. Greeno (1989) and later Lave and Wenger (1991) contribute to the development of the situated perspective—a perspective with roots in constructivism (Cobb & Bowers, 1999). The first key point of this perspective is that learning is situated in context (Cobb & Bowers, 1999; Greeno, 1998; Lave & Wenger, 1991; Putnam & Borko, 2000; Saivyer & Greeno, 2009). This means that knowing does not exist solely inside the minds of individual learners—in this case, teachers. Context, learning, and knowing are inextricably tied to one another. The situation in which something is learned influences the nature of what is learned; and, in turn, the context is shaped by the individuals acting within it. Knowledge

does not exist in a vacuum. It is intimately related to the context in which the knowledge was created. This means that it is important to look beyond the individual when attempting to understand what people know and learn.

Finding authentic contexts to study a particular phenomenon is favorable to taking this perspective. For this reason, the study takes place within a regularly occurring task of teaching—lesson planning. In this study, I pay particular attention to the broad contexts and their influences on what a teacher knows, thinks, and does during the lesson planning process. Even though it is favorable, advocates of the situated perspective do not believe that the actual task must be used to consider an activity authentic. They posit that, as long as the thinking is replicated, then the criteria for authenticity are met (Putnam & Borko, 2000). Despite my agreement, I believe that if the actual phenomenon is available for study, then it should be used. A substitute, regardless of its likeness to the original, is still a substitute. As a result, I chose to interview and observe REMTs as they plan for and conduct lessons within their own classrooms, paying particular attention to the situative nature of this practice.

In addition to cognition being rooted in context, it is equally fundamental to the situated perspective to accept that it is social in nature (Cobb & Bowers, 1999; Greeno, 1998; Lave & Wenger, 1991; Putnam & Borko, 2000; Saivyer & Greeno, 2009). This means that learning and knowing do not reside solely within the individual. Instead, researchers recognize that interaction with others contributes largely to what someone learns and knows. To put it differently, learning can be seen as a form of enculturation into a community (Lave & Wenger, 1991). In the case of this study, it is important to

understand that teachers in isolated rural contexts may not have access to the same type of collaborative environments as teachers from non-rural areas (Harmon, 2003; Harmon, Gordanier, Henry, & George, 2007; Jinks & Lord, 1990; Roberts, 2004; Stern, 1994; Yarrow, Ballantyne, Hansford, Herschell, & Millwater, 1998). Therefore, the social influences that contribute to what a teacher knows and learns about teaching may look quite different in a rural setting as opposed to a suburban or urban setting. Additionally, the simple act of describing the planned lessons during the interview process will likely alter the original conception. Each question I ask will affect the teachers' responses and, in turn, their responses will affect my line of questioning.

Finally, the third key idea forming the situated perspective is that cognition is distributed (Cobb & Bowers, 1999; Greeno, 1998; Lave & Wenger, 1991; Putnam & Borko, 2000; Saivyer & Greeno, 2009). This means that people are capable of cognitive tasks that are beyond the scope of what they have in their minds. Resources, tools, and other individuals all open the cognitive space and allow teachers to accomplish tasks that may otherwise be beyond them. To put it more plainly, tools and resources are critical to teachers' work. Textbooks, websites, colleagues, instructional coaches, plans from previous years, and more all play a major role in how a teacher thinks about lesson planning. It is vital to consider these sites of distributed cognition when studying the practice of teaching. Similar to the point about the social nature of cognition, it is important to recognize and understand the differences between resources and tools when looking at rural communities as opposed to urban or suburban communities.

Other researchers have since adopted the situated perspective to form the theoretical basis for a variety of educational research. In 2004, a group of researchers adopted the situated perspective to guide their understanding about the ways in which teachers learn to teach mathematics (Peressini, Borko, Romagnano, Knut, & Willis, 2004). They found that by participating in various contexts mathematics teachers' skills and conceptions of teaching are formed. In one case, in particular, a first year teacher quite dramatically changed his practice from his previous student teaching experiences. Rather than providing students with multiple, hands-on activities in which they could explore mathematics, the teacher changed to a less interactive, worksheet-driven approach. The researchers attributed this to the variety of contexts that influenced the young teacher on a daily basis including district and state testing, expectations of his students, and norms of the building.

Another study conducted by Boaler (2000) highlights the situated perspective's power to understand the context in which students learn mathematics. In an analysis of seventy-six interviews, she found that students share some similar experiences in mathematics that actually lead to feelings of alienation in the mathematics classroom—repetition and memorization being at the top of the list. Considering Lave and Wenger's (1991) definition of learning, increased participation in a community of practice, it is easy to see why a sense of alienation leads to students' lack of affiliation with mathematics.

A third study investigates the impact of adopting a situated perspective on previously cognitively dominated work (Franke & Kazemi, 2001). The authors explore a

much written about project in mathematics education called Cognitively Guided Instruction (CGI). Their article highlights the ways in which the situated perspective opens avenues for investigating student and teaching learning that a strictly cognitive approach limits. Taking a situated perspective allowed the researchers to gain an understanding of the ways in which participation in the CGI program altered teacher learning and thinking. Rather than following the program in rigid form, teachers made decisions about next steps supported by the program and their conceptions of student thinking and learning. Previous, cognitive focused, work did not produce this line of inquiry.

A final example highlights the reflexive relationship between content knowledge and pedagogical content knowledge (Brodie & Sanni, 2014). They argue that too much weight is given to the role content knowledge plays in teachers' learning. They do not disagree that it is important; however, they see practice shaping content knowledge as much as content knowledge shapes practice. Taking a situated perspective on learning, allows the researchers to support such claims.

In summary, it is the situated perspective and the personal belief that teachers do the best they can with what they have that form the theoretical foundation for this study. Taking this stance allows me to look at not only typical, individual teachers, but the contexts that surround each teacher. Rather than limiting the process of lesson planning to the thoughts and actions of individual teachers, I consider knowledge, tools, resources, and influences that stretch beyond and share an insoluble, reflexive relationship with one another. In the remainder of this chapter, I will discuss other literature relevant to the

study. This includes information about rural teaching contexts, content knowledge, and lesson planning. At the end of the chapter, I provide a summary of insights gained from the review.

Rural Teaching Context

Research specific to rural teaching contexts is sparse. It has been documented that it is difficult to both attract and retain teachers in isolated, rural areas (Roberts, 2004; Yarrow, Ballantyne, Hansford, Herschell, & Millwater, 1999). Articles report that new graduates feel unprepared for teaching in rural areas (Burton & Johnson, 2010; Roberts, 2004; Yarrow, Ballantyne, Hansford, Herschell, & Millwater, 1999). Other studies recommend ways to overcome the isolation in order to better support beginning teachers in these situations (Burton & Johnson, 2010; Harmon, Gordanier, Henry, & George, 2007; Jinks & Lord, 1990). Little has been done to understand and leverage strategies that rural teachers develop to teach mathematics. Albeit, still limited, more attention has been paid to documenting all the resources (e.g. time, fiscal capacity, support services) rural districts lack (Harmon, 2003; Harmon, Gordanier, Henry, & George, 2007).

In 1994, the US Department of Education's Office of Educational Research and Improvement (OERI) published an overview of the status of rural education in America (Stern, 1994). In this report, several key findings were revealed. First, rural schools and rural school districts are found in every state in the nation. It was reported in 2001, that 83% of the land in the United States was considered rural and this accounted for approximately 21% of the population (Harmon, 2003; Stern, 1994). Since then, this number has remained relatively stable and is supported by 2010 census data (U.S. Census

Bureau, 2010). Despite widespread existence, the challenges rural districts face are far from uniform. For example, the OERI report specifically highlights the southeastern United States for its unusually large rural district enrollment. In many rural areas districts tend to have a total enrollment of fewer than 2,500 students. However, in the southeastern United States it is not uncommon for rural districts to have student populations exceeding 2,500 students. This indicates that education, especially in the southeast, would benefit from more attention being paid to the specific challenges of rural educators.

A second key finding from the OERI report is that teachers and principals in rural schools are generally less well-educated than teachers in other geographic areas in the country. Rural teachers tend to have less professional preparation and lower levels of degree attainment beyond the bachelor's degree when compared to urban or suburban counterparts (Harmon, 2003; Stern, 1994). While the report cites isolation and limited access to professional development, this may also be a result of close community ties. Research suggests that many teachers in this setting grew up in the same district in which they inevitably teach (Burton & Johnson, 2010). Despite a general trend supporting a lack of preparation, OERI reports that rural teachers are typically enthusiastic about reform initiatives (Stern, 1994). Perhaps the lack of exposure to new ideas creates a sense of excitement and purpose when new initiatives are presented.

A final key finding from OERI highlights the overwhelming and persistent poverty that exists in some rural areas (Stern, 1994). Other research points to similar findings but indicate that poverty is particularly predominate in the Southeast (Harmon, 2003). Rural schools are more likely than urban schools to have Title I funding and state

or federal programs that support low-income students. Historically, one in five residents of rural America is poor, with minorities in the region experiencing substantially greater degrees of poverty (Harmon, 2003). This, in and of itself, is an overwhelming challenge teachers in rural areas must face. When students enter the classroom hungry or without basic needs being met, it makes planning for quality mathematics instruction seem paradoxical. It is, at the same time, both trivial and vitally important to student success.

Given these findings, it would be easy to write off rural school systems as deficient. Lack of education, resources, and training can quickly demoralize a population. Further research is needed to illuminate the ways in which people, specifically teachers, are engaging in the important work of educating our nation's youth when faced with such great odds. A situated perspective allows for a holistic approach to considering the ways in which the rural context supports or limits the practice of teaching.

Knowledge for Teaching Mathematics

Content knowledge is commonly viewed as the sum total of knowledge that a teacher possesses in relation to teaching a particular subject (Shulman, 1986). For many years prior to the work of Shulman, the field of education treated content and pedagogy as two separate issues. It was unheard of to consider the two intimately linked. Pedagogy was thought of in more general terms such as classroom management or classroom norms. Content was considered to be the crux of what it meant to teach a particular subject or discipline. At first, content was valued above pedagogy and then eventually pedagogy took center stage. In 1986, Shulman proposed a new view of teacher knowledge. In this view, he married content and pedagogy. He coined the phrase

pedagogical content knowledge. He said that not only is subject matter content knowledge important, but that there is another category of knowledge that is specific to teaching. A teacher needs both in order to succeed at teaching. By proposing this view, he changed how people thought about teacher knowledge. The following paragraphs describe pedagogical content knowledge, subject matter knowledge, and the nature of elementary school teachers' knowledge. While this study does not delineate teacher knowledge as it relates to planning for mathematics instruction, background in the complexities of teacher knowledge is foundational to understanding the multitude of variables that go into each decision a teacher makes during the planning process. Knowledge, regardless of its label, is situated in practice.

Pedagogical Content Knowledge

In 1986 Shulman put forth the concept of pedagogical content knowledge (PCK). That is, knowledge that is specific to teaching of a particular subject. Since then, others have expanded on his categories (Ball, Thames, & Phelps, 2008). Each new category parses PCK into more specific types of knowledge. For example, Ball, Thames, and Phelps (2008) identified three subcategories for PCK: (a) knowledge of content and students, (b) knowledge of content and teaching, and (c) knowledge of content and curriculum. Regardless of how many categories one uses, the important idea is that teaching involves knowing more than the facts of your subject. For this reason, I included PCK in the literature review for this study. It would be impossible to talk about planning for a lesson without also talking about the decisions a teacher makes and how those decisions relate to what the teacher knows. This study recognizes and takes into account

two broad categories of teacher knowledge—subject matter content knowledge (content knowledge or CK) and pedagogical content knowledge. It is the author's stance that teachers call on both of these types of knowledge simultaneously while planning lessons; therefore, it would be undesirable to focus on one over the other. One study goes as far to suggest that too much attention is given to content knowledge (Brodie & Sanni, 2014). That, in fact, a teacher's PCK and CK share a reflexive relationship. A teacher's CK is increased just as much by engaging in and thinking about pedagogy as pedagogy is increased by a solid understanding of the mathematics content.

Subject Matter Knowledge of Elementary Teachers

The distinction between subject matter knowledge and pedagogical content knowledge is concrete. However, both are needed in the act of teaching. For instance, it would be highly unlikely that a teacher could exhibit high levels of PCK in teaching mathematics without also having a reasonable level of subject matter knowledge in mathematics. In order to fully understand the distinction, subject matter content knowledge needs to be defined. Shulman (1986) is helpful in defining it. In his quest to define content knowledge more specifically, he delineated content knowledge and subject matter content knowledge. Content knowledge is the set of all knowledge a teacher holds in his or her mind. Prior to Shulman's work, content and pedagogy were viewed as separate entities (Shulman, 1986). Throughout history one was promoted over the other—each receiving the spotlight in different eras of education research. Shulman claimed that content and pedagogy should not be viewed as two separate categories of teaching expertise. Instead, he advocated for a different view of teacher knowledge. In his

proposed view, he defined content knowledge as the overarching construct that contained distinct categories of knowledge. He identified three major categories: (a) subject matter knowledge, (b) pedagogical content knowledge, and (c) curricular knowledge. The first two are focal points of this review. Subject matter knowledge includes the knowledge of the facts and concepts of a domain. It also includes understanding domain specific structures, syntax, accepted truths, and forms of proof (Shulman, 1986). The act of teaching requires both pieces of content knowledge—subject matter knowledge and pedagogical content knowledge. When one is weak, students are affected (Thompson, 1984).

Since then, others have created additional divisions within teacher knowledge (Ball, Thames, & Phelps, 2008). Subject matter knowledge was broken down into common content knowledge, horizon content knowledge, and specialized content knowledge (Ball, Thames, & Phelps, 2008). Pedagogical content knowledge has been broken down into knowledge of content and students, knowledge of content and teaching, and knowledge of content and curriculum (Ball, Thames, & Phelps, 2008). While these additional categories may be helpful in some circumstances, the nuances between each are not the focus of the proposed study. The study's focus is to provide a detailed description of REMTs planning practices within the context of rural, public education. For the purposes of this study, the term content knowledge is used to describe subject matter content knowledge and all of the distinctions within it.

Elementary school teachers. After defining the term content knowledge, it is important to take it a step further in order to see how it has been applied to elementary

school teachers. Given that most elementary teachers are not mathematics specialists, it is important to study what they know about mathematics content. It is assumed that no reasonable person would argue that a teacher must know the content he or she is charged with teaching. In a study about elementary teachers' knowledge of division, Simon (1997) revealed that the participants "exhibited serious shortcomings" in their understanding of division (p. 251). The participants demonstrated a surface level understanding of division but conceptual understanding was weak, at best. That study corroborated previous findings by Ball (1990) about prospective teachers' knowledge of division. In Ball's study, she found that creating representations for division was a particularly difficult skill for teacher candidates. Candidates narrowly focused on algorithms or rules to justify representations. Only one candidate in her study attempted to explain the meaning behind the division symbol in her explanation, and even that explanation was vague. Another study comparing teacher beliefs to a variety of factors indicates that elementary teachers that possess higher degrees of mathematics content knowledge provide more opportunities for students to grapple with mathematics (Clark, DePiper, Frank, Nishio, Campbell, Smith, Griffin, Rust, Conant, & Choi, 2014). One can assume this may show up when investigating the decisions teachers make during lesson planning. As a final example, a group of researchers found that teachers tend to lean towards either a conceptual or calculation approach to mathematics (Thompson, Philipp, Thompson, & Boyd, 1994). This preference for approach appears to be related, at least in part, to teachers' content knowledge.

A related area of concern is elementary teachers' perceived aversion to mathematics. One study, focused on elementary teachers' mathematics identities, reports three distinct stories elementary teachers tell about their relationship with mathematics (Drake, Spillane, & Huffer-Ackles, 2001). Across all three stories, participants reported experiencing disappointment, discouragement, a loss of interest, and a lack of confidence or aptitude. Some participants reported experiencing a turning point, while others continued in the negative storyline for the entirety of his or mathematics experience. A final group reported a roller-coaster experience mixed with alternately positive and negative experiences. Given the varied backgrounds and experiences of elementary school teachers, one can anticipate that a variety of influences will affect the ways in which they plan for and approach mathematics.

The literature reviewed in this section supports the notion that elementary school teachers have differing degrees of content knowledge. Even in the cases where some are, in fact, specialized in mathematics, conceptual understanding can be found lacking (Ball, 1990). Mathematics identities formed, in part, as a result of this lack of confidence or aptitude can influence decision-making throughout the entirety of a teacher's career and, in effect, limit, alter, or expand the mathematics to which they expose their students.

Instructional Decision Making

State and national governments can impose any number of rules and laws attempting to regulate student outcomes, but the fact remains that a teacher is the ultimate decision-maker in terms of what actually occurs from day-to-day within the walls of his or her classroom. Lesson planning and the decisions teachers make during lesson

planning are crucial to succesfully teaching mathematics (Little, 2003). It has also been suggested that planning is so important that it, alone, that it can determine the success or failure of a teacher (Arnold, 1998). Without a lesson plan, the learning that occurs within a classroom is left up to chance. Teaching is about more than what occurs during instructional time. Teaching is also about making intentional decision both before and after instruction occurs. Therefore, it is of vital importance to understand the influences on teachers' decision making during this stage of teaching. Looking through a situated lens, these influences are limitless and produce different outcomes depending on the individual. However, accounts of lesson planning can help to inform the general practice. Lesson planning, in this study, refers to both plans for single lessons and extended, longterm plans for units or the entire year (Glatthorn, 1993). Addtionally, particular attention is focused on decision making as part of the lesson planning process (Borko & Shavelson, 1990).

Studies investigating how teachers plan have been around for the better part of a century (e.g. Clark & Peterson, 1986; Leinhardt, 1989; McCutcheon, 1980; Peterson, Marx, & Clark, 1978; Sardo-Brown, 1988; Tyler, 1950; Zahorik, 1975). Some of these studies point to the invisible nature of lesson planning (Borko & Shavelson, 1990). That is, many planning decisions are made mentally and not all teachers produce written lesson plans. This fact could pose a problem for those wishing to investigate the lesson planning process. Despite the difficulties, numerous studies have been conducted on the topic. In the following sections, I organized my thinking on the topic into three broad

categories—general lesson planning practices, elementary-focused lesson planning, and planning for mathematics.

General Lesson Planning Practices

This subcategory of lesson planning literature refers to studies in which lesson planning was of primary concern at the expense of subject or grade-specific nuances. The studies described herein present findings that result in a classification of the how, what, why, with whom, or with what teachers engage in lesson planning. Due to a lack of focus on a particular grade level or subject, these produce generalizations about the nature of lesson planning.

Several studies focus on the details of lesson planning—where the planning occurs, how often it occurs, what form it takes, what type of plans are developed, the purpose of planning (Arnold, 1988; Glatthorn, 1993; McCutcheon, 1980; Ornstein, 1997; Sardo-Brown, 1990; Yinger, 1980; Zahorik, 1975). In these studies the focus is on defining the why and how of lesson planning. Most of the studies report the same results. For example, teachers produce daily, weekly, unit, and yearly plans (McCutcheon, 1980; Sardo-Brown, 1990; Yinger, 1980; Zahorik, 1975). Teachers rarely use a formal planning model when planning for instruction (McCutcheon, 1980; Leinhardt, 1983; Sardo-Brown, 1988; Yinger, 1980; Zahorik, 1975). Often teachers consider student ability and activities prior to thinking through lesson objectives or assessments in terms of how to organize lessons (Zahorik, 1975). Expert teachers are more adept at planning effective instruction and less likely to produce a written lesson plan than a novice teacher (Leinhardt, 1989; May, 1986; Mutton, Hagger, & Burn, 2011). There appears to be a connection between

teacher planning and teacher behavior as evidenced by observed lessons (Peterson, Marx, & Clark, 1978). That is, goals, objectives, and subject matter designated in lesson plans have been shown to have a significant positive relationship with teacher behavior during a lesson. Focusing on decision making is one way to make visible the process of lesson planning (Borko, Livingston, & Shavelson, 1990; Borko & Shavelson, 1990; So, 1997; Yinger, 1980; Zahorik, 1975).

Not all studies are the same and one study, in particular, stands out. Sardo-Brown (1990) developed a survey to ask teachers about their planning practices. In her study she included the results from a survey of thirty-three teachers. She included every grade level from kindergarten through twelfth grade. In the survey the teachers were asked about yearly, term, unit, weekly, and daily planning routines and decisions. In her sample she included a range of subjects, grade levels, and years of experience. Not unlike other studies, she found that the strict use of a planning model was uncommon; although, this was surprising given that her sample came from a district that strongly encouraged teachers to use a specific model. Also consistent was the overwhelming conclusion that participants did not see formal education as having an influence on their current teaching practices (Sardo-Brown, 1990; Wilkerson & Scheffler, 1992).

Much has changed since the publication of many of these studies. It would stand to reason that while some of these findings likely endure, others probably do not. For example, based on the current focus on accountability in the United States, it is possible that standards and objectives play a larger role in influencing teacher decision making during planning than they once did. It is, also, important to note that none of the literature

reviewed for this dissertation focused specifically on the planning practices of rural teachers.

Elementary-focused Lesson Planning

In contrast to the earlier category, studies in this category have an elementary focus. That is, the teacher participants teach elementary school. Elementary school teachers are unique in that they typically plan for multiple subjects within the same school day. Many are not departmentalized and, even those that are, are often are required to dedicate at least part of the day teaching other subjects (as is the case in this study).

In a landmark study on elementary school teacher planning, McCutcheon (1980) documents several influences on planning decisions. She notes several interesting findings. First, her participants reported a lack of preparation in teacher education programs on the topic of lesson planning. Her participants remember discussing unit and lesson plans, but they do not recall any formal lectures or lessons on the act of planning. From my experience in teacher education, I would say that this is still somewhat true today. Depending on which program a student enrolls, their experiences with lesson planning could be vastly different. For example, my personal experience as a student in a teacher education program is similar to that of McCutcheon's participants. However, my experience as a teacher educator is different. My colleagues at the university pay considerable attention to crafting and refining effective lesson plans. Regardless, either situation could potentially influence the plans teachers write once they are practicing teachers.

A second finding from that study is that elementary teachers tend to teach in isolation (McCutcheon, 1980). This means that the teachers in her study did not tend to collaborate with one another on the topic of lessons. When considering resources for planning, colleagues are invaluable. One can anticipate that rural areas may experience similar influences due to a lack of funding or capacity to develop structured collaboration networks (Stern, 1994). Other influences McCutcheon (1980) notes are administrative policies and practices and class size.

Additional studies report that elementary teachers engage in long term planning (Sardo-Brown, 1990; Yinger, 1980). While making long term plans, teachers make critical decisions about the scope and sequence of instruction. Findings from one study indicate that teachers regularly engage in creating new plans rather than relying on previous years' plans (Sardo-Brown, 1990). Elementary teachers also report that they rarely use information learned in teacher preparation programs to assist in the lesson planning process (Sardo-Brown, 1990). Taking a situated perspective on the topic of transfer, this may indicate that the contexts of teacher preparation programs and those of practicing teachers are incongruous. That is, the ways in which pre-service teachers learn to lesson plan may not adequately enculturate them into the actual practice of teaching.

Planning for Mathematics

The final category includes studies that are specific to planning for mathematics. The studies in this category highlight the complexities of planning for mathematics that are not as noticeable in either the general or elementary-focused studies. Researchers in mathematics education regularly study and promote the use of high-level tasks in

instruction (Smith, Bill, & Hughes, 2008; Smith & Stein, 2011). In order to support mathematics teachers to use these tasks, they provide support in the form of recommendations. One recommendation is to spend time thinking through the task in order to plan for and anticipate student responses. The authors urge teachers to take the time to write out a variety of solution pathways and potential questions that could be used to facilitate student thinking during the task. Those pathways and facilitation questions are one way in which teachers plan to teach with high-level mathematics tasks.

In addition to the researchers listed above, Superfine (2008), a mathematics education professor, recognizes that reform-based mathematics curricula may require a different type of planning than traditional mathematics curricula. He defines reform-based as "emphasizing the discovery of mathematical ideas through tasks" (p. 12). Superfine's study focused on the ways in which teachers plan with one particular mathematics curriculum. However, other researchers have also commented on the uniqueness of planning for mathematics when compared to other subject areas (Yackel & Cobb, 1996). It is also important to note that in both reform and traditional curricula planning, teachers tend to rely on the textbook (McCutcheon, 1980; Superfine, 2008).

Formal lesson plans are different than the typical, daily lesson plan an experienced teacher uses to guide instruction. Recognizing this, researchers attempted to gain understanding of teachers' perspectives on the role of lesson plans (Courtney, Eliustaoglu, & Crawford, 2015). They asked both practicing and prospective mathematics teachers to share their ideas on the topic. Interestingly, practicing teachers saw lesson

plans primarily as a reflective tool and none of the practicing teachers in the sample reported that lesson plans serve no purpose.

Finally, in an attempt to make teacher thinking and decision making visible, Leinhardt (1989) conducted pre-lesson interviews with expert and novice teachers. Pre-lesson interviews are also a feature of this dissertation study. In this study, it was noted that expert teachers' plans are significantly more efficient and effective than those of novice teachers. This is important in mathematics because, as the study reports, novice teachers tend to present fragmented ideas. For math students, this is one of the factors that lead to alienation (Boaler, 2000) as mentioned in a previous section.

Planning Connections

One connection between the three categories of research on teacher planning is that all teachers, in one way or another, plan for instruction. Planning for mathematics may rely on a different set of skills than planning for other contents, but the practice in its most basic form is the same across grade levels and contents. Research on teachers' planning practices suggest that the invisible nature of decision making constructs a barrier that is difficult to surmount (Borko & Shavelson, 1990; Clark, 1989). Planning does not always occur in the same place and time. Many decisions are spontaneous (Borko & Shavelson, 1990; McCutcheon, 1980), which makes it challenging to gain the type of access to teachers that is certainly needed in order to delve into the details of lesson planning decision making. This challenge may be one reason researchers tend to analyze more visible aspects of teaching, such as observable events that occur during

lesson implementation. The pre- and post-lesson interviews are one way researchers, and I, make an attempt to get at teacher decision making (McCutcheon, 1980).

Summary

Based on the literature that is currently available about teacher planning, I see the need to look more specifically at the practice given that much of what is available falls within the general category. As such, I have chosen to look specifically at REMTs planning practices. I am particularly interested in the influences on teacher planning decisions and the ways in which teachers compensate for situations that put them outside their comfort zone.

In this chapter I detailed what it means to take a situated perspective. Following this discussion, I provided a review of literature in three distinct categories: (1) rural education; (2) knowledge for teaching; and (3) lesson planning. In summary, the outlook for rural America, as portrayed in research literature, is bleak. Research on rural education paints a picture of a poor, uneducated population that continues to decline. My experience working with rural teachers in the MSP institutes tells me that these teachers have strengths that have not been capitalized on. That understanding is likely shared by others who work in rural communities. One purpose of this dissertation is to highlight those strengths.

Additionally, elementary teachers as described by research literature, are mostly certified as generalists, and are ill-equipped to teach mathematics in conceptually meaningful ways. These ideas point to a need for supporting teachers in the primary functions of teaching. One of those essential functions is lesson planning. Finally, the

tools teachers encounter in formal schooling—often the only training rural teachers receive—are not useful in the day-to-day activities of teachers' practice. This study is an attempt to highlight and present REMTs as resourceful individuals that have developed strategies for teaching despite the deck that is stacked against them.

CHAPTER THREE
METHODOLOGY

I approached this study with an interpretive stance; that is, I acknowledge that the reality that I present is but one interpretation of many (Denzin & Lincoln, 2013; Merriam, 1998). The situated perspective necessitates this stance, but it also goes hand in hand with my personal view of the world. We all see single slices of reality. While the goal of research is to present one slice fully, it can never replace the object of inquiry as *the truth* of what is or what was. Any representation is, by definition, a mere portrayal. As soon as the researcher enters the environment, no matter how stealthy she may be, the situation is forever changed. It becomes a co-constructed reality—an intricately choreographed dance—where the researcher may want to lead, but chooses to follow. Meaning is teased from experience and the result is an amalgamation of truths pieced together to form a cohesive picture of one carefully crafted reality. If, indeed, the researcher plays the part well, then the picture will make sense and cause others to wonder. It is this idea to which I held when I embarked on the journey to dance with and discover the planning practices of REMTs.

For this study, I selected an instrumental multiple case study as the specific qualitative tradition in which to conduct my inquiry. Merriam (1998) states that for case study research, "the interest is in process rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation" (p. 19). Because I studied the process of lesson planning, especially when teachers feel out of their comfort zone, I was able to delineate my unit of study and define individual cases of this process occurring (Merriam, 1998; Stake, 1995). The remainder of this chapter details the study's design,

the study's context, participant selection techniques, data collection procedures, data analysis procedures, and methodological concerns.

Study Design

The purpose of the study is to investigate the ways in which rural elementary school mathematics teachers plan lessons—specifically when they feel they are teaching outside their comfort zone. Recall that the study has three main questions:

(1) What are the ways in which rural elementary school mathematics teachers (REMTs) plan for mathematics lessons when they are outside their comfort zone?

(2) What influences REMTs' decision-making during the lesson planning process and what decisions are made as a result of those influences?

(3) How does the availability of resources impact REMTs decision-making during the lesson planning process?

After narrowing down the issue for study, it was a logical next step to determine what methods would best fit with the statement of the problem and address the research questions. Because of my particular theoretical framework—a situated perspective—it was logical to select qualitative methods to investigate the research questions. Specifically, I selected an instrumental multiple case study. The situated perspective allowed me to gather data that informed a more complete description and understanding of each case. That is, I paid particular attention to the situative nature of lesson planning. Not only did I want to know about individuals, but I also sought to examine the interaction between context and individual participants. As such, my goal was to provide both a broad view of REMTs' planning practices, but also a much narrower view of

individual cases of REMTs' planning practices. Figure 3.1 illustrates the study's key components. I will explain each component in more detail in this chapter. The next section provides an overall context to the study prior to noting the specifics of the study.

Study Context

In case study the research context is of vital importance. This is especially true in instrumental case studies, such as this one. Case study researchers typically spend a considerable amount of time and space describing the case so that readers can make the best, most informed decision about a study's findings. Broadly, qualitative research is not promoted as being generalizable, but, by providing an in-depth description, it allows readers to make choices about applicability (Creswell, 2013; Howe & Eisenhart, 1990; Merriam, 1998; Rossman & Rallis, 2017). For that reason, I will spend the next several paragraphs describing the context in which the participants worked on a daily basis and the relationship that I developed with the participants prior to participation in this study.

Researcher's Role

It is important to make a note of my relationship with the participants prior to their participation in this study. For the past two years I have worked as part of a Math and Science Partnership (MSP) grant project throughout the summer and at selected points during the academic year to provide extensive professional development for the district in which the participants work. The participants chosen for this study were all involved in that MSP project. For many, this was their first professional development

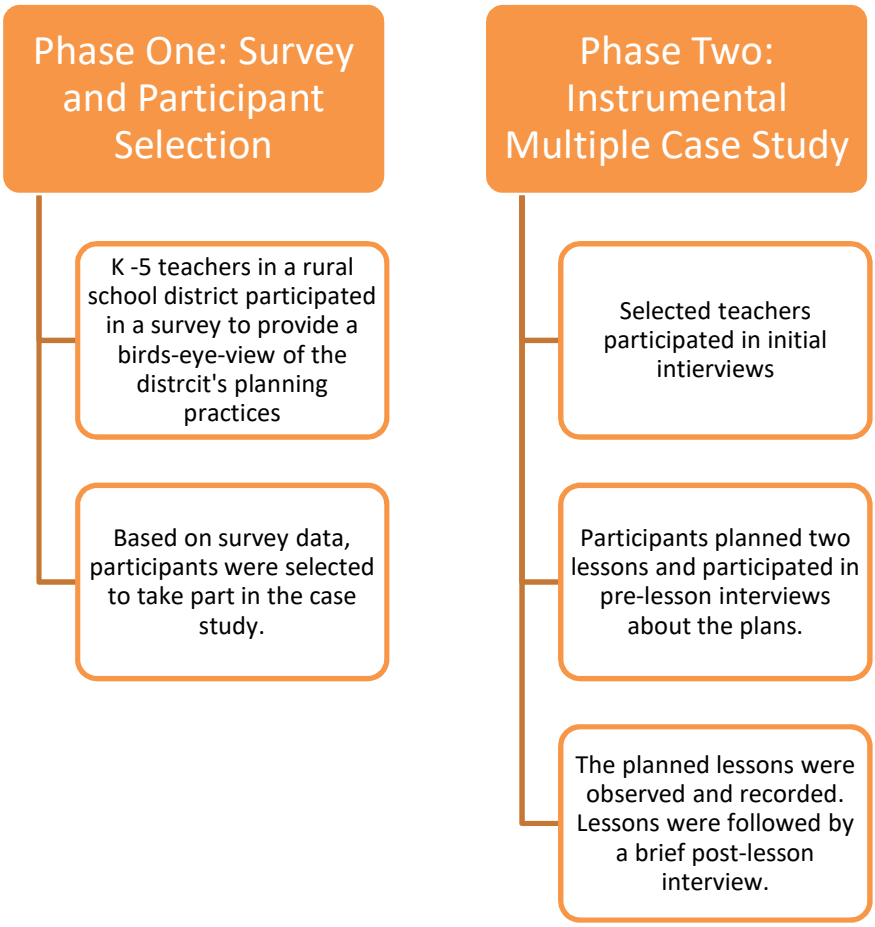

Figure 3.1 Elements and flow of the study

event since graduating from college. I saw it as my role, and continue to see it as my role, to build strong bonds with the teachers involved in the professional development for the sake of their professional learning. Studies have shown that creating a sense of belonging and personal connection are some of the hallmarks of effective professional development (Garet, Porter, Desimone, Birman, & Yoon, 2001); therefore, I worked towards this outcome. Several teachers from that project keep in touch and send regular updates or requests for advice and support.

During the MSP institute, project staff intentionally developed particular norms for interaction, building a community of practice framework (Wenger, 1998). All sessions were discussion-based and each participant was encouraged to share his or her thinking in both small group and whole group discussions. Each session focused on both content knowledge and pedagogy for teaching mathematics. The institute participants were fully engaged in each of the mathematics tasks and asked to reflect on ways in which they could either modify or support the students in their classrooms to do the same. My role in the project was to facilitate primarily the 3-5 grade band sessions. However, through follow-up sessions during the academic year, I was able to build rapport with teachers spanning grades k-8. It is my belief that participants selected from the professional development cohort only strengthened the study's results. The established relationship paved the way for deeper conversations rather than the typical introductory level conversations that happen in a new relationship. However, this situation also came with a great responsibility. All qualitative researchers assume the ethical responsibility of presenting their findings in a way that does not unduly damage their participants while

still maintaining the integrity of the data set. Due to my past and future work with these participants, I feel a greater responsibility and obligation to use my relationship wisely. I did not want to put undue pressure on participants to take part in a study they would not otherwise take part in simply because of our professional relationship. The IRB script was instrumental in ensuring each participant was aware of his or her rights and ability to deny participation without consequence. I assured them that denying participation would not affect our working relationship.

District Context

The district in which the study is situated is a small, rural school district in the southeastern United States. The district serves eight elementary schools and two middle schools. According to the 2010 demographic profile generated by the 2010 census, the county supports approximately 41,000 people (U.S. Census Bureau, 2010). Of those, 22.6% live below the poverty level. Only 7% of the population aged 25 years or older have attained a bachelor's degree or higher. The majority, 58.7%, are high school graduates. The median household income is approximately $33,000. The census estimated that 48.3% of the population 16 years or older to be in the labor force and 43.3% are actually employed. Taking into consideration margins of error, the U.S. Census Bureau assigned a 10.4% estimate for the unemployment rate in the district. Of the population, approximately 8,300 students 3 years of age or older are enrolled in school with the vast majority (87.9%) attending public school. According to previous MSP grant documents and data supplied by district leaders, 87% of the district's students are classified as economically disadvantaged. The district consistently scores low in

mathematics grades 3-8 and during the 2013-2014 school year, district scores along all of the strands for mathematics fell below the state average.

During my time with the teachers at the professional development institutes, I learned that most of them had not been to any professional development since graduating college. Some reported attending only a handful of workshops in their career. Overall, they appeared excited to participate in the mathematics institute because it was an opportunity that was not typically available to them. Upon further investigation, I found that a district policy had been in place for the past several decades that prohibited requiring teachers to seek professional development outside the school day. Due to this, very few teachers reported attending professional development regularly. The unfamiliarity with professional learning settings caused some initial wariness among the group, but by the end of the first institute the teachers were all quite comfortable sharing their ideas and asking questions. The time and effort put into developing relationships was time well spent, as viewed by the project team. I was aware that I needed to responsibly leverage that fragile trust in order to ensure participants felt safe responding to questions that might be uncomfortable to answer. It is human nature to want to disguise our shortcomings and in this study I asked teachers to talk through those instances when they potentially struggled with math and teaching. I believe that without the existing relationship, many would not have been willing to participate in or respond to such an inquiry for fear the information could be used maliciously.

Phase One: Survey and Participant Selection

The first phase of the study included the initial survey and participant selection. I chose to survey approximately thirty-five kindergarten through fifth grade teachers located in the same rural school district in the southeast United States. This population was selected because I had already developed a working relationship with many of them and I wished to learn more about their experiences. My professional background is in urban education and, for this study, I had a desire to learn about other teaching contexts. The survey allowed me to gain a better understanding of mathematics planning practices in the selected district. This also allowed me to identify two larger categories in which to sort participants. This sort supported the selection of the final three case study participants. Both the survey and the participant selection process are described in the subsequent sections.

Survey

Researchers sometimes choose to collect survey data prior to selecting specific participants for more in-depth participation in a study. For example, in her critically acclaimed book, *The Dreamkeepers*, Gloria Ladson-Billings (1994), chose to survey staff and community members to help identify successful teachers of African American students. The survey in this study serves a similar purpose—to identify potential case study participants. This led to a detailed purposeful participant population sample (Patton, 2015). The questions on the survey were created from the results of existing literature (Arnold, 1988; Glatthorn, 1993; McCutcheon, 1980; Ornstein, 1997; Sardo-Brown, 1990; Yinger, 1980; Zahorik, 1975). The findings from major studies about

lesson planning were syntehsized and turned into a list of survey questions and, specifically, aligned to planning for mathematics. Additional questions, not addressed in existing literature, were also included to provide a broader picture of the planning practices of this particular school district. Appendix A includes the full version of the distributed survey. The survey provided a snapshot of a rural school district's planning practices—specifically, mathematics planning practices.

The survey was not anonymous. I needed a way to connect participant responses to individual participants for follow-up. The text preceding the survey alerted participants to this fact and they were reminded, more than once, that they were not obligated to complete the survey. Thirty-five surveys were distributed and twenty-seven were returned. The survey included thirteen questions that were a mixture of multiple-choice, item ranking, and free-response. Three main questions from this survey were used to sort participants for the case study phase of the project. This process is described below.

Participant Selection

Participants were purposefully selected from elementary school teachers teaching mathematics in a rural district in the southeastern United States (Merriam, 1998; Patton, 2015). The surveys were given to all kindergarten through fifth grade teachers who attended at least one session of the MSP summer institutes. This decision was based on the research question and access to participants. My experience working with the summer institute alerted me to the fact that this particular set of teachers is wary of outsiders. It took a significant amount of attention and time before the group trusted I was not there to harm, embarrass, or talk down to them in any way. The overall survey sample is an

example of a *typical* sample (Merriam, 1998). It was not noticeably atypical or unusual upon selection. This sample is ideal for my study because my focus was on the issue (instances of mathematics lesson planning) rather than atypical or unusual cases of individual teachers. I simply needed rural elementary school teachers who regularly plan and teach mathematics lessons.

After the large group took the survey, the case study participants were selected based on the results. The specific case study participants were selected using a stratified random sampling method (Marshall, 1996; Onwuegbuzie & Leech, 2007). That is, I categorized the participants based on confidence and then randomly selected from each category. In order to do this, I entered participant names into a random object generator. The technology facilitated the random selection of a participant name from the entered list. The survey included three questions related to participants' comfort-level and confidence while they plan for mathematics. The questions are as follows:

- I have to refresh my memory before I teach certain math topics. (yes) (often) (occasionally) (no)
- Teaching math pushes me outside my comfort zone. (yes) (often) (occasionally) (no)
- I feel confident when I am teaching and planning for math. (yes) (often) (occasionally) (no)

Going back to the research questions, I was particularly interested in low-confidence individuals, because I wanted to know what strategies they used to overcome a lack of confidence when planning for mathematics lessons. These three questions allowed me to

sort the sample into two main categories: high-confidence and low-confidence individuals. In this instance, low does not necessarily mean lowest. It simply indicates that those participants had less than a high level of confidence.

Out of the twenty-seven returned surveys, five were eliminated prior to stratification based on the participant's teaching status for the academic year. Two of those were no longer classroom teachers (one moved to an administrative position and the other took a position as a math coach), one survey was incomplete, and two were special education teachers. Of all the teachers that participated in the MSP project, fewer than five were strictly special education teachers. Special education was excluded because the planning required for special education presumably does not represent general education and was beyond the scope of this investigation. After excluding the surveys that did not fit within the study's parameters, the remaining sample was stratified into the two overarching categories: participants with self-identified higher confidence and participants with self-identified lower confidence. In this dissertation, I describe the groups as high-confidence and low-confidence. The narrowed sample of twenty-two individuals was sorted into two categories. After sorting, participants were randomly selected from each group. One was selected from the high-confidence category and two were selected from the low-confidence category.

The first category, high-confidence, included eight of the twenty-two survey responses. This category was determined by participants selecting a combination of no, no, and yes to the three previously selected questions. That is, they do not need to refresh their memories before teaching certain topics. They are not outside their comfort zone,

and they feel confident planning for mathematics lessons. The first participant that was randomly selected from this group declined to participate due to other obligations. At that point, I randomly selected another participant and he agreed to join the study. Bryan, listed as case 2 in this study, was selected from this group. Bryan and all other participant names included in this study are pseudonyms.

The second category, low-confidence, included the remaining fourteen individuals. This category included each response that did not qualify for the high-confidence category. The responses in this category varied, but none of the responses indicated confidence across the spectrum of questions like those in the high-confidence category. Table 3.1 shows the frequency of responses for the low-confidence group. The most common response combination was occasionally, occasionally, often. In the three instances where participants selected that, yes, they do feel confident teaching and planning for mathematics, the other selections qualified their response for this category. For example, one of those three selected that math "often" pushes her outside her comfort zone and that she "occasionally" needed to refresh her memory. The other two selected that they "often" need to refresh their memory and "occasionally" feel outside their comfort zone. The two randomly selected cases from this category, Lori and Melissa, had combinations of "yes, often, often" and "occasionally, occasionally, occasionally." Lori was randomly selected first and Melissa was randomly selected after three others declined to participate for various reasons (e.g., newborn baby, illness). Table 3.2 provides an overview of the final case study participants.

Table 3.1. Low-confidence responses

	Yes	Often	Occasionally	No
I have to refresh my memory before I teach certain math topics.	2	2	9	1
Teaching math pushes me outside my comfort zone.	0	2	12	0
I feel confident when I am teaching and planning for math.	3	7	3	1

Table 3.2. Overview of case study participants

Participant	**Confidence Level**	**Grade level**	**Years of Experience**	**Gender**	**Race**	**Classification of Origin***
Lori	Low	4th	12	Female	White	Rural
Bryan	High	5th	6	Male	White	Rural
Melissa	Low	1st	23	Female	White	Rural

*Classification of origin refers to the area in which each participant was born and raised.

Phase Two: Instrumental Multiple Case Study

With any effective research, the questions dictate or, at the very least, illuminate potential and appropriate methodology choices (Creswell, 2013; Howe & Eisenhart, 1990; Merriam, 1998; Rossman & Rallis, 2017; Stake, 1995). Merriam (1998) provides several defining characteristics of case studies. First, she asserts that "the single most defining characteristic of case study research lies in delimiting the object of study, the case" (p. 27). That is, the case has edges. It is a *bounded system*. In this study, the case study is bound by a single rural school district, a limited number of individual teachers, those teacher's classrooms, and all the resources that those teachers use during the planning process. Each teacher is, on its own, a single case. Because I have a total of three participants, I refer to the study's design as a multiple-case study (Merriam, 1998).

After satisfying the initial condition, case boundaries, Merriam provides further characteristics that define case study research. Case studies, according to her, are *particularistic* (Merriam, 1998). The case focuses on particulars. Typically case studies are divided into two large categories: *intrinsic* and *instrumental*. This study is of the latter category. I am interested in the issue of lesson planning. Specifically, I am interested in the particular lesson planning practices of rural elementary school mathematics teachers. The cases I selected were *instrumental* to accomplishing the goal of understanding more about these particular practices (Stake, 1995).

Furthermore, case studies are both *descriptive* and *heuristic* (Merriam, 1998). The end product includes *thick description* of each case (Geertz, 1973; Merriam, 1998; Stake, 1995). As such, chapter four in this dissertation contains evidence in the form of

participant quotes and researcher observations to support each of the findings. This leads to the *heuristic* quality of case study research (Merriam, 1998). The thick description enables readers to learn from the cases and judge the validity of the interpretations put forth by the researcher. The remaining sections in this chapter will describe the data collection procedures, data analysis, and quality control.

Data Collection Procedures

Data collection procedures for phase two of the study are described, in detail, in the subsequent sections. I include information about access and entry procedures and follow that with an overview of the data sources. Each data source—interviews, observations, and artifacts—is provided in the description.

Access and Entry Procedures

The initial sample for this study included a pool of teachers with whom I had worked in the past. Through the MSP grant project, permission and access to these teachers had already been granted. I had already visited many of their classrooms for follow-up support on grant-related activities. Therefore, gaining additional permission to extend my access beyond the grant was relatively seamless. Additionally, an IRB was already in place that allowed the project staff to collect data on willing pariticipants, including interviews and observations. All that was required was a slight amendment to the original document in order to expand it to cover my study, as well. This means that initial contact with the participants occurred in summer 2015 and will potentially continue through summer 2018, pending additional grant funding.

In order to gain access to specific teachers' classrooms for the purposes of collecting data for my study, I included that request when I asked each of them to be part of the case study. I met with each participant individually and in person prior to any data collection. The purpose of these meetings was to provide a detailed description of the ways in which I was requesting their participation and to acquire signed consent documents. I allowed participants to ask questions to make sure they felt completely comfortable before they signed the consent form. Additionally, I offered to let them think about it and let me know at a later time if they needed more time to ponder their decision. Two of the three asked about confidentiality. The biggest concern was the video-recorded observations. They were curious who would see the recording. I assured them that only my committee chair and I would watch the film. All three of the final participants agreed and signed during those intial meetings.

After gaining permission, I was concerned that the students in the classroom might be confused or wary of my presence in their classroom. I offered to make an initial visit to meet and speak with them prior to data collection. All three participants dismissed my concern and claimed that visitors were a norm and the students would not be adversely affected by my presence in their space. Which, as a side note, turned out to be an accurate assumption on the part of their teachers—the students, for the most part, ignored me. After deciding that, we selected dates for the initial interview and first observations. I did not encounter any issues when I arrived at the individiual schools. The teachers let the front office staff know to expect me. The only real trouble I experienced

was when I saw other MSP participants in the hallway and they asked why I was not coming into their classrooms, too.

Data Sources

The data sources for this study were typical sources as recommended by qualitative researchers (Creswell, 2013; Merriam, 1998; Rossman & Rallis, 2017; Stake, 1995). I primarily collected interview and observation data. However, I also collected artifacts whenever possible. The sections below describe each data source in more detail.

Interviews. I conducted several semi-structured and open-ended interviews with each participant. See Appendix B for the interview protocols. I labeled the interviews as either initial, pre-teach, or post-teach. Each interview served a distinct purpose. The initial interview served as an in-depth look at the teacher and his or her practices. This interview sought to uncover detailed information about the participant and the ways in which he or she planned for mathematics instruction. Information about the participants' comfort level with mathematics was also included in this interview. This interview lasted between sixty and seventy minutes.

Initially, I designed the study to have participants plan two lessons—one where they felt confident and one where they felt a little out of their comfort zone. However, after conducting the initial interviews, I quickly realized that this would not be possible. During the initial interview, participants reported doing everything in their power to avoid situations where they were out of their comfort zone. Therefore, I made adjustments to the interview and observation requirements. Rather than intentionally forcing participants to teach a lesson with which they were uncomfortable, I asked about

strategies they used to avoid or mitigate those instances. This line of questioning produced valuable data and the intention was not lost. In hindsight, a pilot study would have caught this issue. Even with the adjustment, this did not change the general procedure. Participants still planned and taught two mathematics lessons that I observed.

The second category of interview was the pre-teach interview. The participants were asked to describe their process of planning for each observed lesson. In addition, they were asked to provide a written copy of the plan if one was available. The pre-teach interview focused on how the lesson plan was designed and what resources were consulted. I asked participants to explain their thinking about particular lesson choices they had made. I also asked participants to describe the instruction that occurred directly before each pre-teach interview. These interviews allowed me to get a more specific look at the decisions each teacher made during the lesson planning process.

Finally, the participants were asked to participate in a post-teach interview after each lesson observation. The purpose of the post-teach interview was to clarify any additional instructional decisions that did not come up during the pre-teach interview. Speaking from experience, written plans are not always clear and detailed. The written and verbal explanations, in some cases, were not enough to gain a complete understanding of the lesson prior to observation. The post-teach interview helped to clarify any lingering questions I had about planning decisions. In all cases, I conducted the post-teach interviews immediately after the observed lesson. Given the teachers' busy schedules, this was quite fortunate and much appreciated. Both pre- and post-teach

interviews lasted between 10 and 20 minutes. All interviews (initial, pre, and post) were audio-recorded and transcribed verbatim.

Observations. During the initial interview with each participant, we selected a date for the first observation. The observations took place during the first half of the spring semester 2017. As previously noted, I offered to observe once informally prior to data collection so the students would be familiar with my presence, but all three teachers said this was unnecessary. Therefore, I observed each teacher only for data collection purposes. The observations were video-recorded and those recordings were used primarily during triangulation and member checking. This is described in further detail later in this chapter. Field notes were kept throughout each observation.

Another purpose of the observations was to highlight any areas that I wished to follow-up with participants during the post-teach interview. While the recorded footage was primarily used for member checking, I used my observation notes to guide the post-teach interviews. As stated before, the written and verbal explanations were not always clear or complete. Watching the planned lesson allowed me to focus on events that did not come up during the pre-teach interviews. For example, I observed the way in which Melissa made use of her written lesson plan during the observed lesson. This was a detail that did not come up in either her initial or pre-teach interviews. The lesson observation facilitated that discovery.

Artifacts. The purpose of the study was to get a better idea of how REMTs plan mathematics lessons. Therefore, it was logical to collect lesson plans. Research has found that teachers do not tend to use a formal lesson plan structure on a day-to-day basis

(McCutcheon, 1980; Leinhardt, 1983; Sardo-Brown, 1988; Yinger, 1980; Zahorik, 1975). Therefore, I did not dictate the participants use a particular lesson planning model. In all cases, the teachers were already required to keep written record of their plans for the school principals. I simply requested a copy of that plan. Each plan varied in length from one to four pages. In addition to lesson plan documents, I also took pictures of textbook pages and collected any lesson materials (e.g. worksheets) that were distributed during the observed lessons.

During the initial interview, I provided participants with an optional handout that was intended to aid them in remembering specific planning decisions. None of the participants chose to use it. After interviewing them, it became evident that they typically stuck with sources they were comfortable with and it was not an issue for them to remember which resources they consulted. One participant spoke about a pacing guide she created from the content standards. She referenced this multiple times in her initial and follow-up interviews. I collected a copy of it.

Data Analysis Procedures

The following section provides details for data analysis methods applied to data collected during phase two of the study. As recommended by prominent qualitative researchers, data analysis began the moment of my first interview (Strauss & Corbin, 1990; Merriam, 1998; Stake, 1995). I did not wait until the entire collection of data was in front of me to begin analyzing it. Stake (1995) cautions readers to remember, "it is *the* case we are trying to understand, we analyze episodes or text materials with a sense of correspondence. We are trying to understand behavior, issues, and contexts with regards

to our particular case" (p. 78). By correspondence, he means searching for patterns and constancy within those patterns.

Because this study is a multiple-case study, I engaged in two levels of analysis—within-case analysis and cross-case analysis (Merriam, 1998). Chapter four will provide insights gained across both levels of analysis. Throughout the entire analysis, I reminded myself of Merriam's statement that, "…a case study is an intensive, holistic description and analysis of a single, bounded unit. Conveying an understanding of the case is the paramount consideration in analyzing the data" (p. 193).

Throughout the entire analysis, I used memo writing as an analytic device (Charmaz, 2009; Merriam, 1998; Saldaña, 2013). Memos are places where researchers have conversations about the data. They can be reflective, descriptive, or analytical in nature. Following the suggestion of Saldaña (2013), I referred to all of my memos as analytic memos regardless of the content. My memos served to deepen my reflection and thinking about the data. All of my coding took place within memos. I subscribe to the belief that writing is a form of analysis (Charmaz, 2009; Saldaña, 2013). Two sample memos are provided in Appendix C. Overall, my analysis occurred along two lines—description and categorization. The cross-case analysis followed the same pattern. The section below describes my analysis process in more detail.

Listening, Reading, and Re-reading

It is difficult to describe the analysis process on a page in black and white. The structure indicates a chronological order to the process which is a false impression of the reality of the way in which I analyzed my data. As mentioned in the previous section,

analysis began the moment I started my first interview. Following the interview, I made voice memos and later written memos to record initial thoughts and questions that occurred during the interview. This was true of all interviews and observations. This also occurred during the transcription process. I transcribed all of my own interviews. Many of my initial noticings occurred during that process.

Coding and categorizing occurred in phases. First, I listened to each interview in its entirety—pausing on key ideas to write memos—and then reading and rereading the transcript files, field notes, and artifacts. This phase of coding allowed me to capture each individual's comments on the act of lesson planning. I was fortunate enough to complete data collection on one participant prior to collecting data on the next; therefore, I conducted this initial phase on a case-by-case basis. Each initial code and tentative category generated was tested against ongoing data. Some categories were dismissed, and others refined and solidified. For example, one participant uttered the phrase *professional development* early in the initial interview. After comparing this instance to the ongoing data, I discovered that it had no connection to that participant's influences or decision making during lesson planning; therefore, it was not a viable category in this study. Additionally, the category labels became more sophisticated over time. Initial codes included words or phrases from my participants' interviews. Consideration of multiple codes allowed me to define a succinct category label for major influences and outcomes.

My method could be described as crystallization (Ellingson, 2008). I immersed myself in the data and then paused to reflect on and articulate what I noticed. During this process, three coding techniques were leveraged—in vivo, structural, and descriptive. In

vivo coding is also referred to as verbatim coding (Saldaña, 2013). This coding technique allowed me to preserve and honor the individual participant voices within the case study. Rather than treating the participants as one large unit, in vivo coding highlighted unique traits within each participant's data set. Structural coding was a logical choice as it is useful in virtually all qualitative studies including case studies (Saldaña, 2013). It involved chunking large segments of text on broad topics. The codes generated in this category were primarily related to the research questions. Example structural codes include *resources*, *influence*, *decision*, and *comfort*. The final coding technique I used was descriptive coding. Because my priority was to provide an in-depth picture of each case, I needed a way to catalogue topics and main ideas I encountered within each. That is the function of descriptive coding (Saldaña, 2013).

A second phase of coding occurred when I compared individual participant categories to one another. This phase allowed me to identify commonalities and significant differences within the categories. In this phase, I engaged in an iterative process of refining the codes into categories and selecting poignant examples to lend credence to my analysis. Similar to the manner in which I treated codes and categories for individual participants, I tested cross-case patterns against the entire data set. Again, memo writing was the primary tool I used to assist in defining and refining my categories.

Methodological Issues

This section describes issues related to methodological choices. With any research, there are pros and cons to selecting particular methods. The goal is always to

minimize the cons while providing sufficient justification for the choices made along the way. In the following paragraphs, I explain the techniques I employed to engender confidence in my study and analysis.

Verisimilitude refers to the trustworthiness of qualitative research and, specifically, to the authenticity of the participants' words. In my analysis and final report, I attempted to integrate and maintain as much of the participant voice as possible. Thereby, the reader can assess the validity of my claims. As a qualitative researcher, I did not make any attempt to posit my conclusions as the one, true reality. Such a thing does not exist. Rather, I acknowledged that my interpretation is just that—an interpretation of the data. The data does not speak for itself (Merriam, 1998). I analyzed it and constructed a representation that addressed the research questions. In order to increase the verisimilitude of my representation, I provided evidence, in the form of participant quotes, to support my findings. At relevant moments throughout the text, I also included information about my own background and biases. Additionally, I engaged in triangulation (Merriam, 1998; Stake, 1995). I used standards documents, lesson plans, artifacts, and observations to either refute or support the categories I defined throughout the analysis.

Finally, I included member checks as part of my data collection and analysis (Merriam, 1998; Stake, 1995). I sent completed copies of the transcript files to all participants. I allowed them to read through and clarify or omit anything to which they became alerted. Additionally, I used this as an opportunity to ask follow up questions

about topics that were unclear in the interview transcripts. It is important to note that no omissions or modifications were requested from any of the participants in this study.

Summary

This qualitative, instrumental multiple case study was conducted in two phases. Phase one included surveying a pool of thirty-five REMTs and randomly selecting three of those teachers from stratified groups for case study. The individuals selected for the case study participated in an initial interview followed by additional rounds of interviews and observations. The data sources include survey data, audio-recorded interviews and transcripts, observation field notes and video-recordings, and document collection. I employed memo writing as my primary analytic tool to code and categories the data. To generate trust in my analysis I applied several techniques including triangulation, member checks, and honoring the voices of my participants. The next chapter in this dissertation includes a detailed description and findings from each case, as well as, the results of the cross-case analysis.

CHAPTER FOUR
CASE DESCRIPTIONS AND INSIGHTS GAINED

This chapter will describe the findings from the analysis. First, each case is presented as it relates to the findings of the study. The final section of the chapter, titled "Cross-Case Analysis" will provide insights gained by looking across cases. Commonalities and significant differences are detailed in this analysis. For quick reference, the research questions are:

(1) What are the ways in which rural elementary school mathematics teachers (REMTs) plan for mathematics lessons when they are outside their comfort zone?

(2) What influences REMTs' decision-making during the lesson planning process and what decisions are made as a result of those influences?

(3) How does the availability of resources impact REMTs decision-making during the lesson planning process?

Overall findings indicated that mathematics content standards, accountability (local and state), mathematical self-confidence, and confidence in student ability all influence the decision-making that occurs during the lesson planning process. As a result, teachers limit, alter, or expand student access to high-quality mathematics. Additionally, available resources influence decision-making during lesson planning. Each of these influences affect planning decisions differently in each case and are described below. First, each case is described in detail. Readers are introduced to the participant and then the findings are explained in two main categories: influences and decision-making as a result of those influences. Each case ends with a summary of the participant's influences and decision-making as a result of those influences. After that, a cross-case analysis is

provided that details commonalities and significant differences between cases. Finally, the major findings are related back to the research questions.

Case 1: Lori

Lori is an original participant of the MSP summer institutes. From day one of the first institute in 2015, I knew that I would enjoy her company. On that first day she walked through the door with a large cup of coffee and a look that said she was not thrilled to spend her summer talking about mathematics. She was the first participant in the room and, as she made her way to the back table, I nervously went to make her acquaintance. After introducing herself, she told me that she was "no good" until she had finished her coffee. I laughed and we both agreed that waking up that early on a beautiful, summer day should be outlawed, but I promised to try and make it worth her while. She tentatively agreed and I left her to enjoy her coffee in peace. From that moment forward, she did not fail to entertain and grow me as a professional development leader. Every time I put a "thinking question" on the board for the group, Lori would make a joke about how I was torturing her or making her brain hurt. By the end of the institute Lori and her table of colleagues became affectionately known as the "troublemakers."

Fast-forward to the study. After dividing the participants into two piles, Lori's name was the first one that got randomly selected. She is not the kind of person who holds back and she says what she thinks. From a researcher's perspective, she is exactly the kind of person you want to interview. As such, I was not surprised during our first interview when she said, "Ask me anything. I am an open book."

At the time of the study, Lori was in her twelfth year as a professional educator. She has a bachelor's degree in art and an elementary teaching certificate. Her ex-husband was in the service which led to several moves across the country after finishing her certification. During that period she took time off to raise children before beginning her teaching career. When she returned to her home state, she spent time teaching in 2nd, 3rd, 4th, and 5th grade classrooms. The bulk of her time was spent teaching reading. However, when her principal offered her a departmentalized mathematics position, she jumped on the chance. She said that she had gotten "burned out" on reading and wanted a change. She was also excited because, according to her, her math scores on the state accountability measures are always better than her reading scores.

She has taught in the same district for her entire career, but moved schools once. Her first job with the district was that of a traveling art teacher. Even though her degree is in art, she expressed plainly that she "will never teach it again." Rather than seeing an enormous number (about 900) of students each school year, she preferred to have her own classroom where she could "make a difference" with individual students.

The day-to-day activities in Lori's classroom are predictable and stable. She has a routine that she sticks to and it is rare that she deviates from her patterns. She begins her lessons with daily math (five problems from previous material) and small group (response to intervention—RTI) time. After that she provides direct instruction and then the students have time to practice what they learned. If the students finish early, they go to centers. Even though practice time may sometimes be independent or partner work and daily math might take longer on one day than another, the overall structure remains the

same—daily math/RTI, direct instruction, practice, and centers. Her daily planning predominately consists of finding resources to fit within each structure or routine.

Each interview and observation provided valuable insight about Lori's confidence and decision-making as she planned for mathematics lessons. Throughout her time as an educator, she developed a routine for coping with lessons that pushed her outside her comfort zone. Her rural school district provides a large degree of teacher autonomy and the majority of instructional decisions are within her direct control. These planning decisions affect the rigor, pacing, and priority she places on the mathematics standards she is charged with teaching to her fourth grade students. Additionally, the availability of resources greatly affects Lori's planning decisions. The following paragraphs provide detail on these findings.

Influences

Several factors heavily influence Lori's planning decisions—standards and accountability measures, mathematical self-confidence, resources, and confidence in her students' abilities. Influences were determined by considering the frequency and earnestness with which she spoke of them.

Standards. If I were to arrange influences in a hierarchical system, mathematical content standards would be the top influencer of Lori's long and short term planning. The state Department of Education publishes content standards for each grade level and course taught in the public school system. The content standards are intended to drive instruction. For reference, a segment of the fourth grade mathematics content standards are included in Appendix D. Each content standard is given a color-coded designation.

Green indicates major content, blue is supporting content, and yellow is additional content. Lori's planning revolves around the content standards. Each day she knows which standard she is working on with her students based off a pacing guide she created over the summer. I asked Lori to describe her process of creating that pacing guide. She said:

> I look at the standards. As geeky as it sounds, that's what I do during the summer. Especially this last summer when I switched grade levels. If I'm in a grade for several years then it's a no-brainer because I can just look at the last one, but this year I had to go back and re-familiarize myself with the 4th grade standards. I know roughly when the [state test] is and when breaks are and so I try to set up a pacing guide using the standards and I group the standards together. On the standards they have them set up as, this is major content, this is minor content, and so I focus on the major content first and then it kind of trickles down.

I asked her to describe how that affects her daily planning and she said:

> I've got them for each subject hanging on clipboards behind my desk. And, so, if I'm stuck then I look at, okay where did we stop? I'll look at them. I probably need to look at them again when I go back to school this week to see, okay, what do we still have to do? After I teach them, I try to check them off. What do I still have to fit in during this time? And, then I'll adjust.

This supreme attention to standards is unique. It is not prominent in any of the reviewed literature, nor did the other participants speak as earnestly about adherence to the standards documents as Lori did. This is possibly a result of increased accountability

testing and a state-level focus on professional development about the standards, but that is purely speculation.

Accountability. The analysis of Lori's data illuminated two different types of accountability. The first type of accountability is the rules and expectations put forth by her school principal. This guided her general planning practice. In this study, I refer to the first type of accountability as *local accountability*. The second type of accountability is the information put out by the state's Department of Education for end-of-year testing—testing that determines part of her teacher evaluation score each year. I refer to this type of accountability as *state accountability*.

Local accountability. The school where Lori works requires written lesson plans to be turned in each week to the principal. Therefore, she did report that she complied with this expectation. She made no mention of a specific lesson planning model. Years prior her principal had given out a recommended template and that is the one she used. It is important to note, that she never referenced or alluded to anything she learned as part of her teaching certification program. This includes when she was asked about where or from whom she learned the most about teaching. This confirms findings from previous studies that state teachers do not tend to use the lesson planning models they were taught in school (May, 1986; McCutcheon, 1980; Mutton, Hagger, & Burn, 2011; Sardo-Brown, 1988; Sardo-Brown, 1990; So, 1997; Superfine, 2008; Yinger, 1980; Zahorik, 1975). When she described her method for recording lesson plans, she said:

> [I write my lesson plans down] every week. They have to be on the computer. We have to turn them in every week. Several years ago [the principal] gave us a

> format: bell ringer, introduction, and essential questions. That kind of thing. She said that was how she wanted them done. So I've always done them that way since then. I cut and paste a lot and just change stuff. But yea, they have to be submitted every week. Not everybody does it.

However, she openly admitted that her plans are often not accurate day-to-day because her students tend to progress at a rate different than what she expected when she sat down to write the plans. In those instances, she does not go back and edit her submitted lesson plans. She makes quick, pencil notes on her printed plans to indicate how far she progresses each class period. She did not worry about the days when her plans did not match her lesson. Explaining this during one of her planning interviews, she referenced her current lesson plan and said:

> We're going to start here. I mean this talks about, it goes straight into equivalent fractions. We're going to probably, I'm going to do a little review, and I do this [write on printed copies of her lesson plan], too. Um, I'll probably go in and we will talk about adding with the same denominators and review that because they do know how to do that. That's third grade. And then, it's more likely, if they don't remember that, we may have to push this down and do that because we have to see where they are. And that's what today, tomorrow, and hopefully not Wednesday, but by then we'll know where they are.

When she finished explaining, her lesson plan was covered in pencil notes. I asked if she returned to the plans and changed them in the computer and she said no. It is promising that she, at the very least, found the template and format helpful in her daily activities.

State accountability. The state Department of Education publishes testing blueprints for each of the end-of-year accountability tests. This blueprint indicates the number of items that appear on the test from each of the mathematical content standard domains. For reference, the 4th grade mathematics blueprint is included in Appendix E. State accountability is closely related to the content standards and so it is not surprising that Lori focuses so intently on the end-of-year test. The percentage of tested items is directly related to the major, supporting, and additional designations provided for each standard in the grade-level content standards document. That is, major content includes more tested items than supporting or additional content. In the following quote, Lori references the [state test] blueprint:

> I look at, okay is this standard important on the [state test]? If there is going to be one out of sixty questions, then we are pushing that to the end…[I look at the pacing guide] and say, okay we've really got to hurry on this and if we don't get to that then it's okay. We can always teach that stuff after the [state test]…I remember last year when they canceled the [state test]. I was like pfft, we are done! And I was just throwing everything up in the air. We learned origami and stuff like that.

It is interesting to note that Lori's adherence to the content standards and testing blueprint is directly related to accountability, as evidenced by a critical incident. As soon as the test was canceled, she dismissed her pacing guide and spent time exploring origami and other, non-standard mathematics with the students for the remainder of the school year. It is also important to observe that Lori is the only participant who demonstrates an intense

focus on state testing requirements. This focus drives many of her planning decisions and, in turn, affects the scope and sequence of mathematics instruction she provides.

Mathematical self-confidence. The first research question for this study seeks to know more about the ways in which REMTs plan for mathematics lessons when they are outside their comfort zone. It is not unusual, and it is almost expected, that most elementary school teachers do not claim mathematics as their favorite subject. This can be for a variety of reasons, but primarily it is due to a lack of content knowledge—it is uncomfortable to teach something that you do not feel very confident about (Ball, 1990; Simon, 1997; Thompson, 1984; Thompson, Philipp, Thompson, & Boyd, 1984). Not surprisingly, Lori passionately described her elementary mathematics experience like this:

> I hated math when I was in elementary school. I like teaching them all the little tricks that I learned to make it easier for me…I can remember freaking out. I hated word problems. Even in high school I hated word problems.

Even though she acknowledged that it still is not her favorite subject, she liked the certainty of it. She said:

> I like teaching math better. It is very specific. It has a specific set of rules that don't change. Two times three is always six. Always. There is never an exception to that. And so, I kind of like that.

During the participant selection process, Lori was classified as having low-confidence in mathematics. This is a result of personal observations during the MSP summer institutes and her self-designation on the initial survey document. On the survey

she indicated that teaching math "often" pushes her outside her comfort zone. During her interview she said:

> I try not to be [out of my comfort zone]. I'll teach something and think, okay, I'll start something and it just isn't coming out of my mouth right. I'm not putting it out there and I'm seeing all these really confused looks…Sometimes that's a good thing though, like if I'm not understanding it, because I will change it…I try not to get up there and not know what I'm talking about though.

This is an example of Lori attempting to regulate the time she spends out of her comfort zone. Even in those instances when she is uncomfortable, she maintains a positive attitude. She sees it as an opportunity, rather than a roadblock.

Confidence in students' abilities. In terms of planning priorities, Lori put student ability levels near the top of the list. On her survey and in all interviews she discussed how important it was to select "basic" materials because she felt like her students were unable to move beyond the basics. Over the course of the data collection cycle, the origin of her beliefs was illuminated. She talked in great detail about the home lives of the students in her classroom. At one point, she notes:

> When I taught in a self-contained classroom, I had parents that would come up and tell me that their kid can't read. And, that they don't even need to know how to read. And, I'm like, yes they do! A lot of parents say, "I didn't need to learn how to read. I didn't do well in math. I'm not going to make them do well." They don't want their kids to do better than they have. We have a lot of that.

In another example, she said:

> Probably about sixty percent of the kids at our school are being raised by someone other than their parents. And I probably have a higher percentage than that in my room. A lot of foster parents. A lot of grandparents. A lot of great, great grandparents. Aunts, uncles. Sometimes even friends of the family that have no custody of them whatsoever are raising them and taking care of the kids. That's hard. I can handle anything in school. It's the stuff that they are dealing with when they come to school crying because they stayed up all night because somebody in the house was watching TV all night and they are tired and sleepy. That kind of thing. That's the hardest.

Many, if not the majority, of her students are being raised by someone other than their parent due to drug addiction or incarceration. According to the Incarceration Trends Project (Incarceration rates, 2017), "The average incarceration rate among the forty largest counties in 2014 was 271 per 100,000 residents" (para. 2). That number is more than doubled for Lisa's school community. According to her, the county where she works also has a high rate of children born addicted. In an earlier school year, the principal brought in a nurse from one of the local community clinics to talk about strategies to support children affected by addiction. The information that resonated with Lori from that training the most was, "They are never going to retain your information. You are just going to have to get used to it." From that point forward, Lori did not see the need to spend time covering anything that was not absolutely necessary and she placed a large emphasis on repetitive tasks. She commented:

> They've got to learn old school. They've got to. And once they learn those basics, then they get better. But I've got kids, they still can't. I give them a weekly five minute test with 100 addition problems. I don't think anything is above nineteen. Just double digit addition. It may even be twelve. But they can't pass it. A lot of them are still not passing it. They can't do their mental addition, let alone, multiplication.

I asked her to clarify what she meant by old school and she explained:

> Basic algorithms. I know you're supposed to teach [strategies], and I've tried to teach it but this group can't get it. We've even gone through this year with multiplication doing partial product, doing the magic window, doing the box with diagonals—lattice…but for the life of me I don't know why they can't get the steps…they can't seem to grasp that concept.

In my experience as a professional development leader and instructional coach, I have noticed that teachers tend to proceduralize alternate strategies which leads to shallow conceptual understanding or confusion on the part of the student. It is possible that Lori did this, as well, making her revert to basic algorithms.

Assessment of student ability. One constant that exists in Lori's planning patterns is her reliance on assessment, both informal and formal, to determine next steps. Her own classroom-based assessments are what she uses on a day-to-day basis to determine the content of individual lessons. These assessments typically take the form of students answering questions on their desks with dry erase markers. She describes her routine like this:

> We will practice a couple things on the board. Then, more often than not, I give them dry erase markers and we practice them on their desks in front of them. I go around and give them a thumbs up, then they know they are good and they know they can go ahead and erase…Then we practice until I see the majority of them getting it and then I usually say, "Okay one more problem and then I'm going to give you your practice sheet." Then, as I see that they've got it, I'll hand them their practice sheet to get started.

Based on their performance, she decides to either move on, or provide extra practice and instruction the following day. During all pre- and post-observation interviews, these data are what she relied on to talk about her plans for the following class period. Her evaluation of these informal assessments combined with her observations and pre-conceived notions of the students based on home life, all lead Lisa to the conclusion that her students need "basic" instruction. This is explored further in rigor section below.

Resources. Previous research indicates that rural teachers typically teach in isolation (Burton & Johnson, 2010; Harmon, 2003; Stern, 1994). On the macro-level they are geographically and culturally isolated. On the micro-level, they tend to teach in silos even within their own buildings or districts. This holds true for Lori. Throughout the entire study she only mentioned one other colleague by name as being someone she could turn to if she wanted to discuss planning for mathematics. Collaboration is neither the norm nor an expectation in Lori's school. This means that the vast majority of what she uses and plans for her instruction is a result of her own thinking and decision-making.

Based on reviewed literature, I expected Lori to say that she did not have all the resources she needed in order to be successful in her instruction. However, this was not the case. Instead, on her survey, she selected "yes" that she had all the resources needed in order to plan for math lessons. It appears that the internet may be bridging the divide when it comes to disparities in educational resources, as Lori's primary resource is educational websites. Her favorite website is commoncoresheets.com—a website that allows users to create worksheets on any common core standard for mathematics. The closing of this gap is both promising and worrisome. The internet is full of countless resources for mathematics, but not all are high quality. I wanted to know how she makes decisions about which resources are worthy of classroom instruction. She said:

> I look at it. Is it grade appropriate? Is it grade appropriate for my kids? Is it going to follow the standards? Then, is it broken down enough for this group? Sometimes I'll still use it but I'll, well, no I don't. If it's not broken down enough then, you know, I might save it for another year. But, this group has been hard this year because they have to have so much broken down to the basics…Right now it is taking a lot just to find things that are broken down enough for them. We are doing small, small steps.

This statement not only indicates the prominent role the standards play in resource selection, but also Lori's confidence in her students' abilities. She looks for resources that only cover basic information that is broken down into small steps.

Planning Decisions

As a result of the aforementioned influences, Lori makes planning decisions that both alter and limit the mathematics her students are exposed to. Overall, her view of students' ability, her mathematical self-confidence, and standards and accountability expectations cause Lori to reduce and rearrange the mathematics content she presents to students. Her yearly pacing plans demonstrate the modified standards arrangement. The reduction is seen in both her pacing and in the level of rigor she includes in her instructional plans.

Coherence. As mentioned in a previous section, Lori's long-term planning consists of a pacing guide that she creates from the mathematics standards provided by the state. She groups the standards based on either major, supporting, or additional designations. On the surface this appears to be a fair decision. The boundaries are defined by state accountability documents, but there is still room for interpretation. Each teacher interprets these expectations in a different way. In Lori's case, she sees the end-of-year test as a dominant expectation. As such, she makes instructional decisions based on it. For anyone who spends time in a school for any length of time, this is not an unusual phenomenon to focus on accountability testing. Some critics call it, "teaching to the test."

Unfortunately, this focus on accountability testing may not lead to coherent instruction. Rather than arranging the standards in a way that makes sense and supports conceptual development, Lori's grouping system inadvertently creates fragmented silos of information. For example, the following standard is listed as a supporting standard in the fourth-grade mathematics standards (see Appendix D):

> 4.OA.4 Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.

This standard is intended to support several major content standards including the following (examples provided in standards document are omitted):

> 4.OA.1 Interpret a multiplication equation as a comparison. Represent verbal statements of multiplicative comparisons as multiplication equations.
>
> 4.0A.2 Multiply or divide to solve word problems involving multiplicative comparison.

One purpose of standard 4.OA.4 (supporting standard) is for students to understand the decomposability of numbers. It extends the learning that students begin when they are making multiplicative comparisons. For example, a basic multiplication fact is 6 x 6 = 36. This is typically the type of example students would encounter if the teacher only dealt with standards 4.OA.1 and 4.OA.2. However, this is not the only way to decompose the number 36. The students could also use 1 x 36, 2 x 18, 3 x 12, 4 x 9 or the reverse of any of those facts. When standard 4.OA.4 is taught in isolation, it becomes an exercise. It is not connected to the bigger picture of multiplicative reasoning and comparisons.

In this case, Lori's focus on accountability and standards significantly alters the mathematics to which her students are exposed. They are not provided the explicit opportunity to make connections between related ideas. Even though, her decision is

understandable. In a time-bound system, sacrifices sometimes need to be made. In Lori's case, she chooses to teach the high-value content prior to any supporting or additional content because that is how she and her students are held accountable at the end of the school year.

Rigor. When it came to planning rigorous lessons, Lori spoke in contradicting terms. She initially talked a lot about the vast number of special education students she had in her classroom. I asked her what she did in order to prepare for the range of abilities and needs she observes in her students and she said:

> I don't treat the special ed. kids any different than I do the regular ed. kids. I adjust the lessons according to their [individual education plans] IEPs, but a lot of times the IEPs are so general, it is just like a general adjustment and I expect them to do the same thing that everybody else is doing.

In that statement, it appears that Lori is holding her students to high expectations. She does not make excuses for the students or unnecessarily scale back the expectations simply because students have a special education qualification. On the other hand, when talking about her typical lesson planning practices, she frequently made statements like the two below:

> I look at the standard and think, how can I teach this? How can I teach these kids? Then I usually start with the basics. I also look at our textbook…but the kids have a hard time understanding it.
>
> We will go basic, basic, basic. Because, like I said, we started doing multiplication. They were able to do those basic, basic things and then I took it

> one step further and it was just completely over their head because they don't have the background. So we've got to back it up again. There's been a lot of backing up this year.

This stands in stark contrast to her previously stated notions about holding her special education students to high expectations. She believes that her students are unable to go beyond the basics. After she sees the majority of students have mastered the basic understanding of a concept or skill, she typically moves on without ever going beyond the basics. She said, "I go ahead and test them and go on." Her lack of confidence in her students' abilities limits the content she is willing to expose them to. Again, given the explanation of the students' home lives, it is reasonable to see how she can come to this decision. However, it points to a need for further support or professional development in teaching struggling learners.

Summary: Lori

Over time Lori has developed a strategy to cope with instances when she is outside her comfort zone. Mathematics content standards, accountability documents, and internet resources are the primary places she seeks support. This is true for times when she is confident and when she is not. Her lesson plans are not detailed. Instead, her classroom routine guides the structure of her daily lessons. She spends the majority of her lesson planning efforts on locating resources and practice problems. Her primary focus is on student ability and content standards while she lesson plans. Her perception of the students' low ability levels shows up regularly in the plans. She does not extend the learning beyond basic instruction and expectations. Student performance on daily

classroom assessments guides her planning from day-to-day. Her long-term plans are heavily influenced by state expectations and accountability measures. This often leads to modifications that limit student access to coherent, rigorous instruction.

Figure 4.1 represents Lori's planning influences and the relative significance of each. The two outer circles contain *mathematics content standards* and *accountability*. In Lori's case, these are the primary factors that drive both long and short term lesson planning. Each year she creates a pacing guide that prioritizes major content as designated in the mathematics content standards. During this time, she also considers the relative importance of particular topics as it relates to the required end-of-year accountability assessment. If content is coded as supporting or additional content, or does not make up a significant portion of the exam, it gets pushed to the end of her pacing guide. The inner overlapping region contains *resources, confidence in student abilities,* and *mathematical self-confidence*. She is heavily influenced by her perception of student ability. She perceives that her students are struggling learners that need basic instruction and materials. This, in combination with selected resources and her mathematical self-confidence leads to the final, written lesson plan which fulfills local accountability requirements.

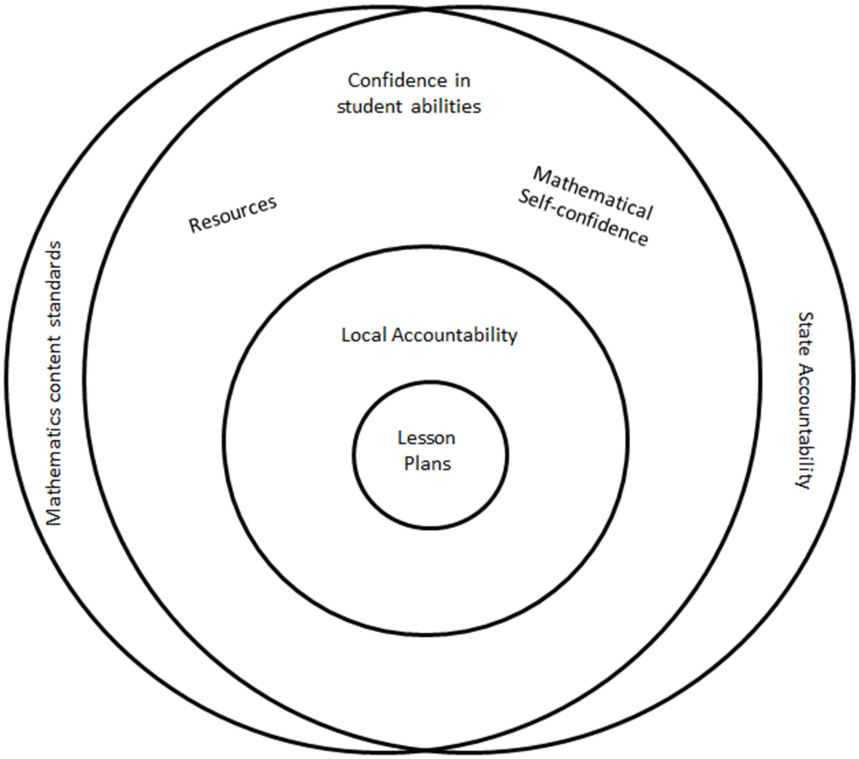

Figure 4.1 Lori's influences

Case 2: Bryan

Bryan began participating in the MSP institute during the second summer of implementation. The first day he walked in, he made a beeline to the back corner of the room. He was one of the only males in the room. At first, he would not volunteer for whole group discussion. As is my norm with any participants that are reluctant, I made an effort to engage him in small group and one-on-one conversations throughout the day. It was not long before he opened up. In the smaller setting, Bryan was eager to discuss mathematics and the strategies he used to solve problems. By the end of the first day, his switch flipped, and he became an active participant in all aspects of the learning environment. Often, Bryan would stay in the room during breaks or after the sessions were dismissed for the day in order to continue discussing mathematics. I could tell that he was comfortable with mathematics and that he enjoyed talking about it. He liked to talk about the strategies he used, in addition to the strategies that were presented at the institute.

At the time of the study, Bryan worked as a sixth-year teacher. He spent all six years in the same school district; however, the first two years he served as the county's mathematics tutor. He tutored students in a total of five different elementary and middle schools. After that, he accepted a position teaching fifth grade and remained in that position ever since. He volunteers time before and after school to facilitate the LEAPs (Lottery for Education Afterschool Program) program that provides care for and academic support to students in the community. His compassion is evident. During one of his interviews he said:

> You've gotta watch these kids. They may come in but be in another world. You find out that mom stayed up high all night or that there was a party at their house or mom got arrested. You know, that's the hardest thing.

During the participant selection process, Bryan's name was randomly selected from the group of individuals that self-rated as confident in mathematics. My interactions with him during the institute supported this designation. Both interview and observational data further supported this claim. Bryan's confidence in mathematics is evident in the ways in which he plans for lessons and interacts with accountability expectations. These influences, in addition to others, affect the scope and depth of mathematics he plans for his students. These findings are described below.

Influences

The study was purposefully designed to select one participant who expressed mathematical self-confidence. Bryan is that case. Confidence in his own mathematical ability, standards and accountability expectations, and confidence in student abilities primarily influence Bryan's planning decisions. Each influence is described below.

Mathematical self-confidence. Based on my previous interactions with Bryan, I anticipated that he would classify himself as highly confident in mathematics. On the survey, he listed himself as "never" being outside his comfort zone and that he "never" needed to refresh his knowledge of any mathematics topics in his curriculum. Therefore, it was not a surprise that he simply answered, "Not really, no. It seems natural to me," when I asked if he had ever been outside his comfort zone teaching mathematics. With a little more probing, he admitted:

> I was a terrible math student. Fractions. I did not understand fractions at all. It didn't click until college…When I first started teaching, yes. I was out of my comfort zone. I mean from the way I was taught—just the basic algorithm, to now? The different things you implement into [teaching mathematics]. That was my biggest thing I had to learn…Like division, putting the zero in. We left a space. I had no idea why we left a space. I just knew you left a space.

That statement indicates that Bryan did not start his career fully confident in his ability to teach mathematics. However, once he learns a new strategy, he confidently proceeds. Below, Bryan describes his favorite aspect of teaching mathematics:

> I enjoy math…Math is black and white. Either it is right, or it is wrong. That's the best thing about math to me…I try to adapt everything to real-life and I try to explain it by real-life. And, you've got to show them where they are going.

This statement is unique to Bryan. It is important to note that, of the three participants, he is the only one who talked about making connections between his fifth-grade mathematics curriculum and the mathematics students would encounter beyond his classroom. This may be a result of his proclaimed confidence with mathematics or his previous experiences in mathematics. As he mentions, he learned disconnected procedures for solving mathematics problems while he was in school. This may be his attempt to provide a more meaningful experience for his students.

Standards. Bryan demonstrates an awareness of the mathematics content standards. Similar to Lori, he places priority on the major work of the grade. In one interview, he states:

> Okay, like, the biggest thing in fifth grade is fractions. So, I spend a ton of time on fractions. And, we just got done with it so now I go into volume because [there will be] some fractions on it with volume.

As he spoke, he pointed to the content standards hanging on his wall. This statement signals that Bryan makes long term planning decisions based on the main ideas within the fifth-grade content standards.

Accountability. Unlike Lori, Bryan does not verbalize a special focus on state accountability measures. Rather, he bases long term planning decisions on the relative importance of content standards. As accountability measures and state content standards are closely related, one could argue that by focusing on content standard designations, he is, in fact, aligning with the accountability measures by default. However, local accountability played an arguably larger role in his day-to-day planning than state accountability.

Local Accountability. Bryan submits weekly lesson plans as required by his principal. Rather than playing a positive role in his planning practices, he sees this requirement as a hoop he has to jump through. In the following quote, he describes this requirement:

> [I write my lesson plans] once at the beginning of the year. Copy, paste, copy, paste, copy, paste. Really, and I'm probably different from everybody else, I play the game. I don't even teach what my lesson plans say. I don't.

As he predicts, this is unique to his case. Of the three participants, he is the only one that does not use his written lesson plans to guide daily instruction. Writing them is part of his process simply because it is an accountability requirement of the school.

Confidence in student abilities. Each day Bryan uses some form of formative assessment to gauge student understanding. His confidence (or lack of) in student abilities is fluent based on what he observes through those assessments. He notes:

> I go by what they know and I may have to go back to a third grade lesson to catch them up to speed on where they should be. That's how I go. What they know is how I plan for the next day. Then I take their homework up at the first of the day and do one on one with them. If they've got it, fine, if they don't then I can take their work and say, okay right here. This is where you're messing up…It's mainly their knowledge. Where are they at?

Bryan's use of data, as evidenced by his comments, is central to his planning. In a lesson debrief, Bryan talked about the day's lesson. He was teaching volume of composite figures and he had used different colored markers to indicate the various ways the students could decompose the composite shapes. He commented:

> In my next lesson, I'm hoping, I'm hoping, that when I changed the colors—I saw that on the video I was going to use today—I was hoping that this would show them, hey, here is what I'm doing. So, we'll see. Like I said, we'll do a couple more problems and I'll see how they cut them, what they do, how they figure everything. And then, if that don't work, back to scratch!

This statement further shows Bryan's reliance on student data to make planning decisions.

Resources. In addition to Lori, Bryan went against the expected outcome when it came to resources. This observation may be a sign that the internet is bridging the resource gap between rural areas and the rest of the country. As previously mentioned, rural teachers are typically presented as being without necessary resources (Harmon, 2003; Stern, 1994). While Bryan's room is rather empty, that is his choice. He is not a proponent of "fluff." When I asked him how he determined if a resource was worthy to use or not, he said:

> I constantly pull things from the internet just for what I'm looking for and I pretty much just click, don't like it, click, don't like it, click, like it. 'Cause a lot of them, they are a lot of neat stuff, but then, it's a lot of fluff, too. These kids have had fluff for years. Time to stop the fluff.

His perception of student ability levels also plays a role in resource selection. He comments:

> Prior knowledge, bringing in prior knowledge is the main thing. And then, it has to show that I'm using basic math. I'm using basic multiplication, or I'm using basic addition, subtraction, division, whatever it is. Don't care how big the problem is.

In addition to evidencing the fact that Bryan relies on student abilities to determine next steps, this statement also supports the observation that Bryan is confident in mathematics.

He does not exclude resources based on the complexity of problems. This makes sense in light of the ways in which he extends student learning.

In terms of physical resources, Bryan has a teacher-computer and several student-computers in his room. He also has an interactive whiteboard and speaker system. He uses the interactive whiteboard to project the day's practice problems and to play short instructional videos. He uses the regular whiteboards to deliver the bulk of his instruction. He mentioned occasionally talking with one particular colleague about lessons, but he did not indicate that this was a regular or ongoing practice. The one resource that Bryan admits is lacking in his district is the availability of professional development. The district does not typically provide or require professional development opportunities and teachers almost exclusively are left to search for those on their own.

Planning Decisions

The vast majority of Bryan's lesson planning is done last minute or in the moment. He cannot say, with any confidence, what his lesson is days in advance. He plans day-to-day. Talking about his planning practices, he says:

> I usually do it [planning] here in the morning. I'm an early bird. I do a LEAPs program in the mornings. So, while I'm in there and they are on computers, I kinda plan what I'm going to do for that day.

He continues by saying:

> The thing is, you don't know. How do you know [what you will do in advance]? Like, I went over this little bit on Thursday. Just telling them, hey, this is what we are going to do and showing them dividing fractions and multiplying fractions.

> And I was like, look, we're going to have to use this for this, so you better know it…A lot of the stuff they should know, they don't know. And that's, when it comes to planning, that's just one of those things.

This type of planning is unique to Bryan in this study. Both of the other participants engage in some degree of advanced planning.

Coherence. Bryan's knowledge of the content standards allows him to make decisions about the order in which he decides to teach the standards. As mentioned in a previous section, he knows that fractions are part of the major work fifth-graders need to learn. He uses that information to make the decision to start his year with fractions. After that, he selects topics that appear to relate. He attempts to provide his students with coherent understanding rather than fragmented bits of information. He comments:

> So, I had to teach that [fractions] before I teach this [volume] for them to know how to multiply fractions. So, if I see they got this, then I move on to something similar, you know, the multiplication or whatever I'm doing next….I try to weave everything in together.

Because Bryan does not have a long term plan for his year, it is impossible to say with certainty if his attempts at creating coherence are successful or not. However, it is logical to reason that having a well-thought-out written plan would likely produce more coherence than an in-the-moment plan based on loose conceptual connections.

Rigor. Bryan's dedication to providing his students with rigorous instruction was evident. He talks about pushing his students beyond the basics. He wants to challenge his students with math that is outside the scope of the fifth-grade standards. In the excerpt

below, he provides an example from earlier in the year when he was teaching the students about solving for unknown quantities:

> What I come to find out was, $5+a=10$. Okay, they're like, okay that's five. Well, how'd you get it? But they didn't know how they was supposed to do it. You know, minus 5, minus 5, equals *a.* They never done it. Counting up. That's what they was doing and I was like, you know that's good that you can count up and you can do it in your head, but there's a reason why you should know this. They never been taught that and that's a big thing…I try to tell the kids, okay, this step when you get to ninth grade algebra, and then I'll write a ninth grade problem on the board. And I say, look, you've got to be able to do this to be able to do that. So I try to show them where they are going.

And then again, he says:

> Then every morning I'll put a brainteaser or something on the board. I was going to have a problem up and let them work it and I was going to go, you know, see if they can work it and if not work it, then I'll go behind them and say, okay, now where did you mess up at? And that's every morning I do that.

This extension of the fifth-grade content standards was also evident in my observations of Bryan's lessons. For example, the state mathematics standards for fifth grade state that students should develop an understanding of volume. Further reading in the standards document indicates that students should be able to "recognize volume as an attribute of three-dimensional space" and calculate volume in a variety of ways. During one of the observed lessons, Bryan extended this understanding for his students. Rather than having

students calculate the volume, he provided the volume for cubes and required the students to reason about the figure's dimensions. Additionally, he continually pressed students to explain their thinking when providing solutions.

Summary: Bryan

Overall, Bryan's mathematical self-confidence plays a primary role in his lesson planning practices. He does not create a usable written lesson plan for the majority of his lessons and he does not reference any type of outline or plan during his instruction. Rather, he plans the day-by-day based on formative assessment data. He exhibits an awareness of the mathematical content standards but occasionally ventures outside the scope of his grade-level curriculum to expand student understanding. His lack of long term planning may indicate a lack of coherence, but it is impossible to know with certainty without a more long-term exploration of his practice, which is outside the scope of the current study. He selects resources based on personal preference and typically does not have trouble finding items to use. He occasionally collaborates with a fourth-grade colleague, but that collaboration is not regular or on-going.

Figure 4.2 illustrates the nature and relative importance of each influence on Bryan's lesson planning. The small circle in the bottom right contains *accountability*. Bryan is aware of both state and local accountability requirements. He complies with regulations but accountability does not directly influence the substance of his daily lesson plan. His adherence to state accountability guidelines is more a byproduct of teaching the content standards. The large, outer circle contains *mathematical self-confidence*. Bryan's personal knowledge, experience, and confidence with mathematics encompass the rest of

the influences. From there, *mathematics content standards* play a big role in what he chooses to teach each day. After he selects what he is going to teach, he considers formative assessment data to gauge *student abilitie*s. That guides his selection of *resources*, and finally his *lesson plan*.

Case 3: Melissa

Of the three participants, I have the least personal experience with Melissa. She teaches first grade. During the summer institutes, I primarily facilitated the grades three through five grade band sessions. However, during MSP follow-up sessions, I briefly met her. She is quiet and reserved. Her face is kind and when she speaks she always smiles. I distinctly remember her enthusiasm during a particular follow-up session when the participants shared student work from the semester. They were tasked with bringing in three pieces of work that they found interesting. During the session, they rotated groups and described the student work and their reasoning for bringing it. Melissa's enthusiasm during this session was evident. Even though I had just met her, I knew she loved children. She spoke about how proud she was of their accomplishments and championed the growth they had shown so far.

Because I did not have the same working-relationship with her as I have with the other two participants, I did not know what to expect when I went to interview her for the first time. Her classroom is colorful and bright. The student tables are arranged in such a way that collaboration among students is easy to facilitate. The walls are print-rich and there is evidence of student learning throughout the room. Her supplies are neat, organized, and readily-available for students. Displayed prominently on one wall is a

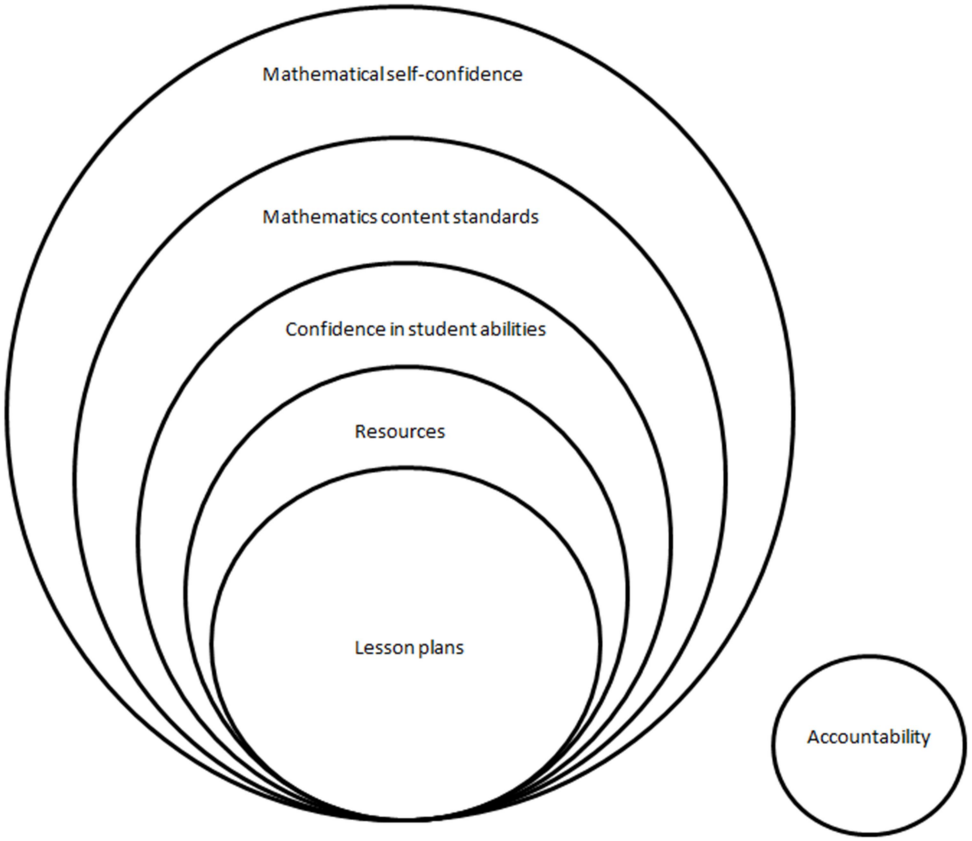

Figure 4.2 Bryan's influences

classroom contract that each student signed. Her desk is off to one side—not a focus of the room. As a whole, her environment can be classified as student-centered.

Melissa is in her twenty-third year of teaching. She has spent her entire career at the same school. In my experience it is unusual, but not unheard of, for a person to spend his or her entire teaching career at the same school. The majority of her time has been in first grade; although, she did spend a year in third grade and a year in kindergarten. She commented that she loves first grade and continued that it is her favorite grade to teach. When I asked her how she came to teach elementary school, she said:

> Well, the truth is that I had three little children and I didn't start teaching until they went to school. I became interested through them and through their work. I knew I always wanted to be with children, so I went back to school.

Prior to that decision, Melissa had not acquired or pursued another degree. During the participant selection process, she was categorized as having low mathematical confidence—a fact that she readily admitted during her interview. Similar to the first two participants, mathematical self-confidence, confidence in student abilities, mathematics content standards, available resources, and accountability all influence her planning decisions which in turn contribute to the mathematics content to which her students are exposed. The following sections provide detail on how these influences relate to Melissa's practice.

Influences

The same factors that influenced Lori and Bryan, also influenced Melissa's planning decisions. Mathematical self-confidence, confidence in student abilities, mathematics content standards, accountability, and resources all made her list.

Mathematical self-confidence. Melissa was initially selected because she was categorized as having low confidence with mathematics. On her survey she indicated that teaching math pushes her beyond her comfort zone and that she has to refresh her memory on certain mathematics topics before she teaches them. She describes her feelings towards math like this:

> I used to shy away from it because I'm not good at upper grade math. But, I don't teach upper grade math. So, it causes me to shy away from it because I was, in general, you know, to my friends I would say, "I don't like math. I don't like math." Well, I base that on, I can't do math. You know, because I'm not good at upper grade math. When I finally dropped the attitude, because that's what it was, I started seeing it through the kids' eyes. I learned to like it. I like to teach math now…I don't feel as confident in math as I do in reading. I'm not as confident in math as I am in the language arts.

She indicated that this is especially true when she is presenting a mathematics lesson to her students. Attempting to gain understanding of where this lack of confidence originated, I asked about her personal experience with the subject. She commented:

> What sticks out to me, and I can use this now because I know how the children feel. I was the child who would maybe ask for help one time and nod my head,

> "Yes, I understand." I would go away and I did not understand…It was just my personality. I could sense, you know, that they didn't have time to devote just to me. They had other students. I might take five minutes of that time, but no more…So I cried. I would cry at home at night, you know. And, my parents, they didn't, they thought, "Well, you do your own homework." My siblings are a lot older than me and they were doing other things. One was already married and gone. So, I was kind of on my own and I would cry over it.

Both of the previous quotes highlight Melissa's relationship with mathematics. I asked her to extend this to her current classroom practice. I wanted to know if she could recall an example of a time when she was out of her comfort zone. She said:

> Yes. Many times. I can't think of a specific one [lesson] right now. I wish I could, but it just happens a lot…Sometimes it just comes off so smooth without much planning. Sometimes with a lot of planning, I see that I'm going down the wrong road. You know, I have taken papers right back up and started from scratch and went back to something that they were comfortable with and I was comfortable with.

In this example, she defines being out of her comfort zone as the in-the-moment events that lead to either her or the students feeling uncomfortable with the content.

Confidence in student abilities. Due to her less than ideal experiences with mathematics as a student, Melissa is able to empathize with her students on a personal level. She said:

> I try to reach out to them so they don't have to reach out to me…I can see on their faces if they're in a bit of turmoil. I can sense that when I'm looking at them. And, you know, then working with them day after day, you know who is going to need that extra help.

Overall, Melissa engages with her students in a way that says she values their opinions and trusts in their ability to master the material. During an observation, I saw her continuously prompt students to share their thinking. She gave each student time to speak and asked clarifying questions whenever they struggled to verbalize their thinking. That particular lesson can be classified as a rigorous lesson. She planned activities that extended student thinking beyond the basics and stuck with each of them until they experienced success. In her lesson debrief, she noted:

> I think sometimes it is too hard. Today's lesson was, I mean, would you call that basic? No. I think basic is just doing the symbols. But today, I felt like, was deep thinking. There's usually four or five lessons [in a unit].

Despite thinking the lesson would be too difficult for some students, she persevered and was happy with the outcome. This is in contrast, for example, with Lori's practice. Lori chooses to limit the material prior to providing instruction. Melissa, on the other hand, plans for deep-level instruction even if she thinks it may end up being too difficult for some of her students.

Standards. Melissa acknowledges an awareness of the standards. When she writes her lesson plans for the week, she includes the standards they are working on

during that week, as a whole. She does not do anything, in particular, to keep track of which standards she covers. She said:

> I go ahead and write what I'm going to do each day. Then I flip it over and on the back I list the standards for the whole week…I have the standards noted in my lesson plans. Other than that, no, I don't just go check them off. Well, sometimes I have, but not religiously. Well, if you've looked at the first grade math, there's just I think five big overarching standards. So, you're doing them almost daily. So you'd just go check, check, check, check, check.

Other than including them on her lesson plans, she does not typically refer to the standards documents. Instead, she trusts that benchmark creators and textbook companies ensure alignment and coverage of the standards. The following quote illustrates this point:

> I don't know how well matched it [the benchmark exam] is, to be honest. I leave that to the test preparers. But I think it is a pretty good match, except there's money on it and money is not in my standards.

When she was asked if she felt the same way about the textbook, she said, "Yes." This is unique to Melissa. She is the only participant who does not regularly reference standards documents for planning purposes.

Accountability. Unlike the other two participants, Melissa is not held accountable with an end-of-year state exam. Therefore, state requirements, aside from the mathematics standards documents, does not influence her planning practices. However,

local accountability does dictate the frequency with which she puts her lesson plans in writing.

Local accountability. Melissa's school principal requires her to keep either physical or electronic record of weekly lesson plans. A specific format is not suggested. The only requirement is that teachers maintain records of lesson plans and submit them for inspection when requested. She admits to complying with this requirement, she says:

> We are supposed to do it [write down lesson plans] weekly. So, I have saved mine from previous years and, of course, this is the first year we are using this [textbook] and so I have to write these down. But for reading, I can pretty much just make little notes and use the same ones I've used over the years. Little tweaks. He [the principal] checks them. He gives feedback on them. Not a whole lot, but yea, he'll look at it. He doesn't always, but the does look.

Similar to the other participants in the study, she writes her lesson plans to comply with school guidelines. However, her reliance on those written plans is different than the other cases. This is detailed in the *reliance on lesson plans* section below.

Resources. Melissa speaks passionately about the relationship between achievement and money. When I asked her if she had everything she needed to teach she made the following statement:

> Well, you know. I find fault with and I'm speaking of nationally, how you'll hear politicians link achievement to money. I have a little problem with that because I think if a person wants to learn and you have a good teacher then money is not that restrictive. It it's nice to have the best textbooks. It's nice to have a lot of

> trade books. It's nice to have all the things you see in here. I think I have a good amount of things to use. But, I don't think it's always a money thing. It's not a challenge to me [to have less money]. It's a personal opinion that it's not always about money.

Of all the participants, she was the only one to explicitly reference politics surrounding rural schools. This demonstrates an awareness of influences beyond the classroom door.

Despite referencing a variety of materials she has available to her, the resource she uses most often is the textbook. Her district recently adopted a new program, and they were issued all new textbooks. Both of the previous participants express distaste for the new book, but Melissa likes it. The following quotes illustrate the ways in which she relies on the text for lesson planning:

> I'm following the book. We've just started comparing numbers so they are going to do less than, greater than but I don't just do one…The book here is a resource book, plus the computer program [that comes with the book] has other resources that you can copy off.

In regards to the regular flow of a lesson, she said:

> I will pull up the very page they are going to work on [from the textbook]. I pull it up here on the board and we will look at it and I'll show them how what we've done there is like what we are going to do here. And the first page they usually have in their [work]book is guided practice and then they have an independent practice and then they have a lesson check page. So, that's kind of the flow of a new lesson.

Again, during one of her follow up interviews, she mentioned:

> Well, I do use the book—probably more than I should. I have the standards noted in my lesson plans…The next chapter is adding two-digit numbers and you can see where this is headed. Yea, I think this [comparing numbers] is kinda preparing them for that.

The reliance on the textbook is unique to Melissa's case within the scope of this study. No other participant uses the textbook as often or as prominently as she does and that may be a result of her lack of confidence in mathematics. This, in turn, affects the mathematics to which her students are exposed.

Planning Decisions

Melissa's planning decisions are a result of the factors that influence her decision-making—mathematical self-confidence, confidence in student abilities, accountability, content standards, and resources. Taken separately, each strand can be traced to, perhaps, one or two specific decisions, but taken as a whole, it paints a clearer picture of Melissa's planning decisions.

Reliance on lesson plan. During Melissa's observations, I noticed that she consistently referenced her written lesson plan throughout the period. I asked her about this and she said:

> I have some that I've saved. I don't have a [printed copy] for every lesson, but I do have some that I have made and it does help me. I always felt like it was something that most people wouldn't have to do [reference a lesson plan]…I feel like I kinda have to.

This may be linked to her lack of confidence in mathematics. Her supposition that "most people wouldn't have to" indicates that she feels as if she is doing something that she would not have to do if she were, perhaps, more comfortable with the subject. This is, indeed, unique to Melissa's case. She is the only participant who utilizes her lesson plans during the actual implementation of the lesson.

Reliance on textbook. As noted in previous sections, Melissa regularly and consistently uses the textbook to guide instructional planning. The textbook determines the sequence, depth, and scope of the mathematics she teaches in her classroom. In this case, one can conclude that this adherence to the textbook has some positive outcomes. These outcomes are detailed below.

Coherence. If, like Melissa, one can trust the reliability of the textbook company, then it is fair to say that her use of the textbook for instructional planning has a positive effect on curriculum coherence. A complete review of the textbook is required before any certain claims can be made about the book's trustworthiness. However, for the sake of argument, I assume that the textbook does, indeed, adhere to a basic level of quality and reliability. My brief inspection of the book supports this assumption.

In Melissa's case, she does not make decisions about sequence or depth of instruction. Rather, she allows the textbook to dictate both of those terms. According to her, there are "four or five" lessons per unit. This means that students receive a minimum of four lessons per mathematics topic prior to moving on to the next topic. Additionally, during an interview she commented on the book's selected sequence. She notes:

> I questioned why we are comparing numbers right before two-digit addition and subtraction. I see that this may increase their awareness of the two-digit numbers. We don't do regrouping in first grade. So, they are going to wonder why a forty-seven might be more than, looking at the ones, like a thirty-eight. The seven and the eight. I still wonder if they are a little fuzzy on the ones.

Not only does this indicate that the textbook considers mathematical progressions, but it also provides evidence to support the claim that Melissa's content knowledge is strengthened by her strict adherence to the text. She, like the students, makes connections between concepts that she, otherwise, may not.

Rigor. Without completing an analysis on the textbook itself, it is impossible to say whether or not the book treats every standard with equal rigor. However, the lessons that I reviewed for this study were robust and required a level of deep thinking. For example, the lesson on comparing numbers required the students to compare a set of given numbers to two separate number clues. An example prompt is provided below:

> Question: Cassidy has the number cards shown below. She gives away the cards with numbers less than 49 or greater than 53. Which number cards does Cassidy have now? [47] [48] [51] [52] [54]. Cassidy has number cards _____ .

In this example, students need to hold multiple pieces of information in their heads at the same time. They are essentially looking for number cards between 49 and 53. This is a complex task considering the standard for this grade level simply states, "Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of

comparisons with the symbols >, =, and <." This demonstrates a level of rigor that is unmatched in the previous two cases.

Avoidance. The final decision that stood out in the analysis is Melissa's tendency to avoid topics that place her outside her comfort zone. After talking about her strategy to cope with moments she is outside her comfort zone, she states:

> The problem with that [abandoning a topic in-the-moment] is will I revisit it? Probably not. If it cost me disequilibrium, then I'm probably going to avoid that. I think I'm hitting all the big stuff…and you can tell when I pull out manipulatives, I am not comfortable with manipulatives. That's one thing.

She admits to using manipulatives she is comfortable with, but otherwise, she attempts to avoid them. This could potentially lead to a lack of coherence or rigor, but no evidence exists in the data set to support this conclusion.

Summary: Melissa

Melissa relies heavily on the district-provided resources and curriculum materials. These materials guide her daily planning. She trusts that the content standards are well-represented in the materials. She abides by school-level lesson plan requirements. She finds the requirements to write her weekly lesson plans beneficial to her daily instruction. Her lack of confidence, coupled with her confidence in student abilities are directly related to the mathematics lessons she plans each day. Despite having low confidence in herself, she gives the students the benefit of the doubt. She plans rigorous lessons and interprets the results of those lessons in order to plan for next steps.

Figure 4.3 provides an illustration of the influences on Melissa's planning practice and their relative importance. Melissa relies primarily on the *resources* (i.e. the textbook) to guide daily instruction. The small circle on the top right containing *mathematics content standards* signifies that she is aware of the standards. That circle is intersecting the *resources* circle because Melissa trusts that her textbook covers all the standards to an appropriate degree. The next circle in the middle of the graphic contains *local accountability*. The requirement to write and submit lesson plans supports the ideas located within it. Finally, *mathematical self-confidence* and *confidence in student abilities* work together to inform the resulting lesson plan. State accountability is absent from Melissa's influence graphic because she does not teach a state-tested grade level.

Cross-Case Analysis

One goal of this analysis was to determine which influences affect REMTs decision-making during lesson planning. While the participants share many influences in common, they also display significant differences. This is to be expected. Taking a situated perspective necessitates this view. Teacher decision-making is situated in context, social in nature, and distributed across resources (Putnam & Borko, 2000). It would logically follow that, because these individuals are members of the same broad contexts (same district, state, nation, and profession) that they would share some common influences. Likewise, each individual interacts with and interprets the world around them in different ways. In a study about working class youth, Fine and Weis (1998) highlight the importance of examining significant differences in combination with common themes. They suggest both are needed to thoroughly capture the lives of those they study.

The subsequent section highlights significant differences between the cases presented here.

Significant Differences

While each individual experiences similar influences on his or her planning decisions, significant differences are found along every influence. No single influence affected all participants the same. Table 4.1 summarizes the significant differences in the participants' planning influences.

State accountability. State accountability refers to the end-of-year assessments that the state requires all students to take, beginning in third grade. At the end of each school year, the state uses these scores to determine up to fifty percent of a teacher's overall effectiveness rating. The effectiveness score is sometimes used to both hire and fire. Not only is the score reflected in the teacher's score, but it follows the student through all of grades 3-12. In some instances, the score on this exam is used to place students in intervention or accelerated mathematics programs. My experience as a mathematics teacher and numeracy coach tells me that a large number of teachers make instructional decisions based on this assessment. With some much weight given to a single exam, it is easy to see why that is the case.

Melissa teaches first grade; therefore, these tests are not influential to her planning practices. However, Bryan and Lori both teach state-tested grade levels. During data collection, I attempted to refrain from overemphasizing the state test because I knew that was a possibility given my own experience. As a result, Bryan and Lori provide alternate views on the magnitude of influence the state accountability system has on their

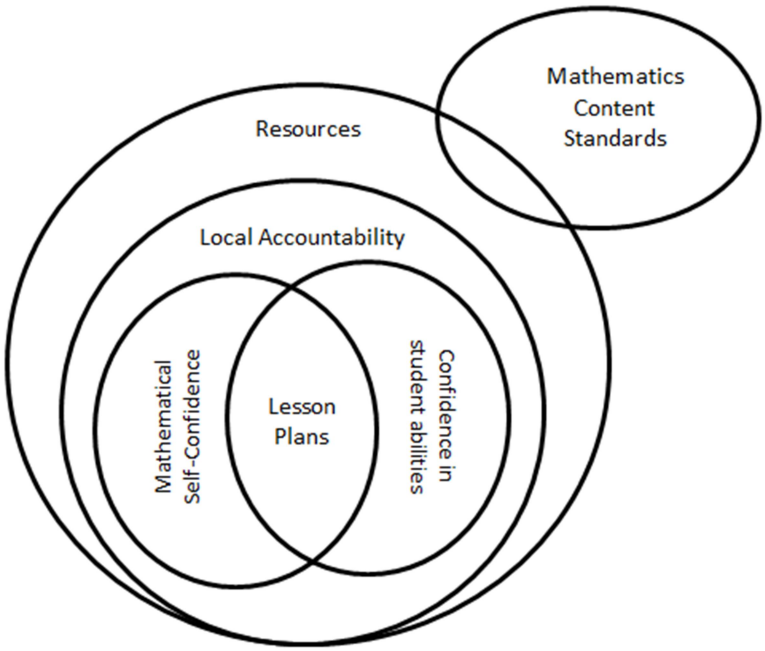

Figure 4.3 Melissa's influences

Table 4.1. Significant differences in influences.

	Lori	**Bryan**	**Melissa**
State Accountability	Intense focus on state test. Planning decisions made as a direct result of this focus.	Awareness of state test. Loosely guided planning, but not a focus.	No state test. Did not influence decision-making.
Local Accountability	Finds template and weekly lesson plans useful, basic outline	Sees requirements as a hurdle, but complies	Finds requirements helpful and references plans throughout class
Mathematics Content Standards	Intense focus on content standards. Major, supporting, and additional content designations drive long term planning decisions.	Aware of state content standards. Uses content standards to determine the scope of content coverage but primarily relies on self.	Aware of state content standards. Put faith in textbook publishers and test designers to ensure proper coverage.
Mathematical self-confidence	Lacks confidence. Conducts research in advance to combat this. Uses a general outline to plan for individual lessons.	Highly confident. Most planning decision are made in the moment.	Lacks confidence. Plans detailed lessons and refers to the plans regularly during instruction.
Confidence in student abilities	Lack of confidence in student abilities. Limits the mathematics content for students.	Lack of confidence in student abilities. Initially limits content with the intention to push students beyond their perceived limits.	Expresses confidence in most students' abilities. Occasionally limits exposure to advanced topics. Pushes students beyond basic content understanding.
Resources	Primary: standards, internet, personal research Secondary: textbook, workbook	Primary: Personal knowledge of the content, internet Secondary: textbook, workbook	Primary: textbook, workbook, personal research Secondary: internet, previous year's plans

planning practices. Lori has an intense focus on the state assessment. She is aware of the testing blueprint and makes long and short term planning decisions based on it. In fact, in the absence of the exam, she abandons the state curriculum altogether and engages the students in "fun" mathematics (e.g. origami). Bryan, on the other hand, does not share Lori's intense focus on the assessment. He is aware of the exam. However, because the standards are so closely linked to the exam, he focuses on teaching the grade-level standards and does not necessarily make planning decisions based solely on the state assessment. His alignment with the exam blueprint is a byproduct of his adherence to the mathematics content standards. In each case, the state exam carries different weight and planning decisions range from being a direct result of the exam to non-existent.

Local accountability. Local accountability refers to the school or district rules and regulations that relate to teachers' planning practices. All three participants are employed by the same school district, but not the same school. Two participants, Lori and Bryan, work at the same school and the third, Melissa, works at a different school. All three are required to turn written lesson plans to the principal on a weekly basis. The principal at Lori and Bryan's school provides an optional template to use for lesson plans, but Melissa's does not. All three are free to use whatever format they choose. All three comply with this local expectation, but in different ways.

Of the three participants, Bryan finds this requirement the least useful in his daily practice. He writes his plans and turns them in weekly. However, he admits that he rarely teaches what is actually written in those plans. He sees this as a hurdle that he has to jump in order to comply with school rules. Lori appreciates the template that her

principal provided. She uses it to create her weekly plans. Often her plans match the day's instruction, but occasionally her students progress at a rate different than what she anticipates. In those instances, she does not make changes to her lesson plans. She uses the plans as a general outline and guide for her instruction. Of the three participants, Melissa relies on her written lesson plans the most. Like Lori, Melissa finds the requirement useful to her daily practice. She often plans detailed lessons and modifies them from year-to-year. Melissa is the only participant who regularly refers to her lesson plans while she is teaching. In all cases, the participants comply with local accountability requirements, but the degree to which each finds the requirements useful to their practice is different.

Mathematics content standards. Mathematics content standards are adopted at the state-level. The standards are divided into three categories: major content, supporting content, and additional content. Each category is coded with a different color on the standards documents. The state in which the participants work received a "Race to the Top" grant in 2010. A large portion of the grant monies were dedicated to providing professional development to teachers on the common core standards in mathematics and English-language arts. Since that time, the state has continued its focus on providing teachers with professional development; although, it is now provided on a smaller scale. This focus at the state-level on content standards caused me to anticipate that my participants would name the standards as an influencer on their planning practices. Similar to the state assessment, I attempted to be mindful of this assumption when I interacted with the participants. Even so, all participants did, indeed, speak about and use

the state content standards for mathematics to make decisions during lesson planning. As with the other influences, each participant interpreted and used the standards in a different way.

Lori has the most intense focus on the standards of the three participants. She creates a yearly pacing guide based on the standard designations (i.e. major, supporting, additional). She uses this, in conjunction with the assessment blueprint, to determine the amount of time she allots for each of the broad content domains. She keeps a checklist on a clipboard near her desk and she regularly references and checks-off standards that she covers. Bryan's use of the content standards is different. He knows, in general, the content standards for his grade. He keeps the standards document on a bulletin board in his room. However, he does not reference them as regularly as Lori. He does make instructional decisions based on his interpretation of the importance of individual content strands, but he does not necessarily group them by the content codes provided in the document. Instead, he groups standards based on his perception of usefulness. That is, he arranges standards in an order that makes sense to a progression he feels is the most logical. At the other end of the spectrum, Melissa lists the appropriate content standards on each of her written lesson plans. Her textbook provides this information at the beginning of each unit or lesson. She does not make an effort to keep track of the standards she has addressed. She trusts that the textbook publishers include all the necessary information her students need. She does, occasionally, reference the standards to determine scope. For example, by looking at the standard, she knows that students should be fluent with strategies for addition and subtraction within twenty.

Mathematical self-confidence. This influence was controlled for in the participant selection process. Participants were sorted into two groups—low confidence and high confidence. The original categorization was a result of participant self-rating scores. The study includes two low-confidence individuals (Lori and Melissa) and one high-confidence individual (Bryan). Data confirm these initial categorizations. Because teaching is a complex system, it is difficult to reduce a specific decision to a single influence. However, each participant spoke of decisions that appear to be related or can be logically linked to their confidence.

Lori and Melissa share a lack of mathematical self-confidence; although, it can be argued that Lori has more confidence than Melissa. Both participants have developed similar coping mechanisms to avoid or manage times when they feel outside their comfort zone in the mathematics classroom. Research prior to teaching particular lessons or topics is the primary way Lori and Melissa attempt to manage their lower confidence levels. Both participants report that they attempt to limit the times they feel uncomfortable. Additionally, both report stopping lessons when they notice they are struggling to present the content. This is where they diverge. Lori reports that she eventually returns to the topic to try again using different methods or improved instructional plans. Melissa, on the other hand, says that she likely will not revisit a topic that has caused her to experience turmoil. Another place of divergence is on each participant's use of the written lesson plan. Lori uses her plans as a general guide but does not often reference them in the middle of a lesson. Melissa's plans are typically more detailed and she does reference them throughout a lesson.

Bryan is different than both of the other participants in this arena. He expresses a high level of mathematical self-confidence. As a result, he does not make use of his written lesson plans. Often his plans are not even related to what he actually teaches. He does not write down long term plans or pacing guides. Bryan's confidence allows him to make in-the-moment decisions about next steps. Most of his planning is a result of the work the students complete each day. He relies on his previous knowledge and experience with mathematics to determine particular teaching strategies or methods. His confidence also allows him to extend the content for his students in ways that Lori and Melissa do not.

Confidence in student abilities. All three participants spoke about student ability levels influencing the decisions they make during lesson planning. The perceptions of student ability levels produce different results in each case. In Lori's case, she tends to limit the content to which she exposes her students. She has the perception that the majority of her students are only capable of functioning on a basic level. This causes her to pre-digest much of the material and break it down into small, basic steps. Using her words, she teaches "old school" because she does not believe they are capable of understanding or using a variety of strategies and reasoning skills. When stories about the students' home lives are taken into consideration, one can see how she comes to this conclusion.

Bryan is at the opposite end of the spectrum. He, too, thinks that some of his students are functioning at a basic level, but rather than limit the content, he expands it. He makes an effort to provide students with real-world examples of mathematics

concepts. In addition to that, he shows the students how the mathematics they are learning in fifth grade connects to mathematics they will learn in high school. He regularly challenges students with brainteasers or higher-level problems than what are expected in the grade level standards.

Melissa is in between these two extremes. She believes that some of the lessons in her textbook are simply too difficult for her students. But, rather than omitting those lessons, she presents them and works with the students until at least some of them experience success. She attempts to give each student the benefit of the doubt. Her students in special education are an exception to this. She does decide ahead of time to either provide them with simpler, related work or to let them participate with the rest of the group. This is done on a lesson-by-lesson basis.

Resources. The final influence that the participants mentioned is resources. This, like self-confidence, was controlled for in the interview protocol. Research question three specifically seeks to understand the ways in which resources influence decision making during lesson planning. All three participants report that they have everything they need in order to successfully plan for mathematics lessons; and, all three report using internet resources, albeit to different degrees. The major differences lie in the specific resources they take advantage of and the decisions that are a result of that selection. One finding that begs more research is that the internet may, in fact, lessen the resource gap between rural schools and other areas of the country. This will be touched on further in the next chapter. None of the participants report consistently collaborating with colleagues as a resource.

Melissa is the only participant who reports using the textbook almost exclusively to lesson plan. She goes lesson-by-lesson, unit-by-unit through the text. The only time she seeks additional resources is when she completes a unit but is not yet satisfied with the students' understanding. At that point she consults files she maintains from previous school years or the internet. The research she conducts prior to teaching a lesson helps to inform her understanding of the concepts and methods the textbook provides.

Lori relies heavily on the content standards to inform her general decision-making. She conducts research (typically via the internet) in order to develop a more complete picture of the requirements of each standard. She occasionally uses the textbook, but does not like it. She does not agree with the scope or sequence of particular topics in the book. She also maintains that much of the material in the textbook is too difficult or confusing for her students.

Bryan's primary resource is his own knowledge and experience with the content. Typically his lesson planning includes selecting a topic and searching for practice problems. The details of each lesson are often decisions he makes in the moment. He relies on his own content knowledge and preferred solution methods when providing instruction to his students. The practice problems he uses typically come from the internet, but he does occasionally consult the textbook. Like Lori, he does not like the textbook and prefers to avoid it. He chooses to teach using his own strategies rather than the strategies the book uses for instruction.

Missing pieces. Often it is just as important to consider words that are not spoken as it is to consider those that are spoken. Two specific ideas stood out as missing from

this analysis. The first is collaboration and the second is professional learning. Both of these are explained below.

Collaboration. It is important to note that only one participant, Melissa, spoke about collaboration as being part of her teaching process. Referencing that, she says:

> I do collaborate with the second grade teacher a lot. We talk about these sorts of things [learning more about math] every day. She's much stricter than I am, so I value her judgement because I know she's probably right and I'm probably wrong. I'm kind of easy-going. She helps me out a lot, plus we talk about what do I need to be doing now so that they'll be ready for her next year. That helps a lot.

This is the only reference that any participant made to consistent collaboration within the entire data set. Even in this case, the collaboration is not specifically structured and it includes only two individuals from the school. The quote makes it seem as if the collaboration is more of an advice session rather than true dialogue and intellectual collaboration that informs mathematics teaching.

Upon further investigation, it became known that the school and district do not require or even promote ongoing, structured collaboration between colleagues. Teachers can essentially close the door and teach without ever interacting with another colleague about the specifics of what he or she teaches. This situation is an area that would benefit from more research.

Professional learning. Also absent from the data set is professional learning. This includes both pre-service and in-service professional development. This absence is not entirely unexpected due to the lack of professional development requirements in the

district. In the reviewed literature there was no mention of professional development designed to specifically address lesson planning, but the literature does indicate that teachers do not typically plan using the methods they were taught in school (McCutcheon, 1980; Leinhardt, 1983; Sardo-Brown, 1988; Yinger, 1980; Zahorik, 1975). I thought that some of the participants might mention the MSP institute considering that is where we originally met one another. It is outside the scope of this study, but it signifies a need to further investigate the connection between professional learning and practice.

Summary of Significant Differences

The participants in this study are all influenced by similar factors during the lesson planning process. This is, by no means, an exhaustive list of all possible influences on teacher planning. The influences detailed above are a result of participants speaking about or making use of them during the data collection phase of this study. While each shared similar influences, they were all affected in different ways. In Lori's case, content standards and accountability requirements play a prominent role in the decisions she makes during lesson planning. Following that, her confidence in student ability levels causes her limit the mathematics she teaches. From there, available resources and her own self-confidence refine the lesson-specific decisions she makes on a day-to-day basis.

Bryan's influences are a bit more nebulous. He has an awareness of accountability systems, but they do not necessarily dictate the specific details of his planning. He relies most heavily on his own mathematical self-confidence to drive the decision-making that occurs when he plans a lesson. Often these are in-the-moment decisions he makes. After

that, he has an overarching mental image of the ways in which different content standards connect. He arranges them based on perceived connections between the standards. His confidence in student abilities typically influence his day-to-day planning, in that, he uses student data to determine next steps. Finally, his lesson plans reflect the resources he locates to deliver instruction. These resources are often a set of practice problems.

Finally, Melissa's decision-making during lesson planning is primarily influenced by her selected resources (i.e. the textbook). She is aware of the content standards, but does not make an effort to confirm that the textbook aligns adequately to them. She trusts that it does align. After that, the local accountability system provides structure and support during lesson planning. Her mathematical self-confidence and her confidence in student abilities go hand-in-hand as she creates her final lesson plan.

In summary, each participant is influenced by many of the same factors, but in different ways. The commonalties are to be expected because the participants all function within the same national, state, district, and professional contexts. Likewise, the differences are to be expected because each individual interacts with these contexts in different ways. The remaining section of this chapter delineates each of the findings by research question.

Findings in Relation to the Research Questions

The final section in this chapter explains the connections between each of the findings and the three research questions. Table 4.2, located at the end of this section, summarizes the main points.

Research question one. The first research question is: *what are the ways in which REMTs plan for mathematics lessons when they are outside their comfort zone?* Two cases, Lori's and Melissa's, provide evidence that suggests teachers with lower mathematical self-confidence are occasionally left feeling outside their comfort zone. In these instances, the participants develop strategies to manage or mitigate the number of times they feel out of their comfort zone. Both Lori and Melissa conduct research upfront in order to best prepare and plan for upcoming mathematics lessons. This research includes studying the lessons in the textbook, reading through the standards documents, conducting internet searches, and pre-working practice problems. Despite the preparation, they occasionally find that in-the-moment they are still outside their comfort zone and the lesson is simply not going as planned. In those instances, both teachers stop the lesson and change to a topic that is within their comfort zone. Lori eventually returns and tries again. Melissa, most often, does not. In addition to those two strategies, Melissa relies heavily on her textbook and written lesson plans to support her instruction. She regularly references her plan and never veers too far from what is included in the textbook.

Research question two. The second research question is: *what influences REMTs' decision-making during the lesson planning process and what decisions are made as a result of those influences?* The bulk of chapter four provides evidence that answers this question. Influences were determined based on participant words and actions. Several factors influence the participants, including: mathematical self-confidence, confidence in student abilities, resources, accountability, and mathematics content standards. State accountability is an influencing factor only in Lori and Bryan's

cases due to the fact that Melissa's grade level does not participate in the end-of-year exam. There is no way to know exactly how she would react if she taught a different grade, but one can surmise that it would likely be included in her list at that point, given the nature and purpose of the exam. Each influence plays a different role depending on the participant.

The decisions participants make as a result of these influences vary. In Lori's case, she limits content and rearranges the standards based on state accountability information and standard codes provided in the standards documents. Bryan's mathematical self-confidence allows him to extend the content he provides for his students. Melissa's reliance on the textbook supports her in providing a balanced set of rigorous and, potentially, coherent lessons.

Research question three. The third, and final, research question is: *how does the availability of resources impact REMTs' decision making-during the lesson planning process?* Evidence related to this question is provided in the participants' comments. Each participant reports that they have all the necessary resources to plan for and teach mathematics. Melissa is the only participant who heavily relies on the textbook. Bryan primarily makes use of his personal knowledge of mathematics, and Lori's decisions are most often a result of content standards and accountability requirements. Two anticipated resources are absent from the data set—professional learning and collaboration.

Chapter 4 Summary

This chapter provided the study's findings and evidence to support those findings. First, each case was described, in detail. Quotes from the participants were included

throughout in order to give voice to the individuals who took part in this study. Following that, the commonalities and significant differences that resulted from the analysis were explored. Finally, the findings were related back to the research questions. The next, and final, chapter of this dissertation provides conclusions, a discussion, and recommendations for further research.

Table 4.2. Findings and research questions.

	Findings: Main Points
RQ1: Comfort zone	• Participants with lower mathematical self-confidence experience times when they are outside their comfort zone in mathematics. • These participants develop strategies for coping with and lessening the moments they are outside their comfort zone.
RQ2: Influences & outcomes	• Common influences: local accountability, mathematical self-confidence, confidence in student abilities, content standards, and resources. • State accountability influenced two of three participants. • Participants alter, limit, or expand the mathematics content as a result of these influences.
RQ3: Resources	• Despite findings that say rural teachers are without many resources, participants all report that they have everything they need. • Resources include: textbook, workbook, internet, content standards, personal research, and personal knowledge of mathematics.

CHAPTER FIVE
DISCUSSION AND CONCLUSION

The purpose of this study was to understand factors that influence REMTs decision-making during lesson planning including the resources that either support or limit that process. Specifically, the study sought to understand the ways in which teachers cope with instances they are outside their comfort zone when planning for mathematics. The final chapter of this dissertation is dedicated to a discussion, recommendations for further research and practice, lessons learned, and a conclusion. I begin by reiterating the study's purpose. After, I will situate my work in the existing literature and follow with recommendations for research and practice. I end the chapter with a conclusion and a discussion of the lessons I learned from this process.

Discussion

The purpose of this dissertation was to investigate the factors that influence teacher decision-making during the lesson planning process and the decisions that are made as a result of those influences. Taking a situated perspective allowed me to consider a range of contextual factors, including the ways in which resources limit or delimit the planning process. Insights gained through analysis of the data were, presented in chapter four. These insights illuminated several common factors that influenced the participants in this study. Those factors include content standards, accountability, mathematical self-confidence, and confidence in student ability. These influences affected each teacher in different ways which caused them to limit, alter, or expand student access to mathematics.

At the outset, it was important for me to consider the ways in which a rural context affected teacher decision-making. Earlier studies report that rural schools are limited on resources (Stern, 1994). In some ways, this study did not support those reports. All three participants, as well as a number of surveyed participants, all indicated that they have everything they need to plan for and teach mathematics on a daily basis. One of the primary sources of instructional material for my participants was the internet. This indicates that, perhaps, the internet is playing a role in closing the resource gap between rural and non-rural school districts. However, in other ways, this study confirmed the reports about a lack of resources. None of my participants reported professional development or collaboration as a contributor to the decision making that occurs during lesson planning. Collaboration and professional learning opportunities are two resources that earlier studies report as being absent or diminished in rural districts (Stern, 1994). It is important to point out that my personal experience working with these teachers during the summer institute indicates that there exists a wealth of collective wisdom and potential that is currently untapped due to the absence of structured, consistent collaboration and professional learning support.

Research on knowledge for teaching mathematics positions elementary teachers as somewhat deficient, particularly in the area of content knowledge. I surmise that this is due to the fact that a large number of elementary teachers do not specialize in a particular content area prior to gaining teaching certification. This scarcity is not the fault of the teacher, but rather, a comment on the system in which they learn to teach. Although, perhaps it is a more poignant comment directed at the ways in which educators teach

mathematics, in general, because even in cases where elementary teachers are specialized in mathematics, they still experience difficulties when attempting to make conceptual connections in the classroom (Ball, 1990). The participants in this study supported previous research in that regard. The goal of this study was not to quantify individual's content knowledge, but content understanding did seem to play a role in my participants' perceived mathematical self-confidence. All three participants shared stories much like the "turning point" stories from prior research (Drake, Spillane, & Huffer-Ackles, 2001). Initially, as students themselves, they had an aversion to the subject. For example, Melissa shared a story in which she told her friends how much she hated mathematics, Lori talked about bad experiences in elementary school, and Bryan reported that he did not understand fractions when he was younger. However, all reported enjoying mathematics now that they have taught it to their own students.

Lesson planning, the last large conceptual category for this dissertation, shared many similarities and differences with previous research. Similarities included some of the details of the planning process. My participants, like those in the past, planned for mathematics instruction spanning from a single day to an entire year (McCutcheon, 1980; Sardo-Brown, 1990; Yinger, 1980; Zahorik, 1975). One of the three participants relied heavily on curriculum materials (i.e the textbook). This phenomenon was cited in earlier research on the planning practices of elementary teachers (McCutcheon, 1980). I was, in fact, surprised that only one of my three participants put emphasis on the text. I anticipated all three would rely on the textbook for basic lesson materials. Also, a somewhat surprising detail emerged when my participants made comments such as,

"Well, when I plan for *math*…" This surprised me because I expected planning routines to be general and not specific to mathematics. As a mathematics teacher, I know that math is different. It requires a different type of thinking and planning—especially when planning for teaching through problems or tasks (Smith, Bill, & Hughes, 2008; Smith & Stein, 2011; Superfine, 2008). My surprise came because I did not necessarily expect my participants to articulate this during the interviews due to the fact that I requested information only about mathematics planning. I did not mention other subjects.

One large point of divergence from previous literature was how a few of my participants put such emphasis on the standards and accountability systems. Knowing what I know about the increased attention on accountability in this state and in this nation, this could have been anticipated. However, it is important to point out, that the reviewed literature put standards and objectives as a secondary concern rather than the primary concern, as it was for the participants in this study (Yinger, 1980; Zahorik, 1975). In earlier literature, student interest and ability were primary (e.g., Zahorik, 1975). None of my participants mentioned student interest as an influencing factor; although, all spoke in detail about the role student ability played in affecting planning decisions. Finally, like several studies reported, making decision-making visible is, indeed, a difficult thing to do (Borko & Shavelson, 1990; Clark, 1989). Many planning decisions my participants made were not written down or well-articulated. Pre and post-lesson debriefs and lesson observations were my attempt to tease out some of the nuances that, otherwise, would have gone unspoken.

As noted above, many of the findings from this study supported previous research studies. However, some findings were new and previously undocumented (e.g. a focus on standards and accountability). The findings, as a whole, have implications for future research and practice. These implications are discussed in the following section.

Theoretical and Practical Implications

This dissertation provided an in-depth look at three REMTs' planning practices. The insights gained from the analysis point to the reality that although certain influences are present in all three cases, each influence carries with it different weight and produces different outcomes. This truth carries with it several implications for both research and practice. The sections below provide insight on each.

Theoretical Implications

Throughout the analysis I encountered five topics that begged further research. These topics include narrowing the resource gap, supporting the interpretation of standards, supporting the decision-making process, bolstering confidence, and alternate lenses for analysis. All of these implications arose from areas that were outside the scope of this study, but would help to advance the study of teacher decision-making, specifically during lesson planning.

The first implication for research relates to the perceived or actual resource gap. This implication is two-fold. The first is noting the simple availability of resources. The second is analyzing the alignment of available resources to current state or national mathematics standards. As previously noted, rural schools are depicted as lacking

resources (Harmon, 2003; Harmon, Gordanier, Henry, & George, 2007; Roberts, 2004; Stern, 1994). Prior to the internet, this was potentially a much larger problem than it is today. Lori, Bryan, and Melissa all reported using the internet as part of their lesson planning process. Although effectiveness could be argued, the fact remains that the participants have access to the same, free internet resources as every other educator that uses the World Wide Web. Not only could future research support a verification of the closure of the resource gap, but it could also critically analyze the quality, frequency of use, and alignment of those freely available resources. Researchers could also investigate schools' access to broadband high speed internet and the ways in which teachers interact with that technology. Future research that provides educators with information about determining the quality of free, internet resources would be of utmost benefit and could serve to support teachers in making rational, high-quality decisions about the materials they choose for mathematics instruction.

A second topic that is in need of further research is on teachers' interpretation of their state's standards. In recent years, many states have adopted Common Core or Common Core-like standards (Corestandards.org, 2017). The language and depth of the standards are, in many cases, more detailed than previously adopted state standards. This is certainly true of the state in which this study was conducted. Previous state standards were brief and direct; whereas, the current standards tend to be lengthy and contain many complex ideas. To illustrate this point, an example is provided below:

Previous standard: *Determine the attributes of a triangle or quadrilateral from a model.*

Current standard: *Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g, quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.*

The current standards are significantly more complex. They require a greater degree of interpretation on the part of the educator. In professional development sessions, I commonly overhear teachers saying, "The old standards were so much easier to understand." This may be a result of the natural inclination of some to resist change. However, the ways in which teachers interpret the current set of standards would be valuable to research. This could highlight content areas that teachers need the most support by focusing their interpretation of different standards—this includes paying special attention to the ways in which teachers interpret the depth and rigor of each mathematics standard. Covering a standard is not the same as teaching it to the fullest extent (or beyond) the standard suggests. Or, as this study found, planning only basic instruction may limit student access to mathematics. A more robust understanding of the standards may lead to more rigorous instruction and reflection. More research is needed on this topic.

As noted previously, studies have been conducted that look at teacher decision-making. Many of these studies attempt to create models for the decision-making that occurs (e.g., McCutcheon, 1980; Zahorik, 1975). Others attempt to fit specific instances of decision making to existing models (Ornstein, 1997). In the future, research that examines the ways in which to best support teacher decision-making, especially at the lesson planning stage of instruction, would be valuable to the field of mathematics teacher education. Previous research positions lesson planning as one of the most influential stages for effective instruction (Little, 2003). This study indicates that decisions made at this stage have a profound impact on the mathematics to which students are exposed.

This study suggests a link between teachers' mathematical self-confidence and planning decisions. In some cases, a lack of confidence may lead to content omissions or reductions. In other cases, a high mathematical self-confidence can lead to expanding opportunities for students to engage in mathematics. In the future, it would be beneficial to investigate ways to improve a teachers' mathematical self-confidence. This consideration was outside the scope of the current study, but would be instrumental in supporting teachers like Lori and Melissa who reported experiencing moments when they were outside their comfort zone. Both of the aforementioned participants reported that they engaged in research prior to planning a lesson in order to avoid or mitigate these moments. It would be beneficial if research could build toward or illuminate a framework or to guide and support pre-planning research. The current study indicates that, perhaps,

written plans and trust in curricular resources may play a role in teacher confidence, but these connections beg for further investigation.

Finally, a situated perspective was adopted for this study. However, it is also possible to analyze the data from alternate lenses. In this case, a lens of identity could help to understand the relationship between the context and the participants' ideas about the context and the practice of teaching mathematics (Cobb, Gresalfi, & Hodge, 2009; Hand & Gresalfi, 2015; Nasir & Cooks, 2009). An identity perspective could examine teachers' ideas about their own mathematical self-confidence and competence.

Implications for Practice: In-service Teachers

In addition to providing implications for further research, this study illuminates implications for practice. All implications speak to the need to support teachers in the decision-making process. At the in-service stage, this includes professional learning and collaboration opportunities.

A wide array of resources is available for teaching mathematics, but access for rural communities may be inequitable (Harmon, 2003; Harmon, Gordanier, Henry, & George, 2007; Roberts, 2004; Stern, 1994). Professional learning opportunities are one site that can encourage and support teachers to interact with and think about those resources. It is important for teachers to have the opportunity to reflect on the importance of mathematical concepts and, in turn, the ways in which resources either enhance or limit students' opportunity to engage fully with those concepts. Asking teachers to modify resources based on the needs of their population is one way in which teacher

educators and professional developers can support this line of thinking. Such modification happens, but it would likely benefit teachers if it happened more often. It is my experience that questioning educators in this way positions them as competent decision-makers and may empower them to continue to make rational, well-reasoned decisions about the nature and impact of their mathematics instruction.

In this study, one teacher produced a pacing guide that structured her mathematics instruction for the year. This pacing guide played a large role in her daily plans. Even though the coherence of the final arrangement of standards can be argued, this pacing guide allowed Lori to ensure she covered a minimum level of content standards. Keeping track of the standards as she went through her year gave her an overall picture of where her students were at in terms of the grade level mathematics standards. As a teacher educator, I encourage this practice; however, this case also points to the need for support. Again, professional development that facilitates thinking and discussion of the impact of long term pacing decisions could support teachers to make more informed, logical decisions at this stage. Professional development leaders can create opportunities for teachers to gain confidence if they encourage teachers to thoroughly think through the consequences of decisions made during the process of making long term plans. Often decisions are made based on influences that do not take into consideration the coherence of a child's mathematics education. With support, teachers can learn to think through the ramifications of changing the scope or sequence of mathematics standards. Perhaps there are no short term consequences for omitting or rearranging particular topics, but that

decision could potentially lead to gaps in knowledge and an inability for students to make significant content connections further in their mathematics career.

This study also described cases in which teachers found written lesson plans useful to their daily activities. It was interesting to note that one participant, Melissa, apologetically admitted to this fact. She believed that most teachers would not need to write down a lesson plan. However, after completing this analysis, I see this practice as supporting teachers' mathematical self-confidence. The simple act of writing down a plan, whatever form it takes, allows teachers to process the day's goals and projected outcomes much more clearly than simply thinking about a lesson. I compare this to being asked to speak about ideas. Missing connections or information becomes abundantly clear once someone is forced to articulate their thinking.

In two of the three cases presented in this study, teachers planned for instruction with an open mind. For the most part, they did not limit students' exposure to mathematics based on pre-conceived notions of ability. In both of those cases, the teachers planned instruction that allowed students to meet, and sometimes exceed, grade-level expectations. Based on this information, it is recommended that educators go into all lessons with an open mind. This does not mean they should not take into consideration prior performance and knowledge of students. Rather, they should plan rigorous instruction for all and provide support so that each student has the opportunity to reach high expectations. In other words, if the teacher does not plan for rigorous instruction then it will certainly not happen; therefore, plan for the best possible outcome and many

students will rise to the challenge, particularly with intentional supports in place. However, teaching is demanding in general, and it is likely that teachers need support in this area. It would be productive for professional developers to consider ways in which they can engage teachers in both planning for student abilities without letting what teachers know of students take over. This is an intricate and delicate task. However, I believe it is possible for teachers to plan instruction that meets students where they are without holding them back mathematically. Basic skills mastery is not a prerequisite for engagement in thinking about mathematical concepts.

Finally, one of the central questions that formed the basis of this study focused on the instances when teachers felt outside their comfort zone. Both Lori and Melissa admitted to experiencing this when they plan for and teach mathematics. Although it was not a continuous state of being, it happened more often than either one preferred. An interesting finding of this study showed that both participants coped in similar ways, albeit to different conclusions. In the midst of an uncomfortable teaching moment, both participants would stop the lesson and change to a topic that was within their comfort zone. This is a valuable skill in which to have in the teaching toolbox. My work with pre-service teachers tells me that many view this type of experience as a failure. However, Lori and Melissa both saw it merely as a setback. Adopting this mindset would be invaluable to teachers of all ages. This is especially true when an educator is charged with teaching a topic or subject that makes him or her uncomfortable.

Implications for Practice: Pre-service Teachers

Teacher educators can also benefit from lessons learned in this study. Grossman and colleagues, discuss two distinct ways in which pre-service teachers need to engage in learning to teach mathematics (Grossman, Hammerness, & McDonald, 2009; Grossman & McDonald, 2008). In their work, they talk about *pedagogies of investigation* and *pedagogies of enactment*. Pedagogies of investigation refer to learning about representations of practice. That is, teachers engage in the analysis and critique of pedagogical practices. On the other hand, pedagogies of enactment allow teachers to engage in the practice of teaching. This includes roleplay, rehearsal, and teaching. Teacher educators tend to do a fantastic job with the former. Opportunities for pre-service teachers to read about, think about, and talk about the practice of teaching are abundant, but Grossman says this is not enough. Teachers also need time to practice what they investigate. Implications from this study indicate the same.

One finding that has been consistent throughout the literature and this study is that teachers do not see formal education as playing a major role in their daily activities once they become practicing teachers. It is possible that providing further opportunities for pre-service teachers to engage in pedagogies of practice would change that perception. One way to look at how a teacher learns to teach is to study the ways in which their participation in the community of teachers changes over time (Lave & Wenger, 1991). Giving pre-service teachers opportunities to practice intentional lesson planning and then providing further supports for those same teachers to implement and reflect on planned lessons could potentially bridge the divide between formal schooling and practicing

teachers. It would benefit pre-service teachers to hear the same messages across contexts. Developing strong, collaborative partnerships between the university and placement schools can allow such messages to carry throughout the pre-service experience.

Lessons Learned

Teaching teachers is my passion. In fact, it is how I began my doctoral journey. As a classroom teacher I found myself, more and more, in leadership roles that allowed me to influence my colleagues' thinking and learning. There is so much quality research available that is underutilized or overlooked. A teacher has only so many hours in the day, and, regrettably, personal growth does not always take priority given a teacher's awesome responsibility of guiding the learning of a class full of young people. When students are the potential casualty, it is understandable that teachers sacrifice their own growth to serve the needs of the next generation. Thankfully, with each new role, I was afforded the gift of time. I had time to read and reflect on the plethora of resources that minds much greater than mine produced. I had time to synthesize and distribute information that had a direct impact on the teaching practices of those around me. Those experiences led me to where I am today, and I want to continue to make a difference in the lives of teachers—young and old.

Each teacher in this study spoke passionately about his or her practice, and my beliefs about teachers were confirmed. Each teacher does the best job they know how to do with the tools and experiences they have available. Lori broke my heart with the stories she told about her students' home lives and the ways in which she cares for them. Bryan encouraged me with his committed determination to provide students a reason for

learning mathematics. Melissa rejuvenated me with the level of pride she shared when speaking about her students' accomplishments. These, and more, are lessons I will never forget. Regardless of where I go from here—be it a university, a nonprofit, operating my own education company, private education, public education, or some other unforeseen path—I will carry these lessons with me.

In my practice I have a reinvigorated commitment to encouraging teachers to reflect on the decisions they make, as each decision has consequences, and students' lives are affected as a result of those decisions. In turn, I realize that my decisions, too, have consequences. The words I speak, the readings I assign, the discussions I facilitate, the professional development sessions I design, the feedback I provide, the instruction I plan—they all have the potential to shape both future and current generations of mathematics educators. If nothing else, I will strive to not be the limiting force on those in my sphere of influence to become bigger and better than I could imagine. This is true for both the teachers and students I encounter in my daily work. Rather than limiting their potential, I want to be the spark that ignites passion and opens new ways of thinking.

When considering my future research, I have learned through this process that I am, indeed a researcher. Even if I spend the rest of my life without publishing a single sentence, I have gained invaluable skills that will never leave me. I have learned to ask better questions and be a more watchful observer. To the shock of those around me, I have even learned to be more organized in my work. Although, the biggest lesson I have learned is to simply listen. People are magnificently interesting if I just take the time to listen. Everyone has a story to tell, and a great deal can be learned by listening to those

that do not often have a chance to speak. My naïve views of a researcher conducting "scientific" research in a sterile lab environment have been shattered and rebuilt to form a beautiful, unexpected picture. This picture is fractured and incomplete; but, the beauty lies in its imperfections. Those that "knew me then" would never have guessed that I would embrace qualitative research so wholeheartedly. If nothing else, I feel I have developed a more compassionate outlook on life, and I am forever grateful for the time I spent with these people during this time.

Conclusion

In conclusion, many of the findings from previous studies still hold true. Teachers are not using formal planning models to plan for instruction (McCutcheon, 1980; Leinhardt, 1983; Sardo-Brown, 1988; Yinger, 1980; Zahorik, 1975). Many elementary mathematics teachers experience a lack of confidence and even, what could be classified as, math anxiety when planning for mathematics instruction (Ball, 1990; Cornell, 2012; Harper & Daane, 2012; Simon, 1993; Wood, 1988). Rural teachers are teaching in isolation with limited access to high-quality professional development and collaboration. Teacher decision-making has a profound impact on the mathematics to which students are exposed.

However, this study also indicated that the standards are playing a prominent role in determining what mathematics is included in the typical lesson plan. This characteristic is a relatively new phenomenon and may be linked to accountability legislation from recent years (i.e. No Child Left Behind Act, 2001; Every Student Succeeds Act, 2015). This is promising, as a child's education should not solely depend

on a teacher's knowledge of mathematics. Instruction guided by standards indicates that, in theory, every student should learn or be exposed to the same mathematics content regardless of the classroom in which they belong. Findings from this study indicate that this is, indeed, happening at a basic level. Accountability does play a role in the daily experiences of students in mathematics classrooms. This should serve as a humbling reminder to policy makers that the rules and regulations they impose have direct impact on student learning. Additionally, it should inspire pause. The best laid plans, in this case standards or testing blueprints, when left broad are open to a wide range of interpretations. The intended outcome may not be the true outcome. In these instances, I am not a proponent of more regulation. Policy makers' first instinct tends to be blaming the teacher and establishing more regulation and control. However, I share a different view. I believe it is important to respect teachers as decision-makers and to provide supports that enable teachers to maintain a degree of autonomy in the classroom. Each planning decision is influenced by a countless number of factors in which this study named but a few. Supporting teachers to appropriately navigate these influences should be the focus.

Another finding indicates that access to high quality resources are not the bottom line. The teachers in this study had access to, presumably, the same virtual resources in which every other teacher in the United States has access. A failure in quality at this level is not an indictment on the individual teacher. Rather, it is a call-to-arms to both curriculum developers and teacher educators. Curriculum developers should be less concerned with profit and more concerned with providing quality resources for educators.

Think of how much more students would benefit from their teachers having widespread access to vetted mathematics resources rather than simply those that get returned as the top hits in a Google search. Teacher educators should adopt or maintain a focus on developing and supporting educators to become rational, independent decision makers.

In closing, much can be learned from listening to understudied populations. In this case, rural teachers encounter issues that should not be overlooked. Even though it was not the focus of this study, the stories each of the participants told me about the lives of the young people they serve would thaw even the coldest of hearts. The ways in which my participants cared for and supported students in tough situations is both encouraging and inspiring. I encourage all researchers who have even the remotest of interests, to take notice of rural teachers, as they have much to share about teaching in all contexts.

LIST OF REFERENCES

Arnold, V. D. (1988). Planning for effective instruction. *The Teacher Educator, 23*(3), 10-12.

Askey, R. (1999). Knowing and teaching elementary mathematics. *American Educator, 23*, 6-13.

Ball, D. L. (1990). Prospective elementary and secondary teachers' understanding of division. *Journal for Research in Mathematics Education, 21*, 132-144.

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 59*(5), 389-407.

Burton, M., & Johnson, S. A. (2010). Where else would we teach? Portraits of two teachers in the rural south. *Journal of Teacher Education, 61*(4), 376-386.

Boaler, J. (2000). Mathematics from another world: Traditional communities and the alienation of learners. *Journal of Mathematical Behavior, 18*(4), 379-397.

Borko, H., & Livingston, C. (1989). Cognition and improvisation: Differences in mathematics instruction by expert and novice teachers. *American Educational Research Journal, 26*(4), 473-498.

Borko, H., Livingston, C., & Shavelson, R. J. (1990). Teachers' thinking about instruction. *Remedial and Special Education, 11*(6), 40-49.

Borko, H., & Shavelson, R. J. (1990). Teacher decision making. In Jones, B. F., & Idol, L. (Eds.). *Dimensions of Thinking and Cognitive Instruction* (pp. 311-346). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Brodi, K., & Sanni, R. (2014). 'We won't know it since we don't teach it': Interactions between teachers' knowledge and practice. *African Journal of Research in Mathematics, Science, and Technology Education, 18*(2), 188-197.

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Charmaz, K. (2009). Ch. 7: Memo-writing. *Constructing grounded theory* (pp. 72-95). London, UK: Sage Publications, Ltd.

Clark, L. M., DePiper, J., N., Frank, T. J., Nishio, M., Campbell, P. F., Smith, T. M., Griffin, M. J., Rust, A. H., Conant, D. L., & Choi, Y. (2014). Teacher characteristics associated with mathematics teachers' beliefs and awareness of their students' mathematical dispositions. *Journal for Research in Mathematics Education, 45*(2), 246-284.

Clark, C., & Peterson, P. (1986). Teachers' thought processes. In M. C. Wittrock (Ed.), *Handbook of Research on Teaching (3rd ed.)* (pp. 255-296). New York: MacMillan Publishing Company.

Cobb, P., & Bowers, J. (1999). Cognitive and situated learning perspectives in theory and practice. *Educational Researcher, 28*(2), 4-15.

Cobb, P., Gresalfi, M., & Hodge, L., (2009). An interpretive scheme for analyzing the identities that students develop in mathematics classrooms. *Journal for Research in Mathematics Education, 40*(1), 40-68.

Comfort zone. (2016). In *Merriam-Webster.com*. Retrieved from http://www.merriam-webster.com/dictionary/comfort%20zone

Corestandards.org, (2017). Retrieved from http://www.corestandards.org/standards-in-your-state/

Cornell, C. (1999). I hate mathematics! I couldn't learn it, and I can't teach it! *Childhood Education, 75*(4), 225-230.

Courtney, S. A., Eliustaoglu, E., & Crawford, A. (2015). Examining the role lesson plans play in mathematics education. In Bartell, T. G., Bieda, K. N., Putnam, R. T., Bradfield, K., & Dominguez, H. (Eds.). *Proceedings of the 37th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. (pp. 632-639). East Lansing, MI: Michigan State University.

Denzin, N. K., & Lincoln, Y. S. (2013). *Collecting and Interpreting Qualitative Materials* (4th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Drake, C., Spillane, J. P., & Hufferd-Ackles, K. (2001). Storied identities: Teacher learning and subject-matter context. *Journal of Curriculum Studies, 33*(1), 1-23.

Ellingson, L. L. (2008). *Engaging Crystallization in Qualitative Research: An Introduction.* Thousand Oaks, CA: Sage Publications, Inc.

Farhi, A. (1999). Hollywood goes to school recognizing the superteacher myth in film. *The Clearinghouse, 72*(3), 157-159.

Fine, M., & Weis, L. (1998). *The Unknown City: Lives of Poor and Working-Class Young Adults*. Boston, MA: Beacon Press.

Franke, M. L., & Kazemi, E. (2001). Learning to teach mathematics: Focus on student thinking. *Theory into Practice, 40*(2), 102-109.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915-945.

Geertz, C. (1973). Thick description: Toward an interpretive theory of culture. In *The Interpretation of Cultures.* New York, NY: Basic Books.

Glatthorn, A. A. (1993). Teacher planning: A foundation for effective instruction. *National Association of Secondary School Principals Bulletin, 77*(551), 1-7.

Greeno, J. G. (1989). A perspective on thinking. *American Psychologist, 44*(2), 134-141.

Greeno, J. G. (1998). The situativity of knowing, learning, and research. *American Psychologist, 53*(1), 5-26.

Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching, 15*(2), 273-289.

Grossman, P., & McDonald, M. (2008). Back to the future: Directions for research in teaching and teacher education. *American Educational Research Journal, 45*(1), 184-205.

Hand, V., & Gresalfi, M. (2015). The join accomplishment of identity. *Educational Psychologist, 50*(3), 190-203.

Harmon, H. L. (2003). Rural education. In Guthrie, J. W. (Ed.). Encyclopedia of Education (2nd ed.) (pp. 2083-2090). New York, NY: Macmillian Reference.

Harmon, H. L., Gordanier, J., Henry, L., & George, A. (2007). Changing teaching practices in rural schools. *The Rural Educator, 28*(2), 8-12.

Harper, N. W., & Daane, C. J. (2012). Causes and reduction of math anxiety in preservice elementary teachers. *Action in Teacher Education, 19*(4), 29-38.

Hill, H. C. (2010). The nature and predictors of elementary teachers' mathematical knowledge for teaching. *Journal for Research in Mathematics Education, 41*(5), 513-545.

Howe, K., & Eisenhart, M. (1990). Standards for qualitative (and quantitative) research: A prolegomenon. *Educational Researcher, 19*(4), 2-9.

Incarceration Rates, (2017). Retrieved from http://trends.vera.org/incarceration-rates

Jinks, J., & Lord, R. (1990). The better elementary science teaching project: Overcoming the rural teacher's professional and academic isolation. *School Science and Mathematics, 90*(2), 125-133.

Ladson-Billings, G. (1994). *The Dreamkeepers: Successful Teachers of African American Children.* San Francisco, CA: Jossey-Bass, Inc.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* New York, NY: Cambridge University Press

Leinhardt, G. (1989). Mathematics lessons: A contrast of novice and expert competence. *Journal for Research in Mathematics Education, 20*(1), 52-75.

Little, M. E. (2003). Successfully teaching mathematics: Planning is the key. *The Educational Forum, 67*(3), 276-282.

Marshall, M. N. (1996). Sampling for qualitative research. *Family Practice, 13*(6), 522-525.

May, W. T. (1986). Teacher students how to plan: The dominate model and alternatives. *Journal of Teacher Education, 37*(6), 6-12.

McCutcheon, G. (1980). How do elementary school teachers plan? The nature of planning and influences on it. *The Elementary School Journal, 81*(1), 4-23.

Merriam, S. B. (1998). *Qualitative research and case study applications in education: Revised and expanded from case study research in education.* San Francisco, CA: Jossey-Bass.

Mutton, T., Hagger, H., & Burn, K. (2011). Learning to plan, planning to learn: The developing expertise of beginning teachers. *Teachers and Teaching, 17*(4), 399-416.

Nasir, N. S., & Cooks, J. (2009). Becoming a hurdler: How learning settings afford identities. *Anthropology & Education Quarterly, 40*(1), 41-61.

Onwuegbuzie, A. J., & Leech, N. L. (2007). Sampling designs in qualitative research: Making the sampling process more public. *The Qualitative Report, 12*(2), 238-254.

Ornstein, A. C. (1997). How teachers plan lessons. *The High School Journal, 80*(4), 227-237.

Patton, M. Q. (2015). *Qualitative Research & Evaluation Methods* (4th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Peressini, D., Borko, H., Romagnano, L., Knuth, E., & Willis, C. (2004). A conceptual framework for learning to teach secondary mathematics: A situated perspective. *Educational Studies in Mathematics, 56*, 67-96.

Peterson, P. L., Marx, R. W., & Clark, C. M. (1978). Teacher planning, teacher behavior, and student achievement. *American Educational Research Journal, 15*(3), 417-432.

Putnam, R. T., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher, 29*(1), 4-15.

Roberts, P. (2004). Staffing an empty school house: Attracting and retaining teachers in rural, remote, and isolated communities. *Online submission.*

Rossman, G. B., & Rallis, S. F. (2017). *Learning in the field: An introduction to qualitative research* (4th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Saldaña, J. (2013). *The coding manual for qualitative researchers* (2nd ed.). Thousand Oaks, CA: Sage Publications, Ltd.

Sardo-Brown, D. (1988). Twelve middle-school teachers' planning. *The Elementary School Journal, 89*(1), 69-87.

Sardo-Brown, D. (1990). Experienced teachers' planning practices: A US survey. *Journal of Education for Teaching, 16*(1), 57-71.

Sardo-Brown, D. (1996). A longitudinal study of novice secondary teachers' planning: Year two. *Teaching and Teacher Education, 12*(5), 519-530.

Saivyer, R. K., & Greeno, J. G. (2009). Situativity and learning. In Aydede, M., & Robbins, P. (eds.), *The Cambridge Handbook of Situated Cognition* (pp. 347-367). Cambridge: Cambridge University Press.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.

Simon, M. A. (1993). Prospective elementary teachers' knowledge of division. *Journal for Research in Mathematics Education, 24*(3), 233-254.

Smith, M. S., Bill, V., & Hughes, E. K. (2008). Thinking through a lesson: Successfully implementing high-level tasks. *Mathematics Teaching in the Middle School, 14*(3), 132-138.

Smith, M. S., & Stein, M. K. (2011). *5 Practices for Orchestrating Productive Mathematics Discussions*. Reston, VA: National Council of Teachers of Mathematics.

So, W. W. (1997). A study of teacher cognition in planning elementary science lessons. *Research in Science Education, 27*(1), 71-86.

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage Publications.

Stern, J. D. (Ed.). (1994). *The Condition of Education in Rural Schools: Statistical Analysis Report*. Washington DC: US Department of Education, Office of Educational Research and Improvement.

Strauss, A. L., & Corbin, J. (1990). *Basics of qualitative research: grounded theory procedures and research.* Thousand Oaks, CA: Sage Publications, Inc.

Superfine, A. C. (2008). Planning for mathematics instruction: A model of experienced teachers' planning processes in the context of a reform mathematics curriculum. *The Mathematics Educator, 18*(2), 11-22.

Thompson, A. (1984). The relationship of teachers' conceptions of mathematics and mathematics teaching to instructional practice. *Educational Studies in Mathematics, 15*, 105-127.

Thompson, A. G., Philipp, R. A., Thompson, P. W., & Boyd, B. A. (1994). Calculation and conceptual orientations in teaching mathematics. In Aichele, D. B., & Coxford, A. F. (Eds.) *Professional Development for Teachers of Mathematics*. Reston, VA: National Council of Teachers of Mathematics, Inc.

Trujillo, K. M., & Hadfield, O. D. (1999). Tracing the roots of mathematics anxiety through in-depth interviews with preservice elementary teachers. *College Student Journal, 33*(2), 219.

Tyler, R. W. (1950). *Basic Principles of Curriculum and Instruction*. Chicago, IL: University of Chicago Press.

U.S. Census Bureau. (2012). *Geographic terms and concepts – urban and rural.* Washington, DC. Retrieved from http://www.census.gov/geo/reference/gtc/gtc_urbanrural.html

U.S. Census Bureau. (2010). *American factfinder.* Washington, DC. Retrieved from http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

Wenger, E. (1998). *Communities of Practice: Learning, Meaning, and Identity.* Cambridge: Cambridge University Press.

Wiggins, G. & McTighe, J. (2005). *Understanding by Design* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Wilkerson, T., & Scheffler, A. J. (1992). Examining an assumption of linkage between lesson planning and implementation. *Education, 113*(1), 74-79.

Wood, E. F. (1988). Math anxiety and elementary teachers: What does research tell us? *For the Learning of Mathematics, 8*(1), 8-13.

Yackel, E., & Cobb, P. (1996). Sociomathematical norms, argumentation, and autonomy in mathematics. *Journal for Research in Mathematics Education, 27*(4), 458-477.

Yarrow, A., Ballantyne, R., Hansford, B., Herschell, P., & Millwater, J. (1999). Teaching in rural and remote schools: A literature review. *Teaching and Teacher Education, 15*(1), 1-13.

Yinger, R. J. (1980). A study teacher planning. *The Elementary School Journal, 80*(3), 107-127.

Zahorik, J. A. (1975). Teachers' planning models. *Educational Leadership, 33*(2), 134-139.

APPENDIX

APPENDIX A: SURVEY

Dissertation Survey for Ashley Walther

The survey you are about to take is not anonymous. You will be asked to provide your name and contact information. This information will be used to identify individuals for follow-up questions and possible participation in part II of Ashley Walther's dissertation study: *Planning Practices of Rural Elementary School Mathematics Teachers*.

No survey data will be reported for individual participants. Any information that is reported will be reported as a group observation or score. No individual answers will be linked to participants in any report. The only people that will have access to the original survey data are Ashley Walther and her dissertation committee (chaired by Dr. Lynn Hodge).

Thank you for participating in this survey about your planning practices. There are 13 total questions. The questions are a mixture of multiple choice and free response. The survey should take approximately 10 minutes to complete. Please read through each question carefully and select or provide the best response.

If at any point you have any questions or concerns, you may contact Ashley Walther at agrob@vols.utk.edu. Again, thank you for your time and thoughtful responses.

Name (First & Last)	
Preferred Method of Contact:	❑ Phone: _____ ❑ Email: _____
Which school do you work at?	
What is your primary role in your school or district?	❑ Classroom teacher ❑ Lead or mentor teacher ❑ Instructional coach ❑ Administrator
Are you teaching math this year?	❑ Yes ❑ No
Which grade level do you teach?	❑ 3rd Grade ❑ 4th Grade ❑ 5th Grade ❑ Other _____

Read the following statements and determine how important they are to your mathematics planning process.					
	Extremely important	**Very important**	**Moderately Important**	**Slightly important**	**Not at all important**
Daily objectives	❑	❑	❑	❑	❑
Content Standards	❑	❑	❑	❑	❑
Lesson Activities	❑	❑	❑	❑	❑
Student interests	❑	❑	❑	❑	❑
Student abilities	❑	❑	❑	❑	❑
Teaching methods	❑	❑	❑	❑	❑
Assessments	❑	❑	❑	❑	❑
Teaching theory/beliefs	❑	❑	❑	❑	❑

Consider the options from the previous question. Which topic would you consider is the **MOST** important while you are planning for math lessons? ***Select one.***

❑ Daily objectives ❑ Student interests ❑ Assessments

❑ Content standards ❑ Student abilities ❑ Teaching theory & beliefs

❑ Lesson activities ❑ Teaching methods ❑ Other:

_____

What is the first thing you think about when you sit down to plan a mathematics lesson?

What is your favorite source for mathematics lesson plan ideas?
How do you decide what mathematics you are going to teach each day?

Read the following statements and select the option that best describes how you plan for mathematics lessons.				
	Yes	**Often**	**Occasionally**	**No**
Once I have developed a lesson plan that works for math, I reuse it year after year.	❑	❑	❑	❑
I try out new ways of teaching math.	❑	❑	❑	❑
I have access to all the resources I need in order to plan for math lessons.	❑	❑	❑	❑
I have to refresh my memory before I teach certain math topics.	❑	❑	❑	❑
Teaching math pushes me outside my comfort zone.	❑	❑	❑	❑
I feel confident when I am teaching and planning for math.	❑	❑	❑	❑

Read the following statements and select the option that best describes your math content knowledge.				
	All	**Most**	**Some**	**None**
I understand the math content standards for my grade level.	❑	❑	❑	❑
I have a deep understanding of the mathematics that I will teach this year.	❑	❑	❑	❑
I understand how the math content I teach relates to the bigger mathematical picture.	❑	❑	❑	❑

APPENDIX B: INTERVIEW PROTOCOLS

Initial Interview Protocol

1. How long have you been a teacher? At this school?
2. What made you select this district/school?
3. How did you come to teach elementary school mathematics?
4. How would you describe your feelings towards mathematics?
5. Describe your own personal experiences with mathematics as a student.
6. Describe a situation when you are completely "in the zone" when teaching…when teaching mathematics?
    a. What are some things you may do or say in this situation…
7. Describe a situation when you are out of your comfort zone when teaching…when teaching mathematics?
    a. What are some things you may do or say in this situation…
    b. What does it mean for you to be out of your comfort zone?
8. Can you explain the challenges of working in a rural district?
9. Can you explain the rewards of working in a rural district?
10. How would you describe your teaching style?
11. How would you describe your classroom environment?
12. If you wanted to learn something new for teaching, what would you do?
13. Pretend your principal came to you at the end of the school year and told you that you were going to teach mathematics in a different grade level the following school year. How would you prepare?
14. Where/from whom have you learned the most about teaching mathematics?
15. How often do you write your lesson plans down?
    a. When you do write them down, what form do they take?
16. Describe your preferred planning location.
17. What takes the most of your time during lesson planning?
18. Describe your lesson planning process.
    a. On a day-to-day (or week-to-week) basis, how do you play for math lessons?

Pre-Interview Protocol

1. Tell me about your lesson plan.
2. Tell me about the resources you plan to use.
3. How did you decide this was the lesson you were going to teach?

Post-Interview Protocol

1. Tell me how you think the lesson went.
2. Did anything happen that you were not expecting?
3. Based on what you saw/did today, what do you think you'll do tomorrow?
    a. What makes you say that…

APPENDIX C: SAMPLE ANALYTIC MEMO EXCERPTS

Sample #1: Initial surprises about resources, looking across 2 cases

In the age of pinterest and fully-formed lessons for sale on sites like teachers-pay-teachers, I expected to see more of that when I started exploring teachers' lesson planning habits. I saw a lot of pinterest-inspired décor in participant #1's classroom, but neither participant #1 nor participant #2 affirmed the use of these popular sites as lesson go-to's. Rather, they both taught somewhat "off the cuff" when it comes to the in-the-moment teaching that occurred in the classroom. They both started with what they know/were taught about the mathematics and then went from there. Both participants #1 and #2 talked about using the internet for lesson materials, but those materials usually took the form of worksheets and practice problems rather than complete lessons. Additionally, they both mention that they sometimes use educational videos to take the place of teacher-led lecture. I have not yet witnessed (not been told) either teacher use or plan to use a task or "problem" to guide the lesson. Overall, both are quite traditional even though no one would mistake the teaching style of one for the other. I'm curious if this will be true of participant #3.

Sample #2: Developing the category of 'confidence in student abilities'

A developing category is that "my kids can't"—maybe it is because of their compassion for the kids or maybe it is because something else, participant #1 seems unable or unwilling, for whatever reason, to reach beyond the basics with her students. She stresses the need to keep things "basic" "simple" and "broken down." Her perception of her students' ability seems to be a major influence on her lesson choices. Will this hold for P2 and P3?

Update: This is confirmed in P1's pre- and post- interview data.

Update: P2 talks about student ability levels and references "basic" but it does not seem to affect his planning decisions in the same way that it affects P1. P2 still provides his students with grade appropriate (and often extensions) of the mathematics. He does indicate that he occasionally needs to return to lower grade standards but that appears to happen only long enough to bolster the students' pre-req knowledge before he returns to grade-level standards.

Update: Student abilities do seem to influence all three participants but in different ways. This can be used as a category under influences but the differences need to be explained. P1's view of basic leads her to reduce and modify the math she prepares for her students…P2 extends…P3 has reservations but doesn't limit (*SPED may be an occasional exception for her).

APPENDIX D: SAMPLE 4TH GRADE CONTENT STANDARDS

Domain	Cluster	Standard
Operations and Algebraic Thinking	Use the four operations with whole numbers to solve problems.	1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
		2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
		3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
	Gain familiarity with factors and multiples.	4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.
	Generate and analyze patterns.	5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*
Number and Operations in Base Ten*	Generalize place value understanding for multi-digit whole numbers.	1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*
		2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
		3. Use place value understanding to round multi-digit whole numbers to any place.
	Use place value understanding and properties of operations to perform multi-digit arithmetic.	4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.
		5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
		6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
		*Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

	Major Content		Supporting Content		Additional Content

APPENDIX E: 4TH GRADE TESTING BLUEPRINT

Grade 4			
	# of Items	# of Score Points	% of Test
Computation with Whole Numbers • **4.NBT.B–Use place value understanding and properties of operations to perform multi–digit arithmetic. • **4.OA.A–Use the four operations with whole numbers to solve problems.	10–13	11–15	22–25
Fractions • **4.NF.A–Extend understanding of fraction equivalence and ordering. • **4.NF.B–Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers. • **4.NF.C–Understand decimal notation for fractions, and compare decimal fractions.	12–17	15–19	30–32
Number Relationships and Patterns • 4.OA.B–Gain familiarity with factors and multiples. • 4.OA.C–Generate and analyze patterns. • **4.NBT.A–Generalize place value understanding for multi–digit whole numbers.	8–12	10–14	20–23
Geometric and Measurement Concepts • 4.MD.A–Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. • 4.MD.B–Represent and interpret data. • 4.MD.C–Geometric measurement: understand concepts of angles and measure angles. • 4.G.A–Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	8–10	8–12	16–20
Total	38–52	*50–60	100

**All assessments must have a minimum of 50 score points.*

***Clusters with asterisks indicate major content of the grade.*

VITA

Ashley Paige Walther was born in Valdosta, Georgia to the parents of Donald and Patricia Grob on January 28, 1985. She graduated from Lenoir City High School in Lenoir City, Tennessee in May 2003. She studied mathematics and received her Bachelor of Arts in Mathematics from the University of Colorado at Colorado Springs in 2007. She received a Master of Arts in Curriculum and Instruction from the same institution in 2008. After finishing her Master's degree, she taught secondary mathematics. In August 2014 she entered the doctoral program at the University of Tennessee, Knoxville. There, she pursued a doctoral degree in education with a concentration in teacher education and a specialization in mathematics education.