A GROUNDED THEORY STUDY EXPLAINING TEACHERS' INSTRUCTIONAL DECISION-MAKING ON MATHEMATICS FACT FLUENCY FOR STUDENTS WITH A MATHEMATICS LEARNING DISABILITY

by

Awilda Soto Rudd

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

The purpose of this systematic grounded theory study was to explain the process teachers undergo when making instructional decisions on mathematics fact fluency for students with a learning disability in mathematics (MLD). The study focuses on revealing the factors, influencers, and knowledge that teachers negotiate to make instructional decisions. These constructs are necessary to understand and explain as the field of mathematics looks to improve the use of evidence-based instructional practices for students with MLD. There are currently no studies that provide an in-depth understanding of teachers' decision-making within the construct of instructional decisions in mathematics fact fluency for students with MLD. Furthermore, there is no model or theory that explains decision-making in special education mathematics practices. The conceptual framework that guides this study is a synthesis of the theories used to explain decision-making in education: behaviorism, affirmation theory, concerns-based adoption model, and growth mindset. The study was open to licensed educators and tutors who teach mathematics to students with MLD in the United States. Data was collected from interviews, responses to vignettes, and student profile examinations. Data was analyzed using systematic grounded theory data analysis procedures and themes of the model form the structure of the theory, which was developed from the data. The resulting theory explains teachers' decision-making as a process focused on students passing the end of year test. All teachers experience the same influencers (i.e., curricula, pacing guides, school and district initiatives): however, the difference in their decision-making lies on their perceived autonomy or perceived diminished autonomy. Implications for further research are also included.

Keywords: mathematics fact fluency, mathematics learning disability, MLD, dyscalculia, accuracy, automaticity, teacher's decision-making

Dedication

בָּרוּךְ אַתָּה ה' אֱ-לֹהֵינוּ, מֶלֶךְ הָעוֹלָם *Barukh ata Adonai Eloheinu, melekh ha`olam* Blessed are You, Lord our G-d, King of the universe

I dedicate this work to my husband and children. Individually and collectively you have made me stronger and kinder. I love the clay that we were given by Hashem, and together we will continue to mold to become our best selves, אני אוהבת אתכם!

Baruch Hashem – Bless the Name

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List of Abbreviations

Adequate Yearly Progress (AYP)

Common Core State Standards - Mathematics (CCSS-M)

Concerns-Based Adoption Model (CBAM)

Concrete – Representational – Abstract model (CRA)

Cover, Copy, Compare (CCC)

Curriculum Based Assessment (CBA)

Curriculum Based Measure (CBM)

Diagnostic and Statistical Manual of Mental Disorders *5th edition* (DSM-5)

Digits Correct Per Minute (DCPM)

Enhanced and Anchored Instruction (EAI)

Every Student Succeeds Act (ESSA)

Facts that Last (FTL)

Incremental Rehearsal (IR)

Individualized Education Program (IEP)

Intelligence Quotient (IQ)

Institute of Educational Sciences (IES)

Institutional Review Board (IRB)

Improvement Rate Difference (IRD)

Kaufman Test of Educational Achievement (KTEA)

Learning disabilities (LD)

Mathematics to Mastery (MTM)

Mathematics Learning Disability (MLD)

National Council of Teaching Mathematics (NCTM)

National Mathematics Advisory Panel (NMAP)

Peabody Individual Achievement Test (PIAT-R)

Percent of Non-Overlapping Data Points (PND)

Percent of All Non-Overlapping Data Points (PAND)

Response to Intervention (RtI)

Science, Technology, Engineering, and Math (STEM)

State of Texas Assessments of Academic Readiness (STAAR)

South Carolina Palmetto Assessment of State Standards (SCPASS)

Washington Access to Instruction and Measurement (WA-AIM)

What Works Clearinghouse (WWC)

Woodcock-Johnson Tests of Achievement (WJ)

CHAPTER ONE: INTRODUCTION

Overview

Many students across the United States have not acquired the basic skills needed for high school level mathematics (Fuchs et al., 2009; Gersten, Jordan, & Flojo, 2005; Merritt, Rimm-Kaufman, Berry, Walkowiak, & Larsen, 2011). A teacher in the D.C. area attested to this current state of affairs in a letter to *The Washington Post*:

> Many of the seventh graders I teach have a poor sense of numbers. They don't understand that adding two numbers results in a larger number, that multiplication is repeated addition, that 5x6 is larger than 5x4, or that one-quarter is smaller than one-half. This lack of basic math facts detracts from their ability to focus on the more abstract operations required in math at a higher level. (Sheridan, 2004, p. 12)

Basic competency in mathematics and algebraic thinking influence employability, wages, and on-the-job productivity (Frey &Osborne, 2013; Rivera-Batiz, 1992). Mathematics is the science of numbers; it is used in everyday life from calculating time and distance, to handling money and analyzing data to make decisions in financial planning and insurance purchasing, and is essential in the science, technology, engineering and math (STEM) fields. Thus, there are individual and societal benefits to a workforce with strong mathematical abilities.

Concerns about low performance in mathematics generated a need for mathematics instruction to be analyzed. The National Mathematics Advisory Panel (NMAP, 2008) was created, and it led to the development and implementation of more rigorous standards for teaching and learning (e.g., the National Council of Teachers of Mathematics; NCTM, 2000). More recently, 42 states across the country have implemented Common Core State Standards - Mathematics (CCSS-M) that require students to use a variety of cognitively demanding skills, procedures, and knowledge to solve complex problems (Powell, Fuchs, & Fuchs, 2013). However, rigorous expectations from these standards present considerable challenges for students with learning disabilities (LD; Maccini, Mulcahy, & Wilson, 2007). Students with a mathematics learning disability (MLD) struggle with grade-level expectations, and may lack number fluency, knowledge of fractions, and reasoning skills; all necessary to attain more rigorous standards such as CCSS-M (Powell et al., 2013).

In an effort to create common language around the term used to describe students that have a mathematics learning disability, Berch and Mazzocco (2009) conducted a synthesis of the terms used in academia and the medical field. Due to the lack of consensus in the definition and multiple different terms that have been used, they made a call to the field to use the term MLD. Therefore, this study uses MLD to be inclusive of the following terms: (a) learning disabilities; (b) learning disorder in mathematics; (c) learning difficulties in mathematics; (d) specific learning disability in mathematics; (e) dyscalculia; (f) mathematics disorder; (g) mathematics or arithmetic disorder; or (h) arithmetic disability.

It is important to note that poor performance of students with MLD may be linked to teacher-related factors such as ineffective instruction (Fuchs et al., 2009; Gersten et al., 2005; Merritt et al., 2011), as well as teachers' inadequate understanding and implementation of evidence-based instructional adaptations (Maccini & Gagnon, 2006), or fixed mindsets about disabilities (Dweck, 1986; Gutshall, 2013; Hohnen & Murphy, 2016; Rattan, Good, & Dweck, 2012; Yeager & Dweck, 2012). Moreover, any given approach to instruction will not be equally effective for all children; thus, the teaching methodologies that are needed for students with MLD are different, and those pedagogies need to be available to schools and teachers. In the mathematics domain, the NMAP (2008) identified fluency with whole numbers as a critical skill for mathematics achievement. Fluency with whole numbers is the measurement of recalling mathematics number combinations accurately: “Fluency is the ability to find an answer quickly and effortlessly, either because the answer is memorized or because the individual has developed an efficient strategy for calculating the answer” (Forbinger & Fuchs, 2014, p. 154).

Unfortunately, many students with MLD do not achieve fluency with basic facts, failing to develop automatic responding or an efficient strategy to calculate answers. Furthermore, lack of fact fluency leads to difficulties in overall performance. Students who are not fluent with facts are more likely to struggle with concepts and application problems, which require students to build on foundational skills such as computation fluency (Forbinger & Fuchs, 2014; Geary, Hoard, Byrd-Craven, Nugent, & Numtee, 2007; Hofstadter-Duke & Daly, 2015;). Additionally, students who are fluent with facts are more likely to be successful with algebra in the upper grades, which then predicts later significant outcomes including attending and graduating college (Duncan et al., 2008; Ketterlin-Geller, Chard, & Fien, 2008; NMAP, 2008). Although the importance of mathematics achievement—specifically the prerequisite skill of fact fluency—has been established, many teachers opt to provide students with MLD with accommodations (e.g., calculators, number charts, and aids) instead of working towards mastery on mathematics fluency. This apparent disconnect between what researchers know about mathematics instruction and what teachers know (i.e., research-to-practice gap) is a longstanding issue in education (Vanderlinde & Braak, 2013); and it may contribute to why there has been little increase in mathematics achievement for students with MLD. A concerted effort is lacking in the landscape of research surrounding MLD and what constitutes *how* teachers make instructional decisions on mathematics fact fluency for students with MLD. This chapter will delve deeper into these constructs and develop the needs for this study.

This introductory chapter provides a background context, problem statement, and rationale for this study investigating the instructional decision-making process that teachers undergo concerning fact fluency as requisite knowledge for mathematics performance for students with MLD. I first review history of MLD and the changes to academic standards and the requisite skills for mathematical achievement in a *common – core* world before situating the discussion in the context of fluency as a predictor of achievement, and body of research and evidence-based interventions available. From there, I connect the conversation with the role of the Individual Education Program (IEP), accommodations, and modifications to the mathematics curricula highlighting the role of the teacher in the educational process. A gap in the literature is identified regarding instructional decision-making processes that teachers undergo concerning fact fluency for students with MLD. Philosophical and theoretical frameworks, as well as the situation-to-self, provide insight into the approach I use in this study. The problem is identified as well as the significance of the study empirically, theoretically, and practically. Finally, I present and position the research question in the literature that drives this study.

Background

There is an absence of information on MLD, and little made available to educators, let alone to the general public. At the time of this writing (May 2018), when the phrase reading disability was Googled, it yielded 272,000,000: The phrase mathematics or math learning disability yielded 1,150,000, the term specific mathematics learning disorder only yielded 545,000 results, and dyscalculia yielded 1,420,000; a very small percentage of the reading disability yield. The number of Google responses for MLD versus reading disability is partially because learning disabilities were not separated into domains until recently. Likewise, the inception of research in MLD came into focus much later than reading disabilities. The first recording of learning disabilities in reading was in 1872 (West, 1978) and introduced into the IDEA in 1975. However, the fist mention of MLD in research occurred in 1966 (West, 1978).

Historical

The past should be used as points of reference and guides, and investigators of MLD will either recreate past mistakes or perhaps use the contributions of their professional progenitors when they should instead extend and correct the works of those who researched before. It is important to understand that history adds to our comprehension and gives us differing perspectives while allowing us to be reminded of what has occurred in the past. Sometimes we can overly focus on the problems of today without seeing how the past has already dealt with similar issues: "Without a historical perspective, the uniqueness of present-day contributions and *discoveries* tends to be overemphasized. But in fact, these contributions represent extensions, modifications, verifications, or duplications of previously observed phenomena or stated positions" (Wiederholt, 1974, p. 98). Thus, I present the history of MLD and how it impacts this research study.

History of MLD. The history of MLD starts within the larger construct of LD, which is divided into periods; (a) U.S. Foundation Period from 1920 – 1965, (b) Emergent Period from 1965 – 1975; (c) Solidification Period from 1975 – 1985, (d) The Turbulent Period from 1985 – 2000, and the Current Period from 2000 to present (Wiederholt, 1974). Each period strengthened the research on reading disabilities, defined the disability terms, and solidified the identification of the students' that display characteristics of LD. However, MLD came into focus during the Emergent Period (Wiederholt, 1974) when LD became inextricably tied to the notion of intelligence quotient (IQ) / achievement discrepancy. Using the IQ-Achievement discrepancy model for LD identification uses the deviation between IQ and achievement to identify a difficulty in learning that is not due to a lack of ability (i.e., intelligence). This process shed light into discrepancies in mathematics achievement for the first time (Wiederholt, 1974).

In 1969, the field attempted to write a definition of LD that was comprehensive, and it included arithmetic (Haring & Bateman, 1969). Next, during the Turbulent Period the issue of placement came into forefront for LD as the push for inclusion and full inclusion began in 1986 (Will, 1986). Thus, inclusion and full inclusion became regular practice for students with LD. By the 1990s having students with LD in a co-teaching placement was widespread. In early 2001, Hallahan and Mercer highlighted the pressing problems of the discrepancy model (Fletcher et al., 2011). They began to argue that this formula did not reliably identify students with LD (Fletcher et al., 2011; Vellutino, Scanlon, & Lyon, 2000). Fuchs and Fuchs (1998) began pursuing alternatives which lead to the current focus on response to intervention (RtI).

RtI is a multi-level approach to the identification of students that struggle academically; it uses a universal screening process to identify students who are struggling academically, and then offers three tiers of support. Tier 1 students receive effective, research-validated instruction in the general education setting. Students that do not make progress in Tier 1 are moved to Tier 2. In Tier 2 intervention the students receive different or additional support from the classroom teacher or another educational professional. When students do not make adequate gains from the Tier 2 intervention, they are moved to a third tier, where they receive more intensive instruction. Depending on the state's policies, students may qualify for special education services based on the progress monitoring data, or they may receive either an abbreviated or comprehensive evaluation for the identification of a learning disability (Fuchs, Fuchs, & Compton, 2012).

The definition in the most recent revision of the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5), is in the single category of specific learning disorders with specifiers for the area of mathematics (others being reading and written expression). The definition states that difficulties should have persisted for at least six months despite interventions, and skills should be substantially below those expected for age (i.e., IQ-Achievement discrepancy or progress monitoring data). Deficits should interfere with functioning, as confirmed by individually administered standardized achievement measures and comprehensive clinical assessment. The disorder includes possible deficits in number sense, memorization of mathematics facts, calculation, and mathematics reasoning.

Identification of MLD. There is no consistently used test, achievement cut off score, or IQ-Achievement discrepancy for diagnosing MLD (Gersten, Clarke, & Mazzocco, 2007; Mazzocco, 2007). However, a consensus is emerging among researchers with respect to the usefulness of distinguishing the mechanisms contributing to MLD, even though the profiles of students represent different cutoffs on the normal distribution continuum of mathematical abilities (Geary et al., 2007; Murphy, Mazzocco, Hanich, & Early, 2007). Even though states are rapidly adopting RtI for the identification of students with MLD, researchers have expressed concerns (Fuchs & Deshler, 2007; Fuchs & Fuchs, 2005). Although, some models of RtI may identify students with LD accurately, other models may prevent students from receiving a full evaluation and actually deny student access to an individualized education program (IEP; Riccomini & Witzel, 2010).

Mathematics Instruction

Some key publications, including *A Nation at Risk* (1983), *The Underachieving Curriculum* (McKnight, Crosswhite, & Dossey, 1987) and NCTM's Agenda for Action (1980) pointed at lagging student performance on national and international assessments. These publications called for extensive changes in the way students were taught mathematics and what mathematics they were taught. Recommendations about mathematics instruction were profoundly influenced by the emergence of constructivism and technological advancements, while curricular recommendations were meant to help modern mathematics curricula reflect the increasing value placed on mathematical literacy and technological agility in an age of information. Before 1989, mathematics curricula focused almost exclusively on the mathematical content (e.g., operations on numbers; measurement; algebra; and geometry) students were to learn. The curricula changed when the NCTM's (1989) *Curriculum and Evaluation Standards for School Mathematics* was published. This publication reflects the current research, emphasizing cross-cutting processes of doing mathematics: problem-solving, reasoning, communicating with mathematics, and making connections using mathematics.

The trend toward a cross-cutting process continued, with NCTM producing an updated version of standards in 2000 (NCTM, 2000), and with groups like the National Research Council (2001) painting the picture of evolving mathematical proficiency. The conceptual understanding and procedural fluency, the primary foci of prior instruction, were not enough; actual mathematical proficiency also includes developing a favorable disposition toward mathematics, the ability to approach new problems and use of the knowledge one has developed in other contexts and doing so strategically.

The CCSS-M represent the progression and evolution of these constructs. These standards provide content specifics at each grade level. CCSS-M have a large emphasis on the focus and coherence of the mathematics to be learned and more importantly how students are to engage with mathematics, which is referred to as standards for mathematical practice. The eight mathematical practices highlighted in the CCSS-M are that students will: (a) make sense of problems and persevere in solving them; (b) reason abstractly and quantitatively; (c) construct viable arguments; (d) model with mathematics; (e) use appropriate tools strategically; (f) attend to precision; (g) look for and make use of structure; and (h) look for and express regularity in repeated reasoning (CCSS-M, 2010, pp. 6–8). All of the changes to the field of MLD—from recognition of the disability, to identification, to placement and now rigorous standards—have social considerations for students and teachers alike.

Social

In order to fully understand the social implications of teachers' decision-making in mathematics number combination fluency for students with MLD, it is imperative to understand the implications that mathematics fluency has on student achievement, the progression of skills and evidence behind mathematics number combinations. Although my study foci are on teachers, the content matter must be unpacked; because in order to be successful with the established standards, students must have access to basic mathematical logic and basic number sense. The standards have raised the bar on what and how students manipulate mathematical concepts. The statement from the Washington D.C. teacher leads to the question, what requisite knowledge is needed in order to be successful in higher level mathematics?

Requisite skills. The NCTM (2000) identified the themes or content strands for the acquisition of the conceptual understanding of mathematics. These strands are (a) number and operations; (b) algebra; (c) geometry; (d) measurement; (e) data analysis and probability. These themes form a comprehensive foundation of the mathematics that all students should learn. For this study, I will focus on numbers and operations only since this is the first strand in mathematical skill acquisition and at the genesis of algebraic literacy and conceptual understanding of numeracy.

Numbers and operations. These strands focus on what happens when two sets are joined together or when a set is separated into parts. These quantity changes explore the ideas that a single large set can be composed of two or more smaller sets (i.e., large numbers contain smaller numbers). One of the big ideas in this skill set is that a quantity (i.e., a whole number) can be broken into equal or unequal parts; the parts can be put back together to form the whole. Next, students can compare using the attributes of numerosity, and order by more than, less than, and equal to. Lastly, students know that sets can be changed by adding items (i.e., joining, adding, multiplying, and squaring) or by taking some away (i.e., separating, subtraction, division, square root; NCTM, 2000).

Numbers. The *numbers* strand refers to a student's ability to understand numbers, ways of representing numbers, relationships among numbers, and number systems. Examples of the most elementary number sense skills for learners are as follows: (a) count with understanding and recognize *how many* in sets of objects; (b) use multiple models to develop initial understandings of place value and the base-ten number system; (c) develop understanding of the relative position and magnitude of whole numbers and of ordinal and cardinal numbers and their connections; (d) develop a sense of whole numbers and represent and use them in flexible ways, including relating, composing, and decomposing numbers; (e) connect number words and numerals to the quantities they represent, using various physical models and representations; and (f) understand and represent commonly used fractions, such as 1/4, 1/3, and 1/2 (NCTM, 2000).

These skills increase in intensity in upper elementary grades to skills that involve the understanding of the place-value structure of the base-ten number system and the ability to represent and compare whole numbers and decimals. In other words, students are required to recognize the equivalent representations for the same number and generate them by decomposing and composing numbers. The recognition of equivalence also requires a new and deeper understanding of fractions as parts of unit wholes, as parts of a collection (i.e., fractions as a division of whole numbers). Students are also required to represent these numbers by using models, benchmarks, and equivalent forms to judge the size of fractions. The skills also move to exploring integers to the left of zero by extending the number line and describing classes of numbers according to characteristics such as the nature of their factors (NCTM, 2000).

The goal is for students to be able to work flexibly with fractions, decimals, and percentages to solve problems; compare and order fractions, decimals, and percent efficiently and find their approximate locations on a number line; understand and use ratios and proportions to represent quantitative relationships; develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation; use factors, multiples, prime factorization, and relatively prime numbers to solve problems; develop meaning for integers and represent and compare quantities with them (NCTM, 2000).

Operations. The notion of operations encompasses much more than standard procedures for computation. The big ideas related to operations focus on the meaning of the operation as well as the relationship between the operations (i.e., operation sense). For example, in learning about division, students can consider how division is related to subtraction (i.e., division is in fact repeated subtraction). In other words, operations are about the understanding of the meanings of operations and how they relate to one another. In early grades students must understand various meanings of addition and subtraction of whole numbers and the relationship between the two operations. They also must understand the effects of adding and subtracting whole numbers (i.e., magnitude) and understand situations that entail multiplication and division, such as equal groupings of objects and sharing equally (NCTM, 2000). Later, the students will evolve their understanding to various meanings of multiplication and division where they must understand the effects of multiplying and dividing whole numbers and be able to identify and use relationships between operations (e.g., division as the inverse of multiplication) to solve problems. Understanding the relationships will eventually translate to understanding the meaning and effects of arithmetic operations with fractions, decimals, and integers; and the use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with integers, fractions, and decimals (NCTM, 2000). With all of these skills that make up numbers and operations, there is a common construct: the need for students to manipulate mathematics number combinations fluently.

Fluency as a predictor. In the case of mathematics facts, fluency is being able to respond to basic mathematics facts in the four operations (i.e., addition, subtraction, multiplication, and division). Moreover, NCTM Principle and Standards of School Mathematics (2000) defines computational fluency as having efficient, flexible, and accurate methods for computing. In other words, fluency refers to the rapid and accurate responding to a group of stimuli (Parkhurst et al., 2010). In order to be fluent, one must be quick and correct.

However, students with MLD struggle to store and retrieve number combinations from their long-term memory and use it for their working memory (Gersten et al., 2005, 2007). Students need to be fluent in mental mathematics, paper and pencil methods (i.e., whole numbers as well as fractions and decimals), because students who can fluently compute mathematics facts are more likely to be able to engage in more advanced mathematical tasks (i.e., higher order task that includes but are not limited to complicated calculation) and this is due to lower frustration and anxiety (Parkhurst et al., 2010; Poncy, Fontenelle, & Skinner, 2013; Smith, Marchand-

Martella, & Martella, 2011). In other words, "without facility and agility in retrieval of arithmetic combinations, students cannot follow the logic of mathematical explanations as presented in traditional instruction, which assumes this facility has been acquired" (Gersten et al., 2005, p. 16). Geary (2004, 2013) further described this construct by proposing that once automaticity is achieved in number computation, it will offset the working memory limitations and in turn frees up working memory resources for higher order calculations.

The importance of fluency with basic mathematics facts in completing more advanced tasks related to mathematics and computing is clear. Thus, gaining fluency with basic mathematics facts becomes an essential focus in the early elementary grades. The sequential next question is, are there research or evidence-based methods to teach mathematics fluency to students with MLD?

Evidence-based interventions on mathematics fluency. CCSS-M and mathematical skill acquisition requirements both need for mathematics fact fluency to be part mathematics instruction. There is a generous amount of research that indicates that interventions targeting fact fluency do in fact increase achievement for students with MLD. Interventions with positive effects on mathematics fact fluency include taped problems (McCallum, Skinner, Turner, & Saecker, 2006); cover, copy, compare (Skinner, Turco, Beatty, & Rasavage, 1989); and detect, practice, repair (Poncy et al., 2013). Researchers have identified common elements across these interventions: They include multiple response opportunities, immediate feedback, and error corrections to effectively increase rate and accuracy of response (Poncy, Skinner, & Jaspers, 2007).

The degree to which mathematics curricular materials focus on mathematics fact fluency can vary widely; however, teachers can supplement their curricula with quick, easy activities to increase number combination fluency (Parkhurst et al., 2010; Poncy et al., 2013). Gaining fluency with basic mathematics facts becomes an essential focus in the early elementary grades, and there is evidence that students with MLD can in fact learn mathematics fact fluency. The sequential next question is, what information drives the instructional decisions around mathematics fact fluency for students with an MLD?

Instructional decisions. Instructional decisions for students with MLD in mathematics core content start with the IEP or similar document depending on the student's placement (e.g., private or public school) and what the instructional team has decided the student needs in order to access the grade-level mathematics curriculum. In some cases, instructional methods in number combinations will be part of the annual goals, and in other instances, students will be given accommodations to access higher level mathematics without accessing mathematical fluency instruction. For number fact fluency, these accommodations can be allowing students to use a calculator, use of a number line, and/or a number chart (Kettler, Niebling, & Mroch 2001; Schulte, Elliott, & Kratochwill, 2000).

Instructional practices reference the use of accommodations and modifications to aid or level the playing field for students with MLD, however, there is no evidence that these accommodations aid in skill acquisitions (Kettler et al., 2001; Schulte et al., 2000). I have not been able to identify any literature that speaks to the benefits of avoiding number combination skill acquisition and replacing it with an accommodations or modification in order for the student to access mathematics curricula.

Instructional environments. Student placement while in special education is an important social influence that teachers and students face. Students with LD are spending more time of their school day in general education classrooms; 60% of students with LD are placed in general education classrooms and receive their core instruction in this setting due to the Least Restrictive Environment (LRE) clause (Bryant et al., 2011). LRE is the requirement in federal law that students with disabilities receive their education, to the maximum extent appropriate, with nondisabled peers and that special education students are not removed from regular classes unless, even with supplemental aids and services, education in regular classes cannot be achieved satisfactorily [20 United States Code (U.S.C.) Sec. 1412(a)(5)(A); 34 Code of Federal Regulations (C.F.R.) Sec. 300.114.]. For teachers whom have a student(s) with an MLD within their general education classroom, their decision-making process may be influenced due to the fact that the instructional methods that are recommended for students with MLD are not the same as those that are recommended for students without an academic struggle. In other words, teachers may be making decisions based on social factors for the students (i.e., keeping them included) rather than academic factors (i.e., ensuring they receive the instruction they need).

Teacher factors. The changes to standards and the need for rigor along with merit pay and state testing are social factors that teachers of students with MLD face. Incentive-pay and/or merit pay, which is tied to student achievement, is normally measured by student scores on the state test or end of year course assessment. The result of recent studies suggest that average awards range from $26.00 to $20,000.00 (Pham, Nguyen, & Springer, 2017). The determinants differ by state and by district; however, most rely on a percentage of improvement on the previous years' assessment or percent of students that pass the test after a year of instruction. In light of evidence that merit-pay programs can result in better test scores, Pham and colleagues (2017) said that the practices that are increasing test scores must be identified. These initiatives push for academic improvement; however, in mathematics, higher-level work can be accomplished by the use of an accommodation. Some teachers may be influenced by the initiative to avoid teaching mathematics number combinations to students with MLD and provide them with a calculator or a number chart instead.

The adoption of the new academic standards (i.e., CCSS-M) mandated changes to the mathematics scope and sequence, and these curricular changes have increased the rigor of mathematics learning in the classroom. Research demonstrates that mathematics fact fluency is the primary predictor of mathematics success (Berrett & Carter, 2017; Bryant et al., 2011; Fuchs et al., 2005; Gersten et al., 2005, 2007). However, for students with MLD mathematics fact fluency is not an innate skill; these students require specific and targeted instruction in mathematics number combinations in order to attain fluency/automaticity (Bryant et al., 2011; Fuchs et al., 2005; Gersten et al., 2005, 2007). There is evidence that interventions that focus on fact fluency do, in fact, increase mathematics achievement (Skinner, Williams, & Neddenriep, 2004; Poncy et al., 2013).

The research-to-practice gap is not a new phenomenon; researchers and educators have access to different information. The federal government has attempted to close this gap by funding centers and databases that hold the results of research. One of these databases is What Works Clearinghouse (WWC). WWC reviews the existing research on different programs, products, practices, and policies in education. The goal is to provide educators with the information they need to make evidence-based decisions. Accommodations and modification in mathematics number combinations continue to be used even with the overwhelming evidence of the importance of fact fluency; thus, this exposes the fact that evidence-based instructional decisions are being ignored. Therefore, the identified research-to-practice gap in special education and mathematics number combination instruction should be examined.

Furthermore, a focused effort on understanding how teachers make instructional decisions on mathematics fact fluency for students with MLD would provide the needed understanding for the work of increasing students' with MLD mathematics achievement. However, the content knowledge needed for effective mathematics instruction and learning is not the only factor. Teachers also face the social pressures associated with state testing, performance pay, and standards-based reform, all of which are meant to help students meet the standards. In addition, teachers face the social pressures of having to keep students with MLD in an inclusive setting and for these same students to make gains in mathematics at grade level, which may result in accommodations or modifications being used.

Theoretical

In grounded theory it is not recommended that the researcher use theoretical frameworks because the "whole purpose of doing a grounded theory is to develop a theoretical explanatory framework" (Corbin & Strauss, 2015, p. 53). However, for this research I build from validated theories explaining teachers' decision-making to justify the choice of methodology, build upon the existing research, and offer an alternative explanation or perspective in a new situation (Corbin & Strauss, 2015). Thus, the theories that will be investigated are radical behaviorism (Skinner, 1953, 1957, 1971, 1976), affirmation theory (Jaspars, Fincham, & Hewstone, 1983), concerns-based adoption model (Hall & Hord, 1987), and growth mindset (Dweck, 2000, 2012).

Skinner's (1953, 1957, 1971, 1976) radical behaviorism explains behaviors as a continuum of positive and negative reinforcement and punishment. Teacher's instructional decisions are a set of behaviors that can be explained as being maintained by reinforcement (Skinner, 1976). Affirmation theory speaks to the "perceived cause of an outcome; it is a person's explanation of why a particular event turned out as it did" (Seifert, 2004, p. 138). This theory suggests that people observe others, analyze their behavior, and come up with their reasonable explanations for such actions. External attributions are those that are blamed on situational forces, while internal attributions are blamed on individual characteristics and traits (Jaspars et al., 1983). This theory can be used to examine how teachers make instructional decisions based on attributions about themselves or about their students.

The concerns-based adoption model has been used to explain data-based decision-making. Concerns theory (Hall & Hord, 1987) is useful in understanding teachers' affective responses, such as resistance, to educational innovations or changes in what is required of the teacher. Concerns are defined as an individual's thoughts, considerations, feelings, worries, satisfactions, and frustrations related to an innovation and/or change (Hall & Hord, 1987). In other words, concerns are emotional responses to an educational innovation and/or change, in this case decision-making in mathematics fluency (Hall & Hord, 1987).

Lastly, growth mindset (Dweck, 2000) is a theory that speaks about intelligence. People vary in the degree to which they assign the cause of intelligence; they can be innate /or fixed factors (i.e., fixed mindset) or they can be variable factors that can be influenced through learning, effort, training, and practice (i.e., growth mindset; Dweck, 2000). The way that teachers think about intelligence impacts their actions and how they view their students. These constructs inform how they teach and what they teach to students. Mindset allows a teacher to see a struggling student as an opportunity or as having reached their potential. Moreover, growth mindset can help unpack how teacher perspectives can influence their decision-making process for students with MLD (Dweck, 2000). Thus, the conceptualization of how teachers make instructional decisions about mathematics fact fluency instruction and then the construction of theory to explain the decision-making process of teachers is essential to understanding the research-to-practice gap in mathematics instruction for students with MLD.

Situation to Self

Since a qualitative research design was selected, it is essential to discuss my philosophical assumptions and the worldview through which I engage with this study as the human instrument of the research. In this section I discuss my philosophical assumptions and worldview and my professional values as they relate to the study. I include my educational and professional background as a special education teacher and school administrator as influencing the driving force and approach to this study, providing more details in Chapter Three, Role of the Researcher. Since I am the human instrument in the study, I deliberate in this section the inevitability of suspending judgment in this research process and the skills I will utilize to do so. The goal of this section is to provide the reader of this study a better understanding of who I am as the researcher and how my experiences and identity influence my lens of students with MLD and the process that teachers undertake in making instructional decisions.

During my studies, I have felt entirely disenfranchised, unidentified and valueless. Conversely, I have been heard, acknowledged, and proven valuable. This ostensibly fractured and variegated summary is both I and not I. It is an identity performance that is now frozen in time through the act of writing, and living through the act of reading, interpreting, and responding to it. These various facets of my social and professional identity carry with them various partialities, predispositions, preconceptions, prejudice, and assumptions that may influence the data and its interpretation. Ultimately, my desire to perform an analysis of the data, and what is considered herein these pages will be what helps to keep the biases that I bring with me from skewing the data.

Philosophical Assumptions and Worldview

"Researchers bring their many aspects of self and experiences to the research process" (Corbin & Strauss, 2015, p. 22).

I have always identified myself as a pragmatist. Because I lean towards the pragmatic, I tend to dismiss, perhaps too quickly, theoretical approaches and critiques that encourage me to see things from a more idealistic perspective. Like Dewey (1929), I assume knowledge is created through action and interaction. Therefore, collective knowledge is accumulated. Moreover, my experiences shape my worldviews. Perhaps primarily here, I am a professionalizing scholar in special education studies. The research I conducted and my writing have a partial gatekeeping function (the dissertation). That is, my writing and my research here will help to determine my success in obtaining my Ed.D., which as of this writing I have been working towards for three years.

This study created a theory grounded in data that was constructed from the participants and me. Corbin and Strauss (2015) discuss the knowledge-making process as "constructed by researchers out of stories that are constructed by research participants who are trying to explain and make sense out of their experiences and lives, both to the researcher and themselves" (p. 26). Thus, I incorporated myself through the process of memoing as theories emerged in the research process. The study reflects the meaning-making of the participants and their voices with my role as the researcher to construct a whole-view theory across the varied voices of the participants.

Finally, the values I hold deeply relate to my religious and cultural beliefs. First, to be a person of Torah is to accept a quest to reveal the light of G-d which is revealed through scripture. Halacha (i.e., Jewish law) is how I believe we translate the scripture into human behavior and radiate the light for which all those who worship the Almighty pray. However, among the subjects that dawdle disconcertingly between the light and the darkness is society's approach to people with disabilities. The Talmud teaches that we all have disabilities. The Talmud takes account of the fact that G-d created all of mankind, in all the forms it may take, in His own image. Not meaning that is a godly body since G-d has no body, rather with an essential nature that is divine. However, man was created in G-d's image is not G-d, he is "a little less" (Psalm 8:6). This is what brings me to the absolute knowledge that all of us are people with disabilities. From this knowledge there is a genuine expectation that I should pave the way when it comes to attitudes towards people with disabilities, people who were also created in the image of G-d. Thus, I see disabilities as differences, not as an impairment, and embrace disability theory. Disability theory sees disability as a dimension of human difference and not as a defect; thus, this view is reflected in the research process (Creswell, 2013).

Professional and Educational Positioning

I am a certified special education teacher and have held the position of visiting professor at a small university in the College of Education; I am also a researcher and school administrator (those who know me best may argue that I am a better administrator than I could ever hope to be a teacher). I hold an unrelenting belief that all children can learn and that for the most part, deficits in academic performance are the teachers' fault and not the students. In addition, I hold very stringent views on teacher performance (i.e., proponent of accountability and adding effectiveness to the certification process for teachers). I prefer observable and measurable data and evade affective science, since those are difficult to operationalize. My aspiration is that educators, trainers, mentors, and coaches find value in teaching mathematics fact fluency to students with MLD.

Suspending Judgement

Philosophical assumptions have implications. Ontologically, different perspectives will develop to demonstrate that reality varies depending on the view. I believe children with MLD can learn mathematics facts, become fluent, and build automaticity. I believe that given the correct duration of intervention students with MLD can be successful in mathematics. I also believe that some teachers have low expectations for students with LD, and there are pressures outside of their control (e.g., standardized testing and performance pay) that impact their decision-making in mathematics number combinations. However, I have been reflective about how I influence the research process and how it influences me. I remind myself that there are likely different perspectives, different realities for individuals, which ultimately helped to generate a theory.

Epistemologically, I lessened the distance between myself and the participants by utilizing quotes and permanent products (i.e., interviews and data analysis). Axiologically, the values of the participants and my own are disclosed. Methodologically, inductive logic was used to revise the questions I ask while the experiences of participants added new data. Using the methods and processes of grounded theory (e.g., journaling and keeping an openness to the data) allowed me to limit the effect of my assumptions on the data analysis. In addition, as a behaviorist and pragmatist who embraces disability theory, I looked for the environment and the interactions to divulge the behaviors, which helped me in the data collection and analysis process required herein by grounded theory.

Problem Statement

There is an apparent research-to-practice gap in the field of special education where the literature on mathematics fact fluency suggests that fact fluency is a requisite skill for mathematics higher-order skills (Kilpatrick, Swafford, & Finell, 2001; NMAP, 2008; Patton, Cronin, Bassett, & Koppel, 1997; Shapiro, 1996; Siegler & Shrager, 1984); however, in practice students with MLD are often provided accommodations or modifications (e.g., calculator, number charts) to help them with their lack of automaticity in number combinations (Kettler et al., 2001; Schulte, et al., 2000). The review of the research in mathematics fluency interventions demonstrate the ability for students with MLD to achieve mastery of fact fluency (Burns, Codding, Boice et al., 2009; Myers, Wang, Brownell, & Gagnon, 2015; Stocker & Kubina, 2017). In other words, the accommodations are given as tools to give students the ability to have the answer to the number combination without having to compute the mathematics. These accommodations or modifications do not allow students to gain automaticity in mathematics facts because the answers are not computed by them. The problem is that the disconnect between evidence-based best practices in the literature versus the instructional practices used in classrooms results in students with MLD not developing the requisite skills to be successful in higher level mathematics (NCTM, 2000). The factors, influencers, and knowledge that special education teachers negotiate to make instructional decisions are necessary constructs to understand and explain. There are currently no studies that provide an in-depth understanding of the special education teachers' perspectives on providing instruction in mathematics fact fluency for students with MLD. Thus, the conceptualization of how teachers make instructional decisions about mathematics fact fluency instruction and then the construction of theory to explain the decision-making process of teachers is essential to understanding the research-to-practice gap in mathematics instruction for students with MLD.

Purpose Statement

The purpose of this systematic grounded theory study was to generate a theory which explains the process teachers undertake regarding mathematics fact fluency instructional decisions for students with MLD. This study focused on teachers in grades 3 – 8 from schools in the United States. Mathematics fact fluency is defined as the ability to recall the answers to basic mathematics facts automatically, without hesitation, and accurately (Forbinger & Fuchs, 2014). Mathematics fact fluency is measured as digits correct per minute. In addition, instructional decision is defined as the systematic process of using student achievement and other data to guide instructional decisions. The theories which guided this study were radical behaviorism (Skinner, 1953, 1957, 1971, 1976), affirmation theory (Jaspars et al., 1983), concerns-based adoption model (Hall & Hord, 1987), and mindset theory (Dweck, 2000). Skinner's radical behaviorism explains behaviors as a continuum of positive and negative reinforcement and punishment. Teacher's instructional decisions are possibly maintained by reinforcement or punishment (Skinner, 1976). Affirmation theory speaks to the "perceived cause of an outcome; it is a person's explanation of why a particular event turned out as it did" (Seifert, 2004, p. 138). Attribution theory suggests that people observe others, analyze their behavior, and come up with their reasonable explanations for such actions. Attributions are grouped as either external attributions or internal attributions. External attributions are those that are blamed on situational forces, while internal attributions are blamed on individual characteristics and traits (Jaspars et al., 1983). Thus, teachers could make instructional decisions based on attributions about themselves or about their students. Concerns-based adoption model has been used to explain data-based decision-making. Concerns theory is useful in understanding teachers' affective responses, such as resistance, to educational innovations or changes in what is required of the teacher. Concerns are defined as an individual's thoughts, considerations, feelings, worries, satisfactions, and frustrations related to an innovation and/or change. In other words, concerns are emotional responses to an educational innovation and/or change, in this case decision-making in mathematics fluency (Hall & Hord, 1987). Lastly, mindset theory speaks to the fact that people vary in the degree to which they assign the cause of intelligence (Dweck, 2000). People can have a fixed mindset or a growth mindset: The difference resides on whether a person sees intelligence as something that can be influenced by the environment and others (Dweck, 2000).

Significance of the Study

The current literature on mathematics achievement for students with MLD focuses on number combination interventions and teaching practices: At this point, I have not uncovered other research focused on investigating and understanding the instructional decisions that teachers make for students with MLD. This study is significant because the findings inform researchers, teacher educators, mentors, curricula writers, and district leaders which factors influence whether or not evidence-based methods are being applied in the field and what the contingencies are for teachers in using them, which provides information on the research-to-practice gap. Another empirical contribution of the study is to the literature on teachers' perspectives on the learning trajectories for students with MLD.

The practical implication of this study is to reveal insight into understanding the instructional decision-making for teachers and how the stakeholders can support the use of evidence-based methods in the teaching and learning of basic computation and numeracy for students with MLD. This insight is the promise in reaching an understanding of what the field (i.e., higher education, school districts, teacher mentors, and curricula, and intervention writers) must change in order to enhance the mathematics learning trajectories for this population and create a space where students with MLD can reach a conceptual understanding and mastery of the building blocks of mathematics.

Finally, the study results in a theoretical model explaining what informs teacher's instructional decision-making and how the field can negotiate this information to inform practice in mathematics fact fluency for students with MLD. This understanding will help researchers, curricula writers, and teacher educators in constructing frameworks to establish the use of evidence-based practices for students with disabilities. While existing theories guided the inquiry and analysis, the resulting model was grounded in the data generated from this study and new theoretical constructs and propositions emerged.

Research Questions

The impact of lacking mathematics fact fluency on overall mathematics achievement was the driving force behind this study. Therefore, to understand the stepwise instructional decision-making process that teachers undertake, their rationale, thinking, factors that influence these decisions, and perspectives were imperative. In an effort to understand this process and construct a theoretical model from the data, the following questions guided the research:

Central Question

What is the process that teachers undertake when making instructional decisions on number-combination mathematics fluency for students with MLD?

As noted, mathematics fact fluency is imperative to overall mathematics achievement and affects a student's ability to gain higher level mathematics concepts and skills (Kilpatrick et al., 2001; NMAP, 2008; Patton et al., 1997; Shapiro, 1996; Siegler & Shrager, 1984) and students with MLD do in fact learn mathematics facts fluently (Burns et al., 2010; Myers et al., 2015;

Stocker & Kubina, 2017). However, there is substantive research that implies that teachers' perspectives impact their instructional approach (Berghoff, 1997; Cochran-Smith, 1994). Thus, I was also interested in learning how teachers' beliefs about their students and how they learn influence the decision-making process.

Subsequent Question 1. What constructs do teachers attribute to the development of their beliefs about the attainment of mathematics number combination fluency for students with MLD?

Instructional decisions should be tied to student outcomes (Campbell & Levin, 2009) and evidence-based practices (McKenna, Shin, & Ciullo, 2015). This question intended to reveal how teachers describe their decisions and thereby the student outcomes. Based on assessment data, instruction should be tailored to the abilities of all students to maximize the achievement of students (Coburn & Turner, 2012); and based on evidence-based practices that ensure success in the domain of interest (McKenna et al., 2015). However, current research fails to provide convincing evidence that teachers effectively practice data-based decision-making when it comes to instructional planning (Carlson, Borman, & Robinson, 2011; Marsh, McCombs, & Martorell, 2010; Slavin, Cheung, Holmes, Madden, & Chamberlain, 2013). Outcomes can be behavioral or cognitive; the question purposefully does not limit findings.

There is considerable evidence that intentional decision-making can improve instructional skills (Cornett & Knight, 2009; Joyce & Showers, 2002). However, very few researchers have investigated the process that teachers undergo in order to make decisions. Due to the limited knowledge on how teachers undergo decision-making and how these decisions affect teaching practices (Datnow & Hubbard, 2015; Poortman, Schildkamp, & Lai, 2016), this study explored the constructs associated with teachers' decision-making and how they affect instructional practices. Unpacking decision-making ultimately gave me the ability to form a complete theory on this issue.

Attribution theory can be partly used to explain what factors teachers' attribute to their decision-making behavior and their thinking about their own behaviors (Gage, 2017; Gaier, 2015). According to the theory, teachers will want to be able to understand the reason for the actions by attributing a rationale to the behaviors of others (Clark & Artiles, 2000; McArthur, 2011; Rae, Murray, & McKenzie, 2011).

Subsequent question 2: How do teachers describe the outcomes of their instructional decision-making in mathematics fact fluency for students with MLD?

Teachers' decision-making, whether through the collection and documentation of student performance or intuition in the classroom, needs to be understood. Decision-making is a fundamental component of formative instructional practices and essential for ensuring student success. There is emerging research that teachers are resistant to using data to inform their decisions (Brown, Lake, & Matters, 201; Dunn, Airola, Lo, & Garrison, 2013; Remesal, 2011; Schildkamp & Kuiper, 2010). Therefore, mindset theories can be used to explain that a teacher's mindset beliefs impact student achievement outcomes (Dweck, 1986; Gutshall, 2013; Hohnen & Murphy, 2016; Rattan et al., 2012; Yeager & Dweck, 2012). A fixed mindset or negative teacher's beliefs about a student's intelligence acts as a limitation to the student's achievement possibilities and the potential to grow (Dweck, 1986; Gutshall, 2013; Hohnen & Murphy, 2016; Rattan et al., 2012; Yeager & Dweck, 2012).

Definitions

The following terms and concepts are presented in this study and defined herein for the sake of clarity and understanding.

1. *Accommodation* - an alteration of environment, curriculum format, or equipment that allows an individual with a disability to gain access to content and/or complete assigned tasks.
2. *Disability* - The American with Disabilities Act defines a person with a disability as a person who has a physical or mental impairment that substantially limits one or more major life activities.
3. *Dyscalculia* - Problems with arithmetic and mathematics concepts.
4. *Fluency* - Described by Forbinger and Fuchs (2014), "Fluency is the ability to find an answer quickly and effortlessly, either because the answer is memorized or because the individual has developed an efficient strategy for calculating the answer" (p. 154).
5. *Instructional decision-making* - Systematic process of using student achievement and other data to guide instructional decisions.
6. *Learning disability* - (i) General: Specific learning disability means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do *mathematical calculations*, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. (ii) *Disorders not included* – Specific learning disability does not include learning problems that are primarily the result of visual, hearing, or motor disabilities, of mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage.
7. *Mathematics learning disability* (also referred to as specific learning disability in math) - *See* above learning disability.

8. *Modifications*- Modifications are made for students with disabilities who are unable to comprehend all of the content an instructor is teaching.

Summary

This grounded theory study explains the instructional decision-making process that teachers undertake in reference to mathematics fact fluency for students with MLD. It delved into the influences and perceptions that aid or hinder the access to mathematics fact fluency instruction. I embraced the inductive approach of grounded theory, the circularity of the method, and theoretical sampling. Thus, I was open to conceptualizing these constructs from the emergence of themes in an effort to inform researchers, teacher educators, mentors, curricula writers and district leaders which factors influence whether or not evidence-based methods are being applied in the field. Furthermore, the emergence of themes informed about the contingencies for teachers in using evidence-based interventions and practices, which will provide information on the research-to-practice gap.

CHAPTER TWO: LITERATURE REVIEW

Overview

The literature on mathematics fact fluency suggests that fact fluency is a requisite skill for mathematics higher-order skills (Kilpatrick et al., 2001; NMAP, 2008; Patton et al., 1997; Shapiro, 1996; Siegler & Shrager, 1984); however, students with MLD are often provided accommodations or modifications (e.g., calculator, number charts) to help them with their lack of automaticity in number combinations (Schulte et al., 2000, 2001). Accommodations and/or modifications are often part of a student's academic plan outlined in the Individualized Education Program (IEP), and therefore an instructional decision had to be made on using accommodations and/or modifications instead of teaching mathematics fact fluency. This disconnect between evidence-based best practices in the literature versus the instructional methods used in classrooms results in students with MLD not acquiring the requisite skills to be successful in higher level mathematics (NCTM, 2000). The purpose of this grounded theory study was to explain the process teachers undertake in making mathematics fact fluency instructional decisions for students with MLD.

This literature review first establishes the empirical basis for mathematics fact fluency interventions for students with MLD, and effective instructional practices. In the second section of the review the limited literature on teacher decision-making process is reviewed. The next section includes a review of theories that have been used to explain teacher decision-making and to understand decision-making behavior.

Mathematics Fluency Review of the Literature

In an effort to first establish the empirical basis for mathematics fact fluency interventions for students with MLD, this section reviews syntheses and meta-analyses that have been completed on the topic. I begin with Maccini and Hughes (1997) and Maccini and colleagues (2007), who performed syntheses on mathematics fact fluency and both assessed the efficacy of mathematics interventions. Both reviews categorized studies by delivery components (i.e., behavioral, cognitive, or alternative delivery system) and whether the intervention focused on conceptual or procedural knowledge. Maccini and his colleagues (2007) concluded that a research-base was beginning to emerge that could inform instruction on more rigorous standards for students with MLD.

Burns (2011) completed a meta-analysis on mathematics fact fluency interventions that used the students' instructional level as a measurement for the intervention entry. A total of 55 students in Grades 2–6 participated in the studies they reviewed. After the initial analysis they determined that student grade and measurement of treatment fidelity did not affect the phi coefficient and that the number of intervention sessions was essentially equal; therefore, all data were combined on these variables for subsequent analyses. The Percentage of Non-Overlapping Data (PND) and Percentage of All Non-Overlapping Data (PAND) for fluency interventions with frustration level was 62% and 75% respectively. The resulting phi coefficient was 0.47, with a 95% confidence interval of 0.25 to 0.68. In summary, the Burns and colleagues' (2011) meta-analysis indicated that although initial assessment of skill level can be useful for planning, it does not impact the outcomes of fluency acquisition.

Methe, Kilgus, Nelman, Riley-Tillman (2012) conducted a meta-analysis of interventions for basic mathematics computation. Overwhelmingly, interventions showed an improved number combination fluency with a mean improvement rate difference (IRD) of .78 and *SD* of .26. IRD effect sizes ranged from .59 to .90 and suggested a moderate to large effect for the mathematics interventions. This meta-analysis revealed an important aspect of interventions in this domain. The variables that moderated the effects were time spent in intervention and intervention type. In other words, those students who used interventions for extended time surpassed peers with less time in the intervention. However, all students improved in their mathematics facts.

Myers and colleagues (2015) updated the results of Maccini's 2007 synthesis and concluded that there is moderate evidence that enhanced and anchored instruction (EAI) and cognitive and metacognitive strategy instruction should be considered by the field when instructing students with MLD in mathematics fluency (*ES* .78).

Fluency and/or Automaticity

Students with MLD and who are at-risk of failing in mathematics struggle to store and retrieve number combinations from their long-term memory and use it for their working memory (Bryant, Bryant, & Hammill, 2000; Geary, 2013; Gersten et al., 2005). NCTM Principle and Standards of School Mathematics (2000) defined computational fluency as having efficient, flexible, and accurate methods for computing. Students need to be fluent in mental mathematics, paper and pencil methods, and using technology such as a calculator in computing answers to problems involving numbers (i.e., both whole numbers as well as fractions and decimals) (Bottge, Grant, Stephens, & Rueda, 2010). In fact, one often overlooked or underdeveloped aspect of computational fluency is not only being able to compute in all three ways but also knowing which method is best, based on a given task. Petrill et al. (2012) and Woodward (2006), examined how mathematics fluency is etiologically distinct from untimed math performance. The results of these studies suggest that mathematics fluency, although related to other mathematics measures, may also be a genetically distinct dimension of mathematics performance. In short, students must be able to compute accurately and rapidly using all three methods and know when to do what operation or which strategy to use. How teachers instruct students with MLD on number combination fluency is also important to understand.

Teaching Practice

The National Council of Teachers of Mathematics (NCTM) and the National Mathematics Advisory Panel (NMAP) recognize the importance of fluency in mathematics facts, yet no consensus exists as to which methods work best and should be taught to increase these skills, particularly for students with mathematics difficulties (NCTM, 2000; NMAP, 2008). Also, given that the Individuals with Disabilities Education Improvement Act (2004) mandated that students with learning problems be instructed using evidence-based interventions and Every Student Succeeds Act (ESSA) of 2015 holds educators accountable for the mathematics achievement of all students, educators need access to research and empirically-validated interventions that reduce or remedy basic mathematics computation skill deficits.

Allsopp, Kyger, and Lovin (2007) identified two instructional practices that facilitate mathematical understanding for struggling learners, and Burns et al. (2015) confirmed the effectiveness of these practices. In order to scaffold mathematical understanding and begin to build a conceptual understanding of mathematics, the following practices should be employed in interventions in order for them to be effective for students with MLD: (a) scaffold learning experiences from concrete to abstract; (b) incorporate both receptive and expressive response formats when asking students to demonstrate mathematical understanding (Allsopp et al., 2007; Burns et al., 2015). In order to develop conceptual understanding of mathematics and numeracy, teaching practices should include instruction in both the ability to manipulate the mathematics and also discuss the mathematical concepts and metacognition (Mancl, Miller, & Kennedy, 2012).

Therefore, mathematics fact fluency instruction should involve more than memorization of facts. There is a requisite correlation that increasing computation fluency will improve overall mathematics outcome and prevent mathematics failure (Codding, Boice, et al., 2009; Codding, Hilt-Panahon, Panahon, & Benson, 2009; Fuchs et al., 2009; Geary, 2013). According to NCTM, the following items should be present in an intervention that aims at increasing mathematics computational fluency: (a) the methods that a student uses to compute should be grounded in understanding, (b) increase in knowledge of basic number combinations, (c) increase in computational fluently, (d) allow students to achieve computational fluency using a variety of methods (and should, in fact, be comfortable with more than one approach), (e) students should have opportunities to invent strategies for computing using their knowledge of place value, properties of numbers, and the operations, (f) students should investigate conventional algorithms for computing with whole numbers, and (g) students should be encouraged to use computational methods and tools that are appropriate for the context and purpose (e.g., including mental computation, estimations, calculators, and paper and pencil) (NCTM, 2000).

I completed a systematic review of the literature for interventions that aim to increase fluency in number combinations in mathematics that were implemented through the use of single case design (SCD). SCD was isolated as a methodology because the only population of interest are students with MLD, and SCD will ensure participant homogeneity. I wanted to review the empirical findings of interventions meant to increase mathematics fact fluency of students with MLD in an effort to discover teaching practices that increase mathematics fact fluency for students with MLD. Moreover, my goal was to establish whether there is evidence for one or more programs to increase computational fluency for this population.

Six studies met inclusion criteria and were systematically reviewed. The data were extracted using a data coding form which coded the following study features: (a) Participant variables including the grade of the participants and MLD or at-risk designation; (b) intervention variables including intervention description, components, intervention agent, setting, and intensity (the number of sessions was reviewed and analyzed against the total sessions per week and session length) were also coded; (c) study variables included single case design method, intervention fidelity,05 and inter-observer agreement (IOA).

The six studies tested a total of five different interventions; (a) Cover Copy Compare (CCC); (b) Facts that Last (FTL); (c) Incremental Rehearsal (IR); (d) Mathematics to Mastery (MTM); and (e) Memory Mathematics. The corpus of studies included six single case designs: Five of the studies (Burns et al., 2015; Codding, Archer, & Connell, 2010; Irish, 2002; Poncy, McCallum, & Schimitt, 2010; Poncy, Skinner, & McCallum, 2012) used a multiple baseline designs across subjects, and the Mong and Mong (2010) study used an alternating treatment design.

The total participants included 28 students in second grade, three students in third grade, three students in fifth grade. Ethnicity and socioeconomic status were reported in all of the studies (although not coded). Special education status was reported in all of the included studies. All 28 participants were identified with an MLD (Burns et al., 2015; Irish, 2002; Mong & Mong, 2010; Poncy et al., 2010). The authors reported that the participants had severe mathematics difficulty as measured by teacher report and academic achievement. Of the six studies, four were conducted outside of the general education classroom (i.e., resource room) where the students received their regular mathematics instruction (Burns et al., 2015; Codding et al., 2010; Irish, 2002; Mong & Mong, 2010). In three of the studies, the researcher was the interventionist, (Burns et al., 2015; Codding et al., 2010; Mong & Mong, 2010). The special education teacher administered the intervention in the Irish (2002) study. The Poncy et al. (2010) study was conducted in the general education classroom during mathematics centers, and the school psychologist administered the intervention. In all the studies, numbers and operations as the mathematical domain were targeted. Three studies focused on multiplication (Burns 2015; Codding et al., 2010; Irish, 2002). Mong and Mong (2010) focused on addition and Poncy et al. (2010) worked on subtraction.

In the six studies, the dependent variable in the domain of numbers and operations was correct digits per minute (DCPM) in a curriculum-based measure (CBM) timed probe. Mong and Mong (2010) also looked at errors per minute as a second dependent measure. In all studies, the CBMs were counterbalanced across sessions. The CBM probes were used for all baseline measurements and throughout the intervention phases.

The mathematics number combination fluency interventions that have been studied and have provided evidence of increasing computation fluency for students with MLD are Cover, Copy, and Compare; Facts that Last; Incremental Rehearsal; Math to Mastery; and Memory Mathematics. There is emerging literature that supports Rocket Math as an intervention for students with MLD, but there is not enough evidence in the field.

Cover, Copy, and Compare (CCC). CCC is composed of five steps. The student looks at the problem with the answer, covers the problem with an index card, writes the solution to the problem, uncovers the problem and solution, and compares the answer. CCC was used in Poncy et al. (2010); Poncy et al. (2012); Mong and Mong (2010). CCC is an effective intervention because it works in a systematic way to add new unknown facts to the students' repertoire. The process of seeing it, saying it, and then writing it allows for memorization and recall with ease for students with MLD (Mong & Mong, 2010).

Facts that Last (FTL). FTL is a two-part intervention. In the first stage, a tutor presents the student with a fact family and asks specific questions about the fact family. During this stage, the purpose is to build conceptual understanding of the mathematics and start to make connections with patterns. In addition, introducing the language helps students with MLD store the information and recall it. The second part of the intervention is asking higher-level questions to increase the mathematical thinking, and lastly, the student needs to explain the relationship and the answers.

Incremental Rehearsal (IR). Codding et al. (2010) and Burns et al. (2015) identified unknown facts for each participant and used the IR process to teach the unknown facts. Each fact was written horizontally on a 3”x5” index card without the answer. The tutor presented the fact, the answers, and asked the student to restate the fact. In IR, the number of known facts is increased while still including the one unknown fact. The number of index cards always remains at ten.

Math to Mastery (MTM). MTM is a structured intervention package that includes previewing mathematics computation problems, the tutor modeling the completion of the fact sheet, and then the student receiving repeated practice by completing the fact sheet until mastery is achieved. While the student is completing the worksheet, the student receives immediate corrective feedback. Student receive their score immediately and chart their progress.

Memory Mathematics (MM). Students learn a mnemonic strategy and select pictures that rhyme with the peg and keyword used in the mnemonic strategy. Then students learn the pictures and rhyme, and students can identify the missing parts of the rhyme. Lastly, students are given the mnemonic picture and product to match. MM was used in the Irish (2002) study.

The literature in the area of teaching practices that increase number combination fluency for students who are diagnosed with MLD, specifically interventions that embed specific teaching practices, were reviewed (i.e., Memory Math, CCC, MTM, IR, and FTL). All interventions increased the student's ability to compute mathematics facts fluently. When comparing the studies by using PND, the data reflects that MM, MTM, CCC, and IR had large effect sizes. Students increased in their DCPM when direct, explicit instructions were part of the intervention; when the teacher was part of the drill and helped with student thinking and error correction as seen in CCC and IR, there was a more significant effect observed in the data and PND. These results confirm the current literature on the need for students with MLD to receive explicit instruction and multiple opportunities to respond to the skill being taught. Practice with modeling, drill, and those treatments with instruction embedded in the intervention were highly beneficial to the study participants. Teacher-led instruction resulted in better outcomes when the visual inspection was applied. Overall, MTM is more effective than CCC. MTM and IR are extremely effective. CCC is more effective than FTL. Interventions that did not include direct instruction did not show the same level of positive effects on increasing mathematics fluency.

Computer-based Interventions

I also conducted a systematic review of the literature on computer-based interventions that aim at increasing fact fluency in mathematics. Hawkins, Collins, Herman, and Flowers (2017); Musti-Rao and Plati (2015); Musti-Rao, Lynch, and Plati (2015); and Shin and Bryant (2017) reviewed computer-assisted instruction as a curricula supplement to mathematics instruction for fact fluency. The research findings support the use of computer-based instruction for improving mathematics skills, including mathematics fact fluency (Hawkins et al., 2017; Musti-Rao & Plati, 2015; Shin & Bryant, 2017). Furthermore, these studies indicate that fast-paced programs that include many opportunities to respond and immediate feedback increase student outcomes in mathematics fluency.

Riccomini, Stocker, and Morano (2017) and Nelson, Burns, Kanive, and Ysseldyke (2012) discuss the use of activities or games to increase mathematics fact fluency. These studies did not look at interventions per say, but activities that can be done at home or independently that may improve outcomes in mathematics fluency. The results were varied; however, one item that was consistent is that when students were given multiple opportunities to manipulate the number combinations, there were significant changes in their abilities (Nelson et al., 2012; Riccomini et al., 2017).

Rocket Math

Smith et al. (2011) and Rae et al. (2011) conducted a study on Rocket Math as a class-wide intervention for increasing mathematics fact fluency for heterogenous groups, and both studies resulted in marked improvement for the students that used Rocket Math as the intervention. Furthermore, this intervention proved to maintain the number combination gains over extended time (Smith et al., 2011; Rae et al., 2011).

Hulac, Dejong and Benson (2012) and Reisener, Dufrene, Clark, Olmi, and Tingstrom (2015) write about how teachers can select interventions that improve mathematics fact fluency for students with MLD. In these studies, only the students who were part of evidence-based interventions made improvements in their mathematics fact fluency. However, it is important to recognize the difference between activities and interventions. Powell and Fuchs (2015) and Maccini and Hughes (1997) discussed the importance of implementing intensive interventions in solving the deficits of number combination fluency for students with MLD. According to Powell and Fuchs (2015), intensive interventions require extended duration and adhering to the fidelity of implementation of those researched interventions.

In summary, this review of the literature on mathematics fluency interventions strongly suggests that practice with modeling, drill, and those treatments with more than a drill component are highly beneficial for study participants who have an MLD or are at risk of mathematics failure, regardless of small group, pull out, whole group, teacher-based or computer-based (Burns et al., 2015; Codding et al., 2010; Hawkins et al., 2017; Irish, 2002; Musti-Rao & Plati, 2015; Mong & Mong, 2010; Poncy et al. 2010, 2012; Shin & Bryant, 2017). Furthermore, the implementation of evidenced-based practices designed to help students with disabilities is imperative, yet there is a persistent research-to-practice gap (Cook & Cook, 2013), and practices with demonstrated positive effects on learning outcomes are seldomly being employed (Burns & Ysseldyke, 2009). Specifically, several studies revealed minimal use of evidence-based practices in mathematics instruction for students with MLD (McKenna et al., 2015). Hence, the purpose of this study is urgent because teachers should be implementing evidence-based practices to help students with disabilities reach their potential.

Teacher Decision-Making Process Review of the Literature

One of the guiding tenets of special education is that instructional decisions are made based on the individual needs of each child (Gersten & Chard, 1999). Students with MLD are diverse and no singular instructional approach, even an evidence-based one, will meet the needs of all students. In other words, students with the same diagnosis learn differently from one another (Hallahan & Kauffman, 2006; Watson & Gable, 2013). The heterogeneity of learners makes it particularly difficult to predict which educational practices will be most effective for a particular learner. Therefore, teachers must exercise their professional wisdom to judiciously choose the appropriate evidence-based intervention.

After an extensive systematic search of the literature, there was not a literature review, synthesis, or meta-analysis that covers the teaching decision-making process. The review of the literature that looks at teachers' decision-making processes separates the phenomena into these domains; (a) interactive decision-making; (b) data-based decision-making; and (c) domain of RtI.

Instructional Decision-Making

Instructional decision-making is a systematic process of using student achievement and other data to guide instructional decisions. The process of using data to match instruction to student needs uses a continuous improvement model of needs assessment, planning, implementation, and evaluation (Leach, 2016). Therefore, the operationalized definition of instructional decision-making is inclusive of these features: (a) focuses at the student level; (b) continuous progress monitoring of results; and (c) changes pending the results of measures (Mokhtari, Rosemary & Edwards, 2015).

Teaching is about making informed choices about methods of instruction that are best suited to the teacher, the student, and the material. Exploring the intersection between these three factors is a continual process. At this level of exploration and performance, teaching becomes both an art and a science. The science part of teaching is based on available research, which has examined how students learn best and what teaching models and methods are best suited to the content and the learner. The artful part of teaching is based on teachers finding their professional voice and a style of teaching that is both comfortable and challenging to the students. These intersections should in fact create continuous improvement and reflective evaluation of one's performances as a teacher (Dunn, 2016).

This systematic review of the literature examines studies investigating the decision-making process teachers undergo. This review synthesizes the empirical findings that emerged from the literature on special education teacher decision-making. The review of the literature was intended to examine the steps that teachers undergo in their decision-making process. The goal was to establish whether there is evidence of effective decision-making frameworks that teachers who work with students with MLD can use when making instructional decisions.

Previous Syntheses

Two studies examined two different styles of decision-making: interactive (Bartelheim & Evans, 1993) and data-based decisions (Van der Scheer, Glas, & Visscher, 2017). Interactive decision-making is defined as the on-the-spot decision-making that teachers make when a situation changes during instruction. Data-based decision-making refers to the instructional choices that teachers make prior to teaching the lesson (e.g., while lesson planning): One is on the spot and one is planned. The corpus of studies included one case study (Bartelheim & Evans, 1993) and a quantitative means difference design (Van der Scheer et al., 2017). The total participants are 38 teachers who either taught fourth grade ($N = 34$) or high school ($N = 4$). Ethnicity and the socioeconomic status of the school were reported in both of the studies (although not coded). All teachers worked with special education students and were certified in special education. Settings were reported in both studies in this review. One was in a general education setting (Van der Scheer et al., 2017) and the other occurred in a special education resource room setting. In both studies the teacher of record was the subject of the study.

Interactive Decision-Making. Interactive decision-making is defined as the on the spot decision-making that teachers make when a situation changes during instruction. Interactive decision-making refers to dynamic lessons that are unpredictable and are characterized by constant change. In interactive decision-making, teachers have to continuously make decisions that are appropriate to the specific dynamics of the lessons they are teaching (Richards, 1996). I only found one study that examined interactive decision-making for students with learning disabilities. Bartelheim and Evans (1993) coded interactive decision-making into three categories: (a) personal responsibility; (b) testing; and (c) problem setting. Personal responsibility refers to a teacher's ability to be accountable for the outcome of the solution that is applied to the problem (Bartelheim & Evans, 1993). Testing refers to the teacher's ability to *test* different solutions to the problem before accepting the outcome (Bartelheim & Evans, 1993). Lastly, problem setting refers to a teacher framing the problem. The research team coded decisions that came from the observations; 39% were coded as personal responsibility, 32% were coded as testing, and 29% were coded as problem setting. Thus, the indicators of testing and problem setting were not as evident as those of personal responsibility. Therefore, the researchers concluded that teachers express particular beliefs about how to select, present, and manage instruction in their classrooms, but they are incongruent with their beliefs and their instructional choices (Bartelheim & Evans, 1993).

From other studies on interactive decision-making outside of special education, researchers (Johnson, 1992; Zhu, 2014) have found that interactive decision-making is related to different aspects of teaching, including student motivation and involvement, students' language skill and ability, and students' affective needs. In addition, student understanding, subject matter content, curriculum integration, and instructional management have been identified as variables that impact the process of interactive decision-making (Johnson, 1992; Zhu, 2014).

Interactive decision-making is often used in Montessori schools and meets a great deal of the philosophy of the Reggio Emilia approach (McNally & Slutsky, 2017) to teaching and learning. This approach to learning puts the natural development of children at the center of what drives the curricula. Learning is derived from students' curiosity. Interactive decision-making does not inform my research because I am concerned with the decisions on what to teach, not decisions that occur while teaching (Bartelheim & Evans, 1993; Johnson, 1992; Zhu, 2014). The philosophical pedagogies that would conform to this type of decision-making are not compatible with special education.

Data-Based Decision-Making. The dearth of research in the area of decision-making in special education is concerning since teachers are the ones implementing and deciding how to meet IEP goals for students with disabilities. However, another domain within decision-making that has been researched is the idea of data-based decision-making. The research on data-based decision-making is limited to the process of using data to inform practice, not the actual praxis of teaching. Data-based decision-making is often described as a cyclical and iterative process, including aspects as data analysis and evaluation, transforming data into usable knowledge, and intervening in the classroom to improve student achievement (Ikemoto & Marsh, 2007; Keuning, Van Geel, Visscher, Fox, & Moolenaar, 2016; Mandinach & Gummer, 2016a, 2016b; Poortman et al., 2016).

The components associated with data-based decision-making include four teacher activities: (a) evaluate and analyze student results, (b) set learning and performance goals for each student, (c) determine an instructional strategy to accomplish these goals, and (d) execute the planned instructional strategies in the classroom (Mandinah & Gummer, 2016a). Data-based decisions are rooted in several aspects of teaching, such as planning and delivering instruction, as well as the mastery of a coherent set of knowledge and skills (Mandinach & Gummer, 2016a). Mandinach and Gummer (2016a) argue that foundational knowledge as described by Shulman

(1987) is essential during the data use process to be able to place the data in a meaningful context of curriculum knowledge, (pedagogical) content knowledge, knowledge regarding learners, the educational context, and educational ends, purposes, and values (Mandinach & Gummer, 2016a, 2016b).

As part of the first component, evaluating and analyzing results, teachers have to identify possible data sources (e.g., standardized assessments and the results from student's daily work) and understand the different purposes of the data (Mandinach & Gummer, 2016a). Teachers need to be able to locate the relevant data in a data system (Means, Chen, DeBarger, & Padilla, 2011). Research suggests that by means of training, teachers learn what these possibilities are and how to interpret the outcomes of the data analysis activities (Staman, Visscher, & Luyten, 2014). As Mandinach and Gummer (2016a, 2016b) outlined, many skills are important for analyzing data (e.g., manipulating and integrating data).

Research reflects that while educators spend significant amounts of time collecting assessment data, they often do not take time or perhaps know how to organize and use data consistently and efficiently in instructional decision-making. However, when asked, most teachers admit that documentation of student progress is a weakness because it can be an overwhelming and time-consuming task (Baumann, Hoffman, Duffy-Hester, & Moon Ro, 2000; Holloway, 2000; McGarvey, Marriott, Morgan, & Abbott, 1997; Roy, Guay, & Valois, 2013; Tobin & McInnes, 2008). Other teachers say that they simply lack the knowledge and skills to develop a system for assessing and documenting students' progress (Tomlinson et al., 2003). Van der Scheer et al. (2017) provided insight into the development of teachers' instructional skills during a data-based decision-making intervention. The main finding of this study was that teachers, in response to an intensive data-based decision-making professional development program, improved their decision-making related teaching skills significantly. The related variance component of 0.93 is large in terms Cohen's criteria (1988). After the intervention, they used instruction groups more often and presented and evaluated lesson objectives more.

Decision-Making in RtI. A distinct area of research within teacher decision-making is within the domain of RtI. Classroom teachers are required to identify and implement empirically-based, student-specific instructional interventions with increasing levels of precision and at higher levels of accountability than ever before (Fuchs, 2007; Fuchs, Fuchs, & Vaughn, 2008; Gersten & Hitchcock, 2008). Since 2002 many state educational agencies have mandated full implementation of RtI.

Within these mandated systems, teachers and schools must show systematic, consistent, comprehensive applications of evidence-based practice in academics in more comprehensive and quantifiable ways (Case, Speece, & Molloy, 2003; Gersten & Hitchcok, 2008). The underlying premise of RtI is that children who are performing below the cut off score for an acceptable level should gain access to intense and individualized academic intervention. The problem-solving approach to RtI focuses on the individual and consists of four steps: (a) problem identification; (b) problem analysis; (c) exploring solutions; and (d) evaluating solutions. In summary, the RtI process relies on “proactive, instructional problem solving among educators to develop dynamic instructional or intervention plans that are based on assessment data and that address academic or behavioral concerns about students” (Gresham & Little, 2012, p. 22). It is important to note that RtI is in fact the decision-making model. In other words, RtI serves as the framework that teachers follow to identify practices and make decisions. Specifically, in mathematics, the focus of RtI is on the effective use of evidence-based instructional approaches and strategies within the classroom while continuously monitoring student learning (Fletcher, Denton, & Tilly, 2006;

Fuchs & Deshler, 2007; Fuchs & Fuchs, 2005; Gersten, Baker, Jordan, & Flojo, 2009; Riccomini & Witzel, 2010). There is a set of questions in the RtI framework that aids in the decision-making process for teachers. These questions should guide the instructional planning for teachers. Gresham and Little (2018) compiled the list of guiding questions within the framework in mathematics, which are as follows:

1. What are the critical mathematical concepts and skills to be learned by all students?
2. How do the current resources in my classroom address the selected lesson's mathematical concepts and skills of the standard I am to teach?
3. What prior mathematical knowledge do students need or have to master to reach the content standard?
4. What may be sources of difficulty and confusion for the students?
5. How can this lesson build on students' prior mathematical knowledge and experiences?
6. What will students think and do in response to the instructional lesson?
7. What scaffolding and support can I provide to meet the needs of all learners through differentiating instruction and accommodating individuals?
8. Which questions, resources, strategies, activities, examples, and so on will clarify and/or extend conceptual learning by students?
9. Which grouping arrangements, accommodations, adaptations, use of levels of learning, cognitive/metacognitive strategies, and/or technology are needed for whole/small groups of students?
10. How can I make the mathematical learning task less complex without changing the goal?
11. What kinds of data are available and will help us assess students' mathematics progress toward the set mathematical goals?

12. How will I check for mathematical conceptual understanding and depth of mathematical knowledge? (p.22)

However, whether the decision-making is specifically within the RtI framework or data-based decision-making, the gestalt of the literature on teacher perspectives is overwhelmingly negative. Studies in this area show that teachers are resistant to learning more about data-driven decision-making, and they feel like they are unlikely to use data-driven decision-making in their classrooms (Dunn, 2016; Joseph et al., 2014; Mokhtari et al., 2015). The resistance is due to the scientific approach that data-based decision-making takes and the fear that it takes away some of the gut-feeling decisions.

Differentiated Instruction

Furthermore, the literature points to the fact that teachers may be resistant to implementation of decision-making frameworks because they are unable to provide the differentiation that is needed when students' needs are individualized (Baumann et al., 2000; Holloway, 2000; McGarvey et al., 1997; Roy et al., 2013; Tobin & McInnes, 2008.) The literature on differentiated instruction states that it is a philosophy about teaching and learning based on some set beliefs (i.e., such as ability to learn, different approaches to teaching, and the need for presenting material at different levels of acquisition). Differentiated instruction challenges the traditional way of teaching because student variance is embraced, and student learning is increased by responsive teaching (Tomlinson & Allan, 2000; Tomlinson & Kalbfleisch, 1998). Differentiated instruction is based on the premise that no two students are alike, and therefore students should be provided with many opportunities for conceptualizing information and making sense of ideas (Bell, 2016; Holloway, 2000; McGarvey et al., 1997; Tobin & McInnes, 2008). Tomlinson (1999) contended, "Teachers in the differentiated classroom do not reach for standardized, mass-produced instruction assumed to be a good fit for all students because they recognize that all students are individuals" (p. 2). The approach encompasses modifying the content, process, product, and learning environment for each learner while considering the readiness, interest, and learning profile of each individual (Tomlinson, 1999).

Although teachers contend with how to effectively meet the learning needs of students who range in learning readiness, interests and cultural views, and experiences (Tomlinson & Dockerman, 2002), the literature indicates that there is resistance to differentiation by teacher groups regardless of their assignment (Gregory & Chapman, 2007; Gregory & Kuzmich, 2004; Heacox, 2002) because it is not the way that they envisioned teaching.

Although I have reviewed the available literature in teacher decision-making as an interactive process, as a data-based decision framework, and within the construct of differentiated instruction, and some of these constructs are similar to the phenomena of interest in this study, no literature examined students with learning disabilities. In summary, interactive decision-making is more about the *how* of teaching not *what* to teach. Data-based decision-making literature has focused on the process and not the praxis, and when it comes to MLD, RtI framework is about diagnosing the student, not serving the students that have already been diagnosed with MLD. Thus, there is not a clear framework that explains the process that teachers undergo in their decision-making on mathematics fact fluency for students with MLD. The purpose of this study to focus on revealing the factors, influencers, and knowledge that teachers negotiate to make instructional decisions. Thus, the need for understanding the process framed through a theory is still imperative.

Conceptual Framework

Corbin and Strauss (2015) do not recommend the use of theoretical framework in grounded theory studies as they explain that the "whole purpose of doing a grounded theory is to develop a theoretical explanatory framework" (p. 53). For my research, the theories that have been used to explain decision-making can be used to justify the choice of methodology, build upon the existing research, and offer an alternative explanation or perspective in a new situation (Corbin & Strauss, 2015). A theory is a systematic way to connect well-developed categories in "terms of their properties and dimensions and interrelated through statements of relationship" (Corbin & Strauss, 2015, p. 62) or propositions. Grounded theory is used to construct new theories, refine or extend existing theories;thus, being familiar with relevant theories through their concepts and constructs helped me to differentiate and interpret my data rather than simply restate current theory. Thus, this study points to theoretical constructs and propositions about these constructs that may be applicable, but without a study which investigates and grounds the theory in data, it would be impossible to know if they are applicable.

Radical Behaviorism

B.F. Skinner's radical behaviorism (Cooper, Heron, & Heward, 2007, p. 11) was the thought process behind the analysis of the function of behavior – the *why* and *what* of the variables that evince particular behaviors, and specifically distinguished apart from methodological (observable) behavior that lends its incipience to the laboratories full of pigeons and rats, levers and buzzers, from the experimental analysis of behavior sector of the academy as one movement in psychology. Offering a unique conceptual framework for explaining human behavior, Skinner (1953, 1957) used the term *radical* to note the stark contrast between methodological behaviorism (Cooper et al., 2007, p. 13) and his approach.

Skinner (1966) takes a different approach to thinking about behavior and mannerisms; rather than placing causal relationships in hypothetical constructs, Skinner's radical behaviorism demonstrates orderly relationships between behavior and the environment. Behaviorism assumes that an individual is passive insofar that individuals do not carry behavioral units around; rather, they respond to a constellation of environmental stimuli, including metacognition and autoclitics (i.e., secondary verbal operants that serve as self-modifiers), akin to audible meta-cognition in real-time (e.g., "I think these kids, wait - does it matter what *I* think?"; Cooper et al., 2007, p. 31). Skinner's theory is essentially based on the fact that when faced with a new stimulus, the individual comes to it with a *clean slate*, and behavior is shaped through (positive and negative) reinforcement, punishment, extinction, and/or a combination of the three (Cooper et al., 2007, p. 37). *Shaped* refers to response discrimination— the ability to emit the correct response under the correct circumstances. Behavior that occurs—anything that anyone does — is, by default, being reinforced. For example, why am I engaged in the emittance of typing behavior? Because it *relieves* the anxiety of this dissertation. As my anxiety is suppressed through hard work, the ability to continue typing is maintained by *negative* reinforcement. Why negative? Because something (the anxiety) to a certain extent, left the environment (of me, the behaver). Outside of respondent behavior (i.e., reflexes), operant positive reinforcement (something added to the environment) and negative reinforcement (something removed from the environment) increase the probability that the behavior that occurred immediately before the consequential stimulus/stimuli will happen again (Cooper et al., 2007, p. 37).

Extinction occurs when a previously reinforced behavior is no longer able to contact the reinforcement that previously maintained the behavioral phenomenon. Extinction can be exemplified when a substitute teacher does not praise a student for raising his hand, as the substitute teacher does not know that the lead teacher gives the student a lot of praise for raising his hand. The student does not receive praise, and the hand-raising behavior, after some time, will undergo extinction, until it stops. Then the student resorts to a maladaptive, alternative behavior that had previously undergone extinction (spontaneous recovery), such as calling out, yelling, answering out-of-turn. Another way to think about extinction is through what is known as *a burst*. For example, when a person presses a cross-walk button, he/she often presses it repeatedly faster and faster – and the inter-response time between button pushes will get shorter and shorter in duration until it stops. Tantrums are much the same (e.g., when a child cries himself/herself to sleep). This is behavior that has undergone extinction.

Positive or negative punishment decreases the likelihood that the behavior will happen again (Cooper et al., 2007, p. 40). Positive indicates the application of a stimulus; negative indicates the removal of a stimulus (Cooper et al., 2007, p. 40). Learning is therefore defined as the contrast of change in behavior in the learner. This entire framework is based on operant conditioning, meaning that behavior is followed by a consequence, and the nature of the consequence modifies the individual's tendency to repeat the behavior in the future. Thus, behavior modification is clear; to suppress undesirable behavior the reinforcement must be removed and replaced with a desirable behavior by reinforcing the new (alternative) behavior.

A functional behavior analysis serves to reach the goal of obtaining information in order to determine the function of a behavior of interest, and if the behavior is problematic, how the individual can get to the same consequence in a more appropriate manner (e.g., asking for a water break rather than bolting out of the room). Both behaviors arrive at the same consequence: access to water (relief of thirst); therefore, the behavior is maintained by negative unconditioned reinforcement. The stimulus in this sense in unconditioned because humans do not need to learn that water is reinforcing; it just is.

Although no studies have been conducted using behaviorism to explain teacher decision-making, and behaviorism will lack the ability to entertain mentalistic states, hypothetical constructs, and/or explanatory fictions (Cooper et al., 2007, p. 12), it can indeed begin to explain what reinforces and punishes the behaviors of decision-making in teachers. The idea is that what people emit as their behavior can then be analyzed and therefore understood (Cooper et al., 2007, p. 15), excluding private events observable only by the individual (emitting the thinking behavior). However, behaviorism lacks the explanation for private events and the explication for emotional responses to a situation.

Attribution Theory

Attribution theory is a psychological theory that attempts to explain some of the causes of behavior. Attribution theory, like behaviorism, can help to explain the behavior of teachers and their thinking about their own behaviors. However, as a theory it does not fully explain teacher decision-making as a process. This theory is often used in business to understand motivation. Attribution theory asserts that a person wants to understand the reason for the actions he/she takes and to understand the reasons behind the actions other people take (Clark & Artiles, 2000; Rae et al., 2011; McArthur, 2011). Individuals normally want to attribute causes to their behaviors, which should give them a feeling of control over their own behaviors and related situations. The theory explains that people are naive psychologists trying to make sense of the social world (Clark & Artiles, 2000). There are two main ideas that make up the attribution theory: (a) internal attribution, the process of assigning the cause of behavior to some internal characteristic, rather than to outside forces. When the behavior of others is explained, the observer looks for enduring internal attributions, such as personality traits; (b) external attributions refers to the process of assigning the cause of behavior to some situation or event outside a person's control rather than to some internal characteristic (Gage, 2017; Gaier, 2015). When our own behavior is explained, the tendency is to make external attributions, such as situational or environment features (Gage, 2017; Gaier, 2015).

Attribution theory explains that attributing behavior is a three-step process. The first step is to observe the behavior; secondly, to determine whether the behavior is intentional, and thirdly to attribute the observed behavior to something (Banks & Woolfson, 2008; Jager & Denessen, 2015; Scott, 1985; Tollefson & Chen, 1988; Wieman & Welsh, 2016; Wood & Benton, 2005; Woodcock & Hitches, 2016; Woodcock & Vialle, 2011). Internal causes are factors attributed to the person being observed. Internal causes are usually controllable where external factors are attributed to circumstances such as luck (Banks & Woolfson, 2008; Jager & Denessen, 2015; Scott, 1985; Wieman & Welsh, 2016; Wood & Benton, 2005; Woodcock & Hitches, 2016; Woodcock & Vialle, 2011; Tollefson & Chen 1988). Attribution theory explains how teachers explain their decision based on the attributions they put on each behavior; however, this theory does not explain how decisions are made or why.

Concerns-Based Adoption Model

From the work of Hall and Hord in 1979, 1987, and 2011, the Concerns-Based Adoption Model (CBAM) arose, and this theory has been used to explain data-based decision-making. The CBAM model is useful in understanding teachers' affective responses, such as resistance, to educational innovations or changes in what is required of the teacher. Concerns are defined as an individual's thoughts, considerations, feelings, worries, satisfactions, and frustrations related to an innovation and/or change (Hall & Hord, 1987). In other words, concerns are emotional responses to an educational innovation and/or change, in this case decision-making in mathematics fluency (Hall & Hord, 1987). Concerns help individuals understand not only the likelihood of a teacher or future teacher adopting an educational innovation, but also the reasons why they may or may not adopt the new practices (George, Hall, & Stiegelbauer, 2006; Hall & Hord, 1987). This understanding can be used to help tailor the teacher's mentoring and/or professional development. There are 30 years of research which support this theory that concerns are predictive of teachers' adoption of targeted innovation and/or change (George et al., 2006). There is research in using CBAM in teacher education and in-service teachers to understand how concerns about data-based decision-making influence their affective states (Hord, Rutherford, Huling-Austin, & Hall, 2005).

Hall and Hord (2011) described the CBAM as ''an empirically based conceptual frame-work that describes, explains, and predicts probable teacher behavior based upon relevant concerns as a teacher participates in developmental activities and implements an innovation'' (Dunn et al., 2013, p. 674). Hall and Hord's (1987) CBAM breaks concerns into seven stages, which follow a developmental pattern and are organized into three categories: (a) Self; (b) Task; and (c) Impact. The seven stages are as follows: (a) unconcerned; (b) informational; (c) personal; (d) management; (e) consequence; (f) collaboration; and (h) refocusing.

Three categories. Self-Concerns pertain to what one knows about an innovation and/ or change and how the innovation/change will impact the individual. This level includes the first three stages of concern: Unconcerned, Informational, and Personal. The Task category includes only one stage of concern, Management Concerns. The more mature or user concerns are the Impact Concerns. Impact-level concerns include stages 4–6 (George et al., 2006; Hall & Hord, 1987; Hall, George, & Rutherford, 1979).

Seven stages. Stage 0, or Unconcerned, reflects a lack of awareness or interest in a specified innovation. Stage 1, or Informational Concerns, indicates an awareness of the innovation as well as an interest in learning more or an awareness of a need to learn more about the innovation. Stage 2, or Personal Concerns, involves thoughts about how the innovation will impact individuals as well as concerns about their ability, personal adequacy, demands that will result from the innovation, and how they will be evaluated, punished, and rewarded. Individuals with Management Concerns or Stage 3 focus on logistics of implementation and the resources and support available to them for implementation. Stage 4, or Consequence Concerns, reflects thoughts, worries, and preoccupations regarding how an innovation will help or hurt students. In Stage 5, or Collaboration, teachers express a desire to work with others to increase and improve use of the innovation. In Stage 6, or Refocusing, teachers are interested in modifying or improving the innovation to improve outcomes (George et al., 2006; Hall & Hord, 1987).

According to this theory it is not just the concern that must be considered when understanding teacher adoption of new innovations and/or changes; the relative position or strength of concerns relative to one another also informs the understanding of where a teacher is in the change process related to adopting a new innovation (Hall & Hord, 1987). This theory has been used in the area of data-based decision-making because RtI requires data-based decisions. The research was using this theory to understand how and if teachers accepted the new initiative. However, it does not address the decision-making process of teachers, and it does not reflect the instructional choices that teachers have. It connects decisions to affective states, but it uses the concept of change as the genesis of the response. This theory does not help explain the decision-making process that teachers go through. It more looks at how teachers see change. However, the three categories and the seven stages could help explain the process that teachers undergo when applying their decision-making to mathematics fact fluency instruction for students with MLD.

In summary, the theories discussed (i.e., behaviorism, attribution theory, and concerns-based adoption model) all share particulars with the phenomenon of teachers' decision-making; however, none of these theories fully address the teachers' process, thinking, and/or affective state within the construct of special education or teaching mathematics to students with MLD. Behaviorism explains the environment and motivating operations that influence decision-making but not the inner thoughts or the experience of the behaver. Moreover, attribution theory explains what contributes to decisions already made. The concerns-based adoption model explains how teachers feel about change, but not how they make decisions.

Mindset

Growth and fixed mindset are labels created by Dweck (2006) which are associated with theories of intelligence: the idea that intelligence is something that can be changed, or it remains static (Yeager & Dweck, 2012). The entity theory is defined as how individuals perceive the intelligence to be static or constant; individuals who hold these views are considered to have a fixed mindset (Dweck, 2000). Incremental theory or growth mindset believes that intelligence can be changed (Dweck, 2000). This theory is important to investigate for this study because evidence suggests that the way in which educators use information about intelligence may directly affect the achievement of students with disabilities in their classroom (Osterholm, Nash, Kritsonis, 2007). Thus, this information can help to unpack teachers' perspectives and thus their decision-making about students with MLD and their mathematics trajectory.

A teacher's mindset beliefs impact student achievement outcomes (Dweck, 1986; Gutshall, 2013; Hohnen & Murphy, 2016; Rattan et al., 2012; Yeager & Dweck, 2012). The research states that a fixed mindset or negative teacher's beliefs about a student's intelligence acts as a limitation to the student's achievement possibilities and the potential to grow (Dweck, 1986; Gutshall, 2013; Hohnen & Murphy, 2016; Rattan et al., 2012; Yeager & Dweck, 2012). In other words, teachers' mindsets influence their instructional techniques and praxis. Mindsets also influence how a teacher inquires and questions the student's learning (Olson & Knott, 2012). Further, mindsets also influence which skills a teacher chooses to engage a student with and how these skills are presented (Olson & Knott, 2012). Thus, teachers who hold a fixed mindset are less likely to invest in their students' growth and scaffold their learning if they think that the change will be minimal (Heslin & VandeWalle, 2008). Teachers with a fixed mindset toward student intelligence and/or towards the student's disability are less likely to invest time with struggling students. Interestingly, individuals who hold these mindsets are largely impacted by their understanding of success and failure (Morehead, 2012).

People with a fixed mindset dread failure, feeling that it reflects badly upon themselves as individuals. On the other hand, people maintaining a growth mindset embrace failure as an opportunity to learn and improve their abilities (Morehead, 2012). Research has primarily focused on the associations between mindsets and motivational variables such as attributions and achievement goals to address how mindset is tied to resilience (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013; Dweck, Chiu, & Hong, 1995; Dweck & Leggett, 1988; Hong, Chiu, Dweck, Lin, & Wan, 1999; Mueller & Dweck, 1998). In other words, individuals with a growth-mindset tend to attribute failure to a lack of effort and adopt learning goals to learn as much as possible when approaching a new task. Individuals with a fixed mindset attribute failure to a lack of ability and adopt performance goals where they strive to outperform others (Dweck & Leggett, 1988).

A series of studies compared reactions to failure by those who attributed failure to a lack of effort (like those with a growth mindset) and those that attributed failure of a lack of ability (akin to a fixed mindset); these studies found that the verbal operants during the tasks were either those that encourage the learner or positivistic (Diener & Dweck, 1978, 1980; Dweck & Leggett, 1988). It is important to note that these theories have not been applied to teacher decision-making; however, the constructs can explain how perspectives influence the actions of teachers towards their students. One of the most significant findings within the mindset research is the aspects which relate to teacher feedback. According to Dweck (2012), when teachers praise students for how clever they are, the teacher might actually be encouraging them to develop a fixed mindset, which might limit their learning potential. On the other hand, if teachers praise students for the hard work and the process that they have engaged in, that helps to develop a growth potential (Dweck, 2012).

Research on teachers with a fixed mindset suggests that these teachers are more likely to judge and label a student as low ability after one poor performance (Rattan et al., 2012). A teacher's mindset also impacts the types of comments and feedback given to students (Schmidt, Shumow, & Kacker-Cam, 2015). Although these theories on intelligence may inform which factors go into decision-making, they do not describe the process that teachers go through to make decisions about mathematics fact fluency for students with MLD.

Summary

Given the positive impact of attaining number combination fluency across different profiles of students with MLD (Burns et al., 2015; Codding et al., 2010; Irish, 2002; Mong & Mong, 2010; Poncy et al., 2010) and understanding that teachers' decision-making processes can be tied to interactive or data-based behaviors (Baumann et al., 2000; Holloway, 2000; McGarvey et al., 1997; Roy et al., 2013; Tobin & McInnes, 2008), this literature review posits that understanding the decision-making of teachers in the domain of mathematics fact fluency is imperative to the achievement of students with MLD. These beliefs and behaviors can influence how teachers attack decisions; however, interactive and data-based decisions do not fully explain the process that teachers undergo when making instructional decisions for students with MLD. Thus, the urgency to understand how teachers navigate the instructional choices for students with MLD when it comes to mathematics fact fluency is imperative to the field. However, understanding decision-making for number combination fact fluency recognizes that the process is not an isolated one. It emerges from a myriad of influences, concepts, and constructs. A theory that has been used to understand data-based decision-making only looks at the idea of data-based instruction as a new initiative. Thus, there was a need to develop a theory that will explain how teachers decide to address number combination fluency in mathematics instruction for students with MLD.

It is imperative to acknowledge that the process of instructional decision-making is not well studied in the teacher population and even less in special education settings. Further, current theories about decision-making have not been applied in the context of teacher decision-making about mathematics instruction for students with MLD. While studies relating to interactive and data-based decision-making may help inform the conversation and understanding around decision-making, they do not provide enough to structure to attach the concepts to gain further understanding. Growth mindset and the theories of intelligence can help to shape the ideas around a fixed mindset in teachers and how these mindsets can act as a ceiling for learning. However, these theories do not explain the complexity of decision-making for students with MLD within a mathematics curricula. This study seeks to create a grounded theory explaining the process of decision-making on mathematics fact fluency by teachers who work with students with MLD. By understanding the process of decision-making from a wide range of mathematics teachers, I created a model of instructional decision-making within the context of number combination fluency for students with MLD. The results of this study may inform the creation of professional development and teacher mentoring program to help teachers in their process of decision-making for students with MLD.

CHAPTER THREE: METHOD

Overview

The purpose of this systematic grounded theory study was to explain the process that teachers undergo in their decision-making in reference to mathematics number fluency. Mathematics fact fluency is imperative to the overall mathematics achievement (Kilpatrick et al., 2001; NMAP, 2008; Patton et al., 1997; Shapiro, 1996; Siegler & Shrager, 1984). The gestalt of the research on number combination fluency states that students with MLD can become fluent in mathematics number combinations (Gersten et al., 2005, 2007). The field has identified at least five instructional approaches that increase mathematics number combination fluency for students with MLD (Burns et al., 2010; Myers et al., 2015; Stocker & Kubina, 2017). However, questions about how much of this information is available at the instruction level and whether or not teachers know what is available for their use is an area that this qualitative study will investigate. In addition, the process that teachers undergo when making instructional decisions when it comes to mathematics fluency is an additional area of interest. However, no studies have been found that focus on understanding the decision-making process that teachers undertake to make instructional decisions for students with MLD when it comes to mathematics fact fluency.

This chapter provides the rationale for using a qualitative method and specifically grounded theory to conduct this study examining the decision-making process that teachers undertake to make instructional decisions for students with MLD when it comes to mathematics fact fluency. The setting, participants, and procedures are outlined to contribute to an audit trail and enable replication. Also, my role as a human instrument of this research is outlined. Detailed description of the data collection and analysis is provided. Lastly, I explain how trustworthiness measures and ethical considerations were addressed in the study.

Design

A qualitative research study allows for fluid, evolving, and dynamic interaction with the participants and the data. Using a qualitative approach allowed me to the opportunity to connect with my research participants and to see the experiences from their viewpoint and understand their decision-making process. The most current research calls for understanding how teachers decide on the mathematics interventions that they choose (Everett, Swift, McKenney & Jewell, 2016; Stocker & Kubina, 2017). As a result of this significant gap in the literature further research is needed to develop a model explaining how teachers undertake the decision-making process for fluency interventions and how professional development can be improved to point teachers at the evidence-based interventions available. Qualitative research provided the opportunity to fully understand the thinking and decision-making process of the teachers in a way that is not available in quantitative methodology. Furthermore, a qualitative approach allowed "for a holistic and comprehensive approach to studying this phenomenon" (Corbin & Strauss, 2015, p. 6).

Grounded theory "provides a tried-and-true set of procedures for constructing theory from data" (Corbin & Strauss, 2015, p. 11), hence a valid design for this study. Grounded theory allowed me to "examine topics and related behaviors from many different angles – thus developing comprehensive explanations" (Corbin & Strauss, 2015, p.11) that will help in understanding the process that teachers undergo in their decision-making by developing themes and understandings that may provide the basis of a theory. The main emphasis of grounded theory is on theory development with the "purpose of constructing theory grounded in data" (Corbin & Strauss, 2015, p. 6), a practice, or a process that others should strive to model. However, for this study, the model is most valuable for determining where the research-to-practice gap occurs and what is reinforcing it. In addition, the use of grounded theory helped reveal the implications associated with understanding the process teachers undergo. Thus, the interventions can be designed to improve the teachers' decision-making process to ensure teachers are making decisions based on evidence, not intuition, assumptions, or efficiency, pressure to pass tests, or other influencers that are not based on data. Also, a grounded theory design allowed concepts grounded in the data to construct the theory instead of choosing a theory before beginning research (Corbin & Strauss, 2015).

Systematic grounded theory provides a structure to the research and analysis process and allows the literature review to inform the research throughout the study (Corbin & Strauss, 2015; Strauss & Corbin, 1998). Grounded theory has several variations; however, the differences between Glaser and Strauss is most notable. Although Barney Glaser and Anselm Strauss co-authored *The Discovery of Grounded Theory* (1967), they disagreed about the nature of grounded theory. In 1992, Glaser published *Emergence vs Forcing: Basics of Grounded Theory Analysis*. This book was written in response to Strauss and Corbin's (1990) *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. Glaser discussed his opinion about Strauss and Corbin's book; he believed that the book presented a version of grounded theory that was too prescriptive and argued that the method outlined in Strauss and Corbin's book was not grounded theory because it did not facilitate the emergence of theory from data but rather a method that produced "full scale conceptual forced description" (Glaser, 1992, pp. 61–62). Glaser argued that the methods interfere with, rather than facilitate, the process of discovery. Glaser disagreed with Strauss and Corbin's (1990, p. 38) definition of the research question as "a statement which identifies the phenomenon to be studied." Instead, he proposed that the focus of the research emerges in the early stages of the research itself. Glaser also disagreed with Strauss and Corbin's coding paradigm, particularly axial coding. Glaser argued that Strauss and Corbin's approach to coding introduces preconceptions into the analysis that are incompatible with the spirit of grounded theory. Furthermore, while Glaser proposed that verification (of relationships between categories, of emerging theories) is not part of the grounded theory method, Strauss and Corbin maintain that verificational work is built into the research process itself.

As a new researcher in qualitative methods, the systematic grounded theory approach provided me with a framework or recipe for arriving at theory development (Corbin & Strauss, 2015). The systematic coding of the data to develop concepts, and categories, and linking categories to arrive at a core category, which became the storyline, helped to gain the most useful theory of the data. Systematic grounded theory gave me the freedom to search the literature and conduct a review of it before the start of data gathering. The structures of constant comparison, theoretical saturation, and the final outcome, a visual model depicting the process teachers undergo related to their decision-making surrounding the instruction of number combination fluency as a part of the core class, as an intervention, or not at all. In short, using grounded theory, this study generated a new theory that explains the instructional decision-making of teachers who serve students with MLD in a mathematics setting.

Research Questions

In this study I explored the thinking, behaviors, and factors that influence teachers' instructional decisions in relation to mathematics number combination fluency. Therefore, the study was guided by the following research questions:

The central question: What is the process that teachers undertake when making instructional decisions on number-combination mathematics fluency for students with MLD?

Subsequent question 1: What constructs do teachers attribute to the development of their beliefs about the attainment of mathematics number combination fluency for students with MLD?

Subsequent question 2: How do teachers describe the outcomes of their instructional decision-making in mathematics fact fluency for students with MLD?

Setting

The study setting was limited to elementary and middle schools in the United States. The school must serve students diagnosed or identified with an MLD whether by discrepancy model or through the RtI framework.

Teachers were recruited from private, private independent, Christian, charter, and public-school settings to account for as many possible experiences, settings, and backgrounds. The setting diversity provides transferability to the findings while reaching theoretical saturation. Moreover, the maximum variation in the setting provides credibility to the research and increase the reach of impact because the model can be applied in more settings with more teachers. Lastly the variation benefits this research by adding transferability and allowing for maximum saturation of the data. I contacted school principals and department heads via email (see Appendix B) to gain permission to solicit and work with teachers within their schools.

Participants

For this study the participant pool came from schools in southern, mountain, and southeast regions of the United States. I recruited licensed teachers who teach in grades 3–8 and teach mathematics to at least one student with a diagnosed MLD. Licensure is defined as completing a teacher preparation program, passing a background check, passing exams, and completing student teaching which will result in a license number. In addition, participants must have at least one year of teaching experience with a student with MLD and be certified in special education. Participants were given a questionnaire (see Appendix C) to ensure that they, in fact, make instructional decisions about the student with MLD and have at least one year of teaching experience. In addition, their demographic information and the results are included in a table. This questionnaire helped me locate a theoretical sample and, to respect the time of my potential participants, I avoided interviewing teachers who are not decision makers within the domain of mathematics. The initial questionnaire allowed for the study to have participants who can truly speak to their experiences in instructional decision-making in mathematics fact fluency for students with MLD. Teachers who qualified and volunteered were part of the follow-up interviews and other data gathering activities.

Teachers who qualified were invited to participate in the study. I utilized sampling protocols, including purposeful theoretical selection and maximum variation. The variation that I sought in this study was in reference to setting. I engaged with teachers who are in Special Education, general education, private and public schools. In order to gain access to teachers in a variety of settings, I leveraged my professional network of administrators and Heads of School through The Northwest Association of Independent Schools (NWAIS) and NAIS (National Association of Independent Schools) local public and private schools that use licensed teachers. Upon Institutional Review Board (IRB) approval from Liberty University, I sent the initial screening questionnaire online through email to identify the participants who teach mathematics to students with MLD and are decision-makers in their instructional practices. I kept track of demographics including the type of setting, gender of teacher, race/ethnicity, and participant age to gain a broad representation of participants for the study. I sought variation in gender, ethnicity, grade level they teach, and years of experience. Demographic figures are presented below:

Table 1

Summary of Participant Demographics

Name	Setting	Location	Race/Ethnicity	Experience (in years)	Gender	Age	Decision Making
Ricky	Private	PNW	White – Not Hispanic	2	M	42	Yes
Lunina	Public	Texas	Hispanic	15	F	68	Yes
Jules	Public	Texas	Mixed race	3	F	28	Yes
Mrs. W	Public	Texas	Black	15	F	55	Yes
Joy	Public	Texas	Black	14	F	36	Yes
Ramon	Public	Texas	Black	22	M	48	Yes
Noah	Public	South Carolina	Hispanic	6	F	32	Yes
Imani	Private	Georgia	Black	2	F	24	Yes
Cassandra	Public	South Carolina	Black	14	F	35	Yes
Stacey	Private	Colorado	Black	25	F	46	Yes
Gregg	Private	Colorado	White – Not Hispanic	4	M	26	Yes

I anticipated a sample size of 10 – 20 participants, adding participants until theoretical saturation of the data was reached (Creswell, 2013). The questionnaire went out to 33 possible participants. Grounded theory requires the researcher to be immersed in the research field and to establish and maintain relationships with participants, and "therefore, a small number of cases (less than 20, say) will facilitate the researcher's close association with the respondents, and enhance the validity of fine-grained, in-depth inquiry in naturalistic settings" (Crouch & McKenzie, 2006, p. 485). Saturation is achieved once all the major categories are "fully developed, show variation, and are integrated" (Corbin & Strauss, 2015, p. 135). In other words, enough variation has been sampled and the themes are established and begin to repeat.

Procedures

Upon successfully defending my dissertation proposal, I applied for approval from the IRB of Liberty University. After gaining IRB approval, I secured site approvals and then emailed the questionnaire to the teachers (see Appendix C) to begin the process of collecting data by pre-screening potential participants. Built into the questionnaire is an informed consent (see Appendix D). Questionnaires were analyzed to see how many teachers met criteria. In the event that more than 20 teachers met the criteria, the sample would be chosen by teachers with the greatest experience teaching mathematics to students with MLD and their setting. The second set of teachers would be determined by the number of years teaching students with MLD. If needed, the third criteria would be the number of students with MLD in their current roster. Once teachers were identified as participants, they were emailed one vignette which placed teachers in hypothetical situations where they needed to explain in writing, voice memo, or video recording their instructional decisions and reasons behind fact fluency instruction. After the vignette response was received, I realized that the decision-making process for teachers in some districts may be in the classroom and not so much in the writing of the education plan. Thus, I adjusted the interview questions to be more open ended, in fact creating two sets of questions. Once this was completed, the one-to-one interview was scheduled. Interviews were recorded and transcribed. During the interview the participants were given one additional vignette and their responses were integrated into the semi-structured interview. At the end of the interview, the student profile and the instructional plan were requested.

The constant comparison method was used to analyze the data as soon as each artifact was received. As much as possible, the data analysis was done electronically, including the initial survey and the written review of profiles and instructional plans. Vignette results and interviews were transcribed and uploaded to software for analysis. Memos and analysis were also uploaded to NVivo 12. Any artifact that was received in a non-electronic fashion was digitized. During the research, no participant needed to be excluded because they did not meet the criteria of instructional decision-making; however, in the event that this had been the case, my plan was to segregate their data from the study, and the data would be destroyed.

The Researcher's Role

I have been in education my entire adult life. I went through a teaching preparation program in my undergraduate program, and my original certification was in Middle Grades Social Science. My teacher preparation did not include any work with students diagnosed with a disability. My first day of teaching my principal gave me a stack of files and said, "Here are your IEP kids." The statement was shocking to me, and when I started to review the cases, I had 12 students who all needed to sit by the teacher and 22 needed guided notes, and 18 needed extended time, and the list went on. I sought help and assistance, and I was told that students with disabilities could not slow down the curricula. At that very moment in my early career, I realized that I had just entered into a world that needed change, and that I needed to understand and learn more.

After my first year, I decided to go back to school. I entered into a Master of Arts in Education program with an emphasis on Special Education. In my first class, I was assigned to read the book, *One Child* by Torey Hayden. The book was a source of angst for me. I did not quite understand it, but I connected with some of the stories told in a profound way. I can state that his book changed my life. The master's degree program had four field experience placements. During these experiences I found myself understanding Torey Hayden, and I found the most joy and sense of accomplishment that I had ever felt. Once my degree was completed, I went to work in special education. My first job was in a self-contained classroom for students with autism. Since that placement, I have had experiences as a resource room teacher, a reading specialist, and a math specialist.

For the next 10 years, I held different positions in either special education administration or school administration. During this time, I realize that there is a breakdown in mathematics instruction for students who struggle and students identified with a learning disability. I reached out to Dr. David Allsopp at the University of South Florida. We worked at identifying algebraic literacy gaps and curriculum issues for students who struggle. Most impactful is that during these experiences I started to observe that teachers are often disenfranchised from the process, they lack autonomy (e.g., curricula scope and sequence is mandated) and often hold negative beliefs about students with learning disabilities (e.g., students with MLD cannot learn mathematics facts because of the long-term memory and/or retrieval issues).

The next stage of my professional career was a three-year whirlwind of large-scale research at The University of Texas at Austin, with Dr. Dianne Bryant, where I was enrolled as a full-time doctoral student. While working as the project manager of a large-scale Institute of Educational Sciences (IES) grant and learning from Dr. Bryant, I spent a majority of my time in the classroom, specifically in middle-school Tier 2 classrooms. While conducting classroom visits and during teacher trainings, I once again observed teachers with negative views about the students they serve and a diminished autonomy over their teaching choices. I also observed a new influence, the general education teachers had a great deal of power over the intervention courses, and they had a very different view of what the Tier 2 interventions should look like; they pushed for pre-teaching of core objectives because they needed the students to pass the state test. This push for tutoring also created a large resistance from administration on teaching conceptual understanding of mathematics or even approaching the idea of teaching requisite knowledge. Lastly, the heartbreak was when I realized that the research that I was part of, was situated in a vacuum for federal government reports, for presentations at research conferences, and the many papers that were written for publication. Leaving large scale research behind, I now live in Seattle, Washington, and I am the Executive Director of an independent school. My job allows me to have relationships with other schools within NWAIS and other private schools in the greater Seattle area. The research and the experiences cannot be separated from who I am, and how I see the needs and the promise for students with MLD.

As a long time, special education teacher, administrator, and researcher, I have many experiences that affect my lens. I have a unique perspective on this research because I have been the teacher who needed to decide how to improve mathematics outcomes for students with MLD. I have also been the administrator who promotes a specific curricular design and searches for answers in mathematics instruction. I have been in classrooms that work and classrooms that do not work. I have also been in the field doing research and speaking to principals and district administrators; I have heard and observed uninformed, mentalistic, gut feeling decision-making; I have recently worked with teachers to improve their mathematics instruction for students with MLD and have seen the interventions work first hand. These experiences alongside my views on teachers, the special education process, placements, and specifically the decline of the field of learning disabilities due to the inclusive model and misunderstandings of the LRE give me a distinct perspective on the praxis of mathematics instruction for students with MLD.

The methods utilized in grounded theory match my scientific ideals of understanding human behavior and the processes that they go through to make decisions. My strong research skills and knowledge of quantitative methods alongside the structured methods of grounded theory complement and align well.

Data Collection

In order to build a theory or model many sources of data should be utilized: "One of the virtues of grounded theory studies and qualitative research, in general, is that there are many different sources of data" (Corbin & Strauss, 2015, p. 37). Therefore, for this study in order to build a model explaining the decision-making process that teachers undertake in respect to mathematics fact fluency instruction, many sources of data were collected and analyzed, and then narrowed down to core categories.

A Research Journal

After reading Corbin and Strauss (2015), I started a research journal. Following their advice, the journal kept a record of all the activities that transpired during this study. I journaled about ideas, appointments, special events, commentaries, and after each data collection phase. This journaling helped to keep me aware of my bias and assumptions and rationale for making certain decisions.

Theoretical Memos

Theoretical Memos are documents that I wrote as I proceeded through the analysis of a corpus of data. The theoretical memo occurred in the program NVivo 12 and the memos noted how details of data, whether the text or codes, relates to the literature. These memos aided in the development of the theoretical implications of teacher decision-making for mathematics fact fluency for students with MLD. In other words, the final theory is an integration of several theoretical memos. Writing theoretical memos allowed me to think theoretically about the data (Corbin & Strauss, 2015).

Questionnaire

In an effort to gather participants who met my established criteria, a questionnaire was given electronically to those who were willing to participate in the study (see Appendix C). The questionnaire targeted questions about experience, licensure, teaching mathematics to students with MLD, and the autonomy to make instructional decisions. If the participant indicated no to any of the yes or no questions, they were taken to a screen that thanked them for their time. If the participants indicate yes to the yes and no questions, they were taken to a screen to acknowledge their desire to participate in the study and sign the informed consent.

Response to Vignettes

Vignettes are short scenarios in written or pictorial form, intended to elicit responses to typical scenarios (Hill, 1997). These scenarios should be concrete examples of people and their behaviors on which participants can offer comments or opinions (Hazel, 1995). Therefore, the vignette technique can be used as a method to elicit perceptions, opinions, beliefs, and attitudes from responses or comments to stories depicting scenarios and situations (Hughes, 1998). In qualitative research, participants are usually asked to respond to a particular situation by stating what they would do, or how they imagine a third person, generally a character in the story, would react to certain situations or occurrences. I drafted two vignettes (see Appendix E) using different profiles of students with MLD. These vignettes placed teachers in hypothetical situations where they needed to explain their instructional decisions and reasons behind fact fluency instruction. One prompt was given in a survey format online; the exact wording of the prompt is listed in Appendix E. The response could be written, audio recorded, or videotaped. The responses were transcribed and analyzed. The second prompt was given during the face to face interview and was recorded as part of the interview (see Appendix F). The purpose of this exercise was to understand the metacognitive process of their stepwise decision-making process. These vignettes assisted in answering Subsequent Question 4: What constructs are revealed when teachers' decision-making process is unpacked?

Interviews

Interviews are the most common format of data collection in qualitative research (Kvale & Brinkman, 2009). Interviews are an attempt to elicit the participants' stories, to the extent they are willing to share them. Interviews strive to gather complete accounts and represent the data fairly (Oakley, 1999). According to Oakley (1999), interviews are a type of framework in qualitative research that is best defined as a series of steps in a procedure (Creswell, 2007). Collecting a substantial amount of in-depth data offsets the possible negative effects of several possible misleading accounts and thus reduces the likelihood of the researcher making misleading claims or writing a superficial analysis (Oakley, 1999).

In an effort to maintain a level of consistency over the concepts that are covered in each interview, a semi-structured, open-ended interview was used (Corbin & Strauss, 2015). A semi-structured interview also allowed for off-script questions and to clarify responses. Furthermore, the IRB required an interview guide, and with this type of interview, I was able to provide it. The interview guide can be found in Appendix F. Lastly, the semi-structured interview allowed for grouping answers for data analysis in a systematic fashion.

The interviews were held at a location chosen by the participants, and they were recorded using an iPad with a voice recording app; I then transcribed the interview verbatim. After the interviews are transcribed, I reviewed the audio and transcripts to ensure accuracy of transcription. Filler language and grammatical errors were corrected. Conversations that were immaterial were maintained in the master file but removed for member checking purposes. The transcriptions were sent to participants for member checks. Email directions were attached (see Appendix G).

The following is the list of question prompts:

Teaching:

1. Why did you become a teacher?
2. Describe what or who has influenced your teaching style?
3. What do you think has shaped your views of teaching and your role as a teacher?
4. Describe your purpose as a teacher.

Learning Disabilities:

1. Please define learning disabilities.
2. What is a Mathematics Learning Disability?
3. What are your thoughts on whether MLD is underrepresented as a diagnosed disability?
4. Please describe what teaching practices a student with MLD should receive.
5. How do you define intelligence?

6. What do you believe about students with MLD's potential?
7. How do you view your students with MLD?

Mathematics Instruction:

1. Describe your philosophy in mathematics instruction.
2. What informs your choice on what objectives you have to cover in a school year?
3. Explain your rationale or approach to math facts.
4. Explain your process for assessing math fact fluency.
5. Discuss your thoughts on who is responsible for teaching math facts.
6. How do you determine automaticity in math facts?
7. How long do you spend teaching math facts?
8. What programs have you used to teach math facts?
9. How do you determine what program to use?
10. Explain your use of WWC or similar database.

Instructional Decision-Making:

1. What information do you collect and review when making instructional plans for students with MLD?
2. What information is most important in this process?
3. Describe your instructional decision-making process?
4. Explain how you use curricula, and what curricula choices you have.
5. Explain how you use standards.
6. How is your success or accountability measured?

7. What are the goals for students with MLD in math at your school, your classroom? Explain how you determine which accommodations or modifications are included in the IEP and then part of the academic plan.
8. When and how do you determine if a math facts intervention is needed?
9. Explain what you know about the research on math facts.

The purpose of the questions about teaching were to gather information about the teachers' philosophies on teaching and learning. I believe that by describing their roles and journey, they provided insight on how they engage in their decision-making. The format of the interview was intended to bracket the teacher's perspectives on teaching, mathematics instruction, and students with MLD to establish the context of decision-making. The questions under this heading were geared to answering subsequent research question one: What constructs do teachers attribute to the development of their beliefs about the attainment of mathematics number combination fluency for students with MLD?

The questions related to learning disabilities probed the teacher's mindset on intelligence and their beliefs about student intelligence and ability (Dweck, 2005). Questioning about disabilities also provided a profound narrative into their praxis based on perceptions about student attainment (Fuchs et al., 2009). In addition, it revealed whether they understand the different instructional needs of students with MLD in mathematics instruction (Datnow & Hubbard, 2015; Poortman et al., 2016). These questions answered subsequent question two: How do teachers describe the outcomes of their instructional decision-making in mathematics fact fluency for students with MLD?

The questions related to decision-making probed factors that influence the decision-making process; they also probed how they attack the process (Cornett & Knight, 2009; Joyce &

Showers, 2002). These set of questions generated discussion on whether or not mathematics fact fluency is important to their practice and how it weaves in to instructional time. The questions under this heading aimed to answer subsequent question two: How do teachers describe the outcomes of their instructional decision-making in mathematics fact fluency for students with MLD?

Prior to using the interview guide in the field, I discussed the guide with my chair, Dr. Spaulding, who is an experienced researcher in grounded theory. Changes in substance to the question guide for clarity and word choice were made prior to submitting the prospectus to the IRB for approval. The questions were also reviewed with former co-workers outside of the study sample to ensure clarity of wording and flow of the interview process. Changes were made per their feedback.

Review of Case Load

The participant teacher's caseload of students with MLD was reviewed and analyzed to determine what decisions were made in relation to mathematics fluency instruction. Teacher caseload is synonymous with workload, and for this research, I was concerned with the caseload of students diagnosed with MLD only. Caseload refers to the individual plan for each student with MLD they serve: the accommodations, modifications, and differentiation that is part of the instruction within goals and standard expectations. For this exercise, the documents that were reviewed were IEPs with student names redacted, or in the case of private schools, the document that detailed the plan for that student with names redacted. The documents described the students' present level of performance and their intervention plan. These results were coded in the same manner as the vignette and interviews. The purpose of the review was to identify the actual instructional decisions that were made. This exercise revealed any inconsistencies with the unpacking of decision-making through the vignettes and interview. In other words, the caseload is the actual permanent product of instructional decisions that have been made. The caseload review was another way to extract pertinent information regarding the decision-making process. The teachers were asked to write a short summary of the case and the influences that were pertinent during their process of decision-making as well as the student academic outcomes (see Appendix H for a sample of the prompt). This exercise aimed to answer supporting research question 2: How do teachers describe the outcomes of their instructional decision-making in mathematics fact fluency for students with MLD?

Data Analysis

I utilized the data analysis methods of Corbin and Strauss (2015) to analyze the data. These methods allowed me to analyze the transcripts in a methodical manner, and I was able to identify themes and trends and repeating concepts in an effort to develop a theory from these data. For the analytic process, I used constant comparison as the tool for comparing different pieces of data against each other for similarities and differences (Corbin & Strauss, 2015). It is imperative to remember that the goal of this study was to construct a theory or, at a lower level, create a conceptual order or model depicting the instructional decision-making that teachers undergo on mathematics fact fluency for students with an MLD. The data analysis process described by Corbin and Strauss (2015) provided a framework and procedures to analyze data in a structured way. Data analysis was an ongoing process throughout the research, and it was generative in that it allowed for the genesis of meaning and explication. I attempted to break down data into manageable analytic pieces, brainstorm with data in order to arrive at possible meaning, differentiate between levels of concepts, apply comparative analysis, develop concepts, generate memos, and make use of theoretical sampling until I reached theoretical saturation.

Coding

Interviews were transcribed verbatim immediately following completion. I systematically coded the interview transcripts, responses to vignettes, along with field notes and memos after each session. During coding, I followed the suggestions of asking questions of the data, the precision of coding, writing reflections, and minimizing my assumptions. Coding followed the three-step process described by Corbin and Strauss (2015) including open, axial, and selective coding.

Open coding. During open coding, coding categories emerged that were categorical and dimensional (Corbin & Strauss, 2015). Through this open coding process, I assigned labels to identify categories. In vivo codes provided categories in the participants' own words which captured their voice in the research (Corbin & Strauss, 2015). Corbin and Strauss stated that the participants' voices provide the most accurate and descriptive codes for phenomena being studied.

I used NVivo 12 software to code the data and identify different emerging concepts as well as memoing notations in the software program. As concepts emerged, I used analytical tools to refrain from ignoring the data or constructs. In other words, open coding allowed me to denote concepts to stand for meaning. The analytical tools that were used included questioning, analysis of a word, phrases, or sentences; the flip-flop techniques; making close-in and far-out comparisons; and waving the red flag (Corbin & Strauss, 2015). I used these concepts or words to interpret meaning. During the process, the meaning of the data was considered from different aspects, and assumptions were questioned and constantly compared to the new data.

Axial coding. I continued to use NVivo 12 software during the axial coding stage. From the concepts that emerged, the data was reviewed and grouped into categories. These categories related to conditions, consequences, and strategies and they were linked to each other. The theoretical memos (e.g., internal dialogue, handwritten notes, *in situ* memos) reflected my thinking process and the connections that I make between ideas, themes, and constructs. Corbin and Strauss (2015) recommend using four categories during this stage (i.e., causal conditions—factors that cause core, intervening conditions; factors that influence core; specific strategies-responsive actions to core concept; and consequences-outcomes of strategies). I used the software as a tool to translate these connections into webs or graphic representations.

Selective coding. During the selective coding stage, the integration of the categories from the previous coding process took place. Categories were analyzed to determine the core category at a theoretical and abstract level of analysis (Corbin & Strauss, 2015). This core category became the storyline of the results and theory development, and conditional propositions or hypotheses were framed. The result of this process of analysis was "the process of selecting the core category, systematically relating it to other categories, validating those relationships, and filling in categories that needed further refinement and development" (Corbin & Strauss, 2015, p. 116). Therefore, a visual model emerged from the data. This model focused on the constructs and categories and relationships between them and gave a clear visual explanation for the theory structure.

Constant Comparison

The analysis process informed iterations of data collection, and this process continued until a strong theoretical understanding of the phenomenon emerged. The constant comparison process was utilized to ensure the conformity and coherence of codes, concepts, and categories. This process helped in warranting the reliability of new categories and to prove that the theory was sufficiently developed. This process allowed for the data to be broken into parts and each part compared for similarities and differences. Similar data was grouped together under the same conceptual heading, then grouped to form categories or themes until there was saturation of the categories.

Rater Test

After the secondary open and axial coding process, I utilized the rater test function within NVivo 12 to set up a rater test for a consultant. This test rated the application of the open coding over the interview questions. Upon conclusion of the test, NVivo 12 calculated a statistic to determine agreement in coding using four interview questions and four participants' excerpts for the rater test. I met with the consultant and discussed the research questions and the interview questions. Using a coding form that incorporated code titles and code descriptions, NVivo 12 calculated Cohen's Kappa coefficient, which is a statistical measure of inter-rater reliability which takes into account the amount of agreement that could be expected to occur through chance. Kappa values below 0.40 are interpreted to mean poor agreement, values of 0.40 to 0.75 are interpreted to mean fair to good agreement, and anything over 0.75 is considered excellent agreement. The rater test from NVivo12 was .68, which is considered good agreement.

The final product was shared with the participants to ensure their voices were accurately represented through member-checking procedures. None of the participants requested any change and most did not reply.

Trustworthiness

The goal of the research was for the ideas that developed from the research to be translated into practice as strategies or techniques that will inform pre-service and in-service teachers on how to utilize the data from their student profiles to create a hierarchy of needed mathematical domains and thus inform their instructional decisions. Therefore, the authenticity of the findings needs to be assessed. In qualitative research, validity and reliability are addressed through establishing that the research study's findings are credible, transferable, confirmable, and dependable (Creswell, 2013). These four validation strategies were part of the study and addressed in this section, with an end goal being a quality process that produces a quality final product which makes sense and adds value to the field.

Credibility

Credibility refers to establishing confidence in the "truth" of the findings. In this study, I addressed credibility through the use of triangulation of sources. Triangulation of sources involves using multiple data sources in an investigation to produce understanding (Creswell, 2015). Examining the consistency of different data sources also confirms the findings by revealing the same story from different datasets.

Credibility was also established through member checks. Member checks refer to the process of having the transcripts as well as interpretations or conclusions tested with the members of those groups. Member checks provide an opportunity to understand and assess what the participant intended to do through his or her actions; it also gives participants the opportunity to correct errors and challenge what is perceived as wrong interpretations.

Dependability

Dependability refers to the ability to show that the findings are consistent and could be repeated. Dependability was addressed in three parts during my research. First, my use of journaling to make a permanent product of each step enhanced dependability. Second, I created an audit trail detailing my research steps along with extensive appendices with samples. The audit trail ensured that each step is replicable and an independent review of the design, data collection, and analysis is possible. Third, I conducted a rater test to verify my coding reliability and accuracy of identifying meaning.

Confirmability

Confirmability refers to the degree of neutrality or the extent to which the findings of a study are shaped by the respondents and not researcher bias, motivation, or interest (Creswell, 1998). Confirmability was addressed by the use of triangulation, the audit trail, and reflexivity. Reflexivity is about systematically keeping knowledge construction. I kept a journal to keep an account for decision-making and how I was thinking about each construct.

Transferability

Transferability refers to the ability of the findings to be applicable in other contexts. I addressed transferability through thick descriptions and seeking variation in sites and samples. Thick descriptions are described by Lincoln and Guba (1985) as a way of achieving a type of external validity. By describing a phenomenon in sufficient detail, one can begin to evaluate the extent to which the conclusions drawn are transferable to other times, settings, situations, and people.

Ethical Considerations

Corbin and Strauss (2015) discuss that ethical considerations must be applied to participants, the research, and the researcher. Before any research is conducted, approval from the IRB and each research site was obtained. Informed consent and permission were obtained, including consent to record the interviews. A copy of the consent form is attached to Appendix D. Confidentiality to participants was achieved by using pseudonyms, and sites were only identified with general demographic or geographic indicators. All participation was voluntary. All electronic data were password protected and physical data were locked. I kept the integrity of the methodology of grounded theory; I allowed the theory to arise from the analysis of the data and produce a model. Completing the research was also part of keeping the integrity of the process. The quality of the research must be above reproach. As the researcher, I was embedded in the process; this is a tremendous burden (Corbin & Strauss, 2015). I learned to recognize and respect my feelings and maintain emotional well-being throughout the process. I employed journaling to reduce the influence of my thoughts and lens to make sure I represented the participants and honored their stories.

Summary

The purpose of this systematic grounded theory study was to explain the process that teachers undertake when making instructional decisions about mathematics fact fluency for students with an MLD. This chapter discussed the rationale for a qualitative study and in particular the need for a grounded theory approach. I discussed my background and current positioning about the issue to reveal my approach to this study. I also outlined the type of data I collected and how the data were analyzed. Lastly, I addressed trustworthiness elements and ethical considerations.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this systematic grounded theory study was to explain the process that teachers undergo when making instructional decisions about mathematics fact fluency for students with an MLD. In this chapter, I present the data collected and analyzed. I narrate the identity of 11 participants and present their backgrounds. I utilized NVivo 12 software to organize and analyze the vignette responses, semi-structure interviews, and caseload review from the 11 participants. From the data analysis process a theoretical model emerged in response to the central question of the study to explain how these teachers undertake instructional decisions about mathematics number combinations when it comes to students with MLD and what influences these decisions. A core category, use of curricula, also emerged from the data that undergirded the decision-making process. The core category also informed the construction of the model and understanding of the theory of decision-making that emerged. Aspects of the process, including mediums, influences, and outcomes, are presented in response to the supporting questions used to guide the study.

Participants

A total of 11 participants contributed data to the results of this study, representing public (n = 8) and private (n = 3) school teachers. Teachers were recruited from schools across the United States, representing five states (i.e., Washington, Colorado, Texas, South Carolina, and Georgia), and three geographical regions of the US (i.e., West, Southwest, and Southeast). My goal was to interview at least 10 teachers who teach mathematics to at least one student with a diagnosed mathematics learning disability. A total of 33 teachers originally volunteered for the study; however, after the initial questionnaire, eight teachers did not qualify for the study. Six did not qualify due to not having instructional decision making over mathematics fact fluency. Ten did not qualify because they did not respond to the second step of the research process. Lastly, six did not qualify because they did not agree to be recorded. The study had 11 participants, reaching theoretical saturation after seven data sets. A brief overview of each participant begins this chapter and will provide a greater understanding of the decision-making process discussed.

The demographics for each participant presented in Table 1 provide only part of the story of who these teachers are as individuals. Through their stories, each participant articulated a passion for learning, desire to engage with students, and vision for what is possible in the lives of their students and school.

Ricky

Ricky is a middle school math teacher in a private school in the Pacific Northwest. Ricky has two years of experience as a teacher. He fell in love with the teaching process, the art of teaching. He started as a martial arts instructor and quickly recognized his passion for teaching. He completed his master's in teaching and learning in special education with an emphasis on mild to moderate disabilities including behavioral challenges. He stated that "seeing small improvements, working one-to-one with students got me started." Ricky thinks that his professors in the master's program shaped his teaching style. He thinks of himself as the special education folks that "do science." Ricky described his purpose as a teacher as one "to add socially significant value to the lives of children through behavior and academics."

Lunina

Lunina has been in education for over 15 years and teaching math for the last 11 years. Lunina comes to education from a clinical psychology background; she is certified as a math teacher for middle grades and SPED 6–12. Lunina is a sixth-grade math teacher and also serves as the sixth-grade math team lead. She teaches at a public school in the southwest U.S. Lunina said that social differences and cultural differences have shaped the way she teaches: “I think compassion for the population that I have, this has been what shapes my style every day.” Lunina described her purpose as a teacher as follows: “To make these children the best they can be.”

Mrs. W

Mrs. W has the energy and the passion of a first-year teacher. However, she has been in education for over 15 years and teaching math the entire time. Mrs. W teaches seventh-grade math at a public school in the southwest U.S. She entered education after a career in banking. At that time in her life a few of her family members were struggling in math and she would tutor them: “And one day I was just like, ‘*You know what? I think I could do this for real.’”* She says in an exuberant tone, *“*I have a passion for math. I loved math all my life. That's the only subject that I think I'm great at. I was like, ‘*Okay, I think I could do this. I wanna help. I wanna make it easy*.’” Mrs. W says that her purpose as a teacher is to encourage, to motivate, to inspire, to make math easier for children: "Everything you want to do in life, everything that you will do in life will always have some math in it."

Jules

Jules has been in education for three years and has been teaching math the entire time. Jules teaches sixth grade at a public school in the southwest region of the U.S. Jules became a teacher because she wanted to be a positive influence and a positive role model to young adults or the youth in the community. She described her purpose as follows: “To help all students excel not only academically, but also socially and emotionally. It's not really all about passing a test and stuff like that."

Joy

Joy became a teacher because she has always loved to help children in need, and she wanted to give back to the community. She has a background in banking and accounting. She has now been teaching for 14 years in the middle school grades. She currently teaches eighth-grade math at a public school in the southwest region of the U.S. She feels that the lack of parent involvement in her community influences her teaching because "it makes me step up to the plate and try, and kind of play all roles. Kind of have an understanding that, their parent may not be around. So be a little sympathetic with the kids." She sees her purpose as a mentor, or to become a mentor, "not just for the grade that I'm teaching, but in the future as far as they need anything, and they can come back to me. And once they're gone and graduated from middle school is the open door."

Ramon

Ramon came to teaching after a career in coaching. He has been teaching for 22 years. He currently teaches eighth-grade math in a public school in the southwest region of the U.S. He coaches football and track at the middle school level. He described his purpose as a teacher in the following way: " I believe in creating confidence because with confidence, anything can happen. So I guess being a supporter and again, creating confidence." He talks about being in the shoes of his students; he explained, "Just think of where I was as an eighth grader and it was definitely not math class or science class, it was other places. So you're always teaching, you're always trying to stay abreast of what's going on in their lives." He tearfully concluded by saying, " I will never participate in destroying some of their confidence."

Imani

Imani is in her second year of teaching, and teaching is her first career. She is a special education teacher, certified K–5, and teaches math. Imani teaches at a private school in the southeast region of the U.S. Imani came to teaching when one of her professors told her she would be a great teacher and influenced her to start looking at teaching as a career. She spoke about how her administrator gives her autonomy and this has built her confidence. She holds an immense amount of hope for her students and said, "Draw out the potential that students do not see in themselves. Once I can draw it out of them, I can help distribute it." Imani believes that challenges that are diagnosed do in fact negatively impact students because people start to put limitations on them.

Noah

Noah is in her sixth year of teaching; she teaches middle school math in a public school in the southeast region of the U.S. Noah decided to become a teacher because she felt that there was a need to help with special education students. She also thinks that students in special education need to see a teacher that cares "and to be specific care about more than just the curriculum." She explained, "It was more like a calling and not necessarily a job." Noah stated that her philosophy has been shaped by the population she serves. She has learned "to meet them where they are because we get lost in teaching that we forget that it's more than just teaching them social studies, English, math, and reading that we teach them life skills, coping skills so that's how I look at my classroom that it's more than a curriculum because they aren't going to learn this stuff every day but they are gonna have to live every day."

Cassandra

Cassandra is a public school teacher in the southeast region of the U.S. Cassandra teaches middle school math. She has been teaching for 14 years, and teaching has been her only career. Cassandra has earned the math teacher of the year award in her district two years in a row. She believes that she is effective because she is able to use the curriculum and grade level expectations while improving students' prerequisite knowledge. She stated that her purpose as a teacher is to break the cycles of her community by empowering youth to own their education.

Gregg

Gregg is a young, enthusiastic special education teacher in the southwest region of the U.S. Gregg has been teaching for four years and has been a resource teacher the whole time. Gregg holds a bachelor's and master's in special education and is also a Board Certified Behavior Analyst. Gregg currently serves middle school students in a private school. Gregg finds his passion in being part of the improvements that his students gain, and thus he stated, "Those little things will eventually make their life better- It's all about social significance."

Stacey

Stacey became a teacher for undetermined reasons and stated that "every year I stayed and stayed and 25 years later am still doing it." She is a sixth-grade math teacher at a private school in the southwest region of the U.S. Stacey says that her purpose as a teacher is to teach grade level material to her students. Stacey finds that to this day students are still what influence her style of teaching and her profession. She believes that keeping the students' cultural background in the forefront of her interactions and teaching practices is the most important part of being a teacher.

Results

The results section is organized to present the overall theoretical model of teachers' decision-making process for mathematics fact fluency that emerged from the data. This model is used to answer the central question: What is the process that teachers undertake when making instructional decisions on number-combination mathematics fluency for students with MLD? Then the core category is addressed as it emerged throughout the analysis process. A thorough treatment of the constructs which form the theoretical model is explored and presented. The first supporting questions is as follows: What constructs do teachers attribute to the development of their beliefs about the attainment of mathematics number combination fluency for students with MLD? The second supporting question is, how do teachers describe the outcomes of their instructional decision-making in mathematics fact fluency for students with MLD? Data from the vignette, semi-structured interviews, and caseload review were triangulated and used to justify and triangulate the theme development.

Theoretical Model

As themes emerged from the data, the visual for the model came to me from thinking about influencers / external attributes / or motivating operations. In order to visually represent the elements that comprise the decision-making process that teachers explained through this study and to consider all of the constructs that were revealed from the participants, the model is separated into two parts: (a) teachers who teach mathematics fact fluency (i.e., upper semi-circle), and (b) teachers who do not teach mathematics fact fluency (i.e., lower semi-circle). The resulting theoretical model of Teacher Decision Making About Mathematics Fact Fluency is presented in Figure 1 below.

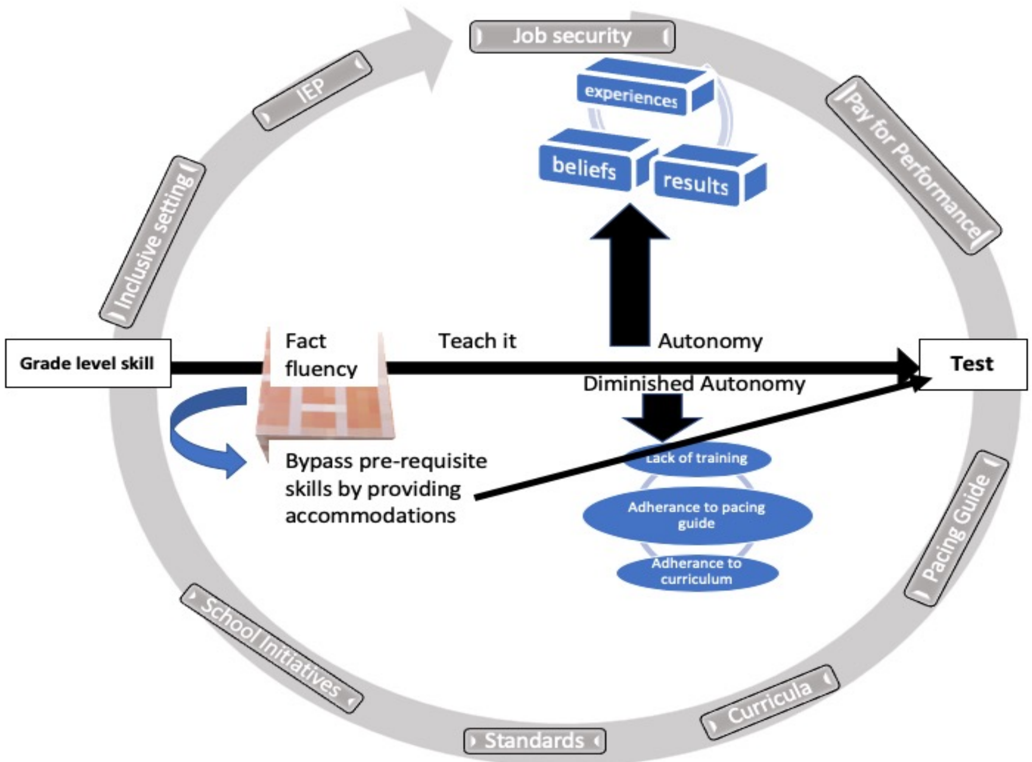

Figure 1. Teacher's decision-making process.

Figure 1 above explains the process that teachers undergo when making instructional decisions for students with an MLD about mathematics fact fluency. The process of decision-making is directly informed by the end goal, which for these participants was passing or increasing the score in the protocol the school uses to determine adequate yearly progress (AYP; e.g., state test or standardized test). Teachers then move to interpret the influences that they perceive as constraints or aids in the process in order to teach the grade-level skill with the goal of passing or increasing a score in the standardized assessment. All teachers have external and internal factors that influence their decision making. These influencers are represented in the diagram as the arrow that makes up the circumference of the circle. These influencers could be following the curriculum and pacing guide, standards-based instruction, school and/or district initiatives, IEP, pay for performance, and job security. Teachers described these influencers as items that are imperative to their job and must be included in their decision-making. For some teachers in the study, curriculum and adhering to the pacing guide are also district mandates that must be followed in order to keep their job.

After all the influences are considered, teachers look at the curriculum for the grade-level specific skill and plan their lessons. When they identify a prerequisite skill (e.g., number combination fluency) to be an issue, the teachers in the study take one of two paths. In the model the divergence of action is represented by a bisected circle into two hemispheres. The upper semicircle represents those teachers who teach mathematics fact fluency (n=3), and the lower semicircle represents those teachers who do not teach mathematics fact fluency (n=8). The diagram represents mathematics fact fluency as a brick wall that teachers have to make a decision about. Some teachers in the study bypass the brick wall by giving their students accommodations (i.e., calculator, number chart) which will prevent the students from having to labor over computing for the answer. Other teachers in the study prioritize daily instructional time to teach mathematics fact fluency in an effort to break down the brick wall and for their students to eventually reach automatic recall of mathematics facts.

Furthermore, the decision-making process is heavily influenced by a teacher's perceived instructional autonomy or their perceived diminished autonomy. For the teachers in the upper semicircle, teaching mathematics fact fluency is possible because of their ability to have a certain amount of autonomy over their instruction. This autonomy allows teachers to make decisions about their instructional time and they choose to teach mathematics fact fluency. In addition, they made the decisions to teach mathematics fact fluency because they all had personal experiences with teaching mathematics fact fluency with positive results. Therefore, their experiences reinforced their beliefs and the results reinforced their actions. This relationship is represented by a relationship diagram in quadrant one. Perceived autonomy allows these teachers to make instructional decisions that coincide with their beliefs about the need for mathematics fact fluency.

Teachers in the lower semicircle discussed a perceived diminished autonomy. These teachers described their inability to make instructional decisions about fluency because of a lack of autonomy in their classroom as well as district mandates such as adhering to the pacing guide and curriculum. The study also revealed a lack of training in the areas of MLD, research-based practices for this population, and training on interventions for mathematics fact fluency.

Teachers with Perceived Autonomy

All participants in this study expressed decision-making as being motivated by *passing a test*, whether it was a school specific protocol, or state assessment: Texas schools used the State of Texas Assessments of Academic Readiness (STAAR); South Carolina schools used the South Carolina Palmetto Assessment of State Standards (SCPASS); the school in Washington, although private, used the state assessment called Washington Access to Instruction and Measurement (WA-AIM); the private schools in Colorado and Georgia used standardized assessments such as Kaufman Test of Educational Achievement (KTEA), Woodcock-Johnson Tests of Achievement (WJ), or the Peabody Individual Achievement Test (PIAT-R). The curricula, school programs or district initiatives, and grade-level standards were influencers for all participants. This select group of teachers taught mathematics fact fluency because they had positive experiences with students who became automatic with number combinations. These teachers developed a set of beliefs about the need for automatic recall of mathematics facts. These beliefs are reinforced by the results they see. Moreover, they are able to teach mathematics fact fluency because they have perceived certain autonomy over their instructional practices. These teachers identify the *brick wall* as a permanent fixture in a students' skill acquisition and see it as their responsibility to break down the *brick wall* in order for students to be successful in mathematics long-term. They spoke about their administrators giving them leeway to make decisions and how this leeway builds their confidence to step outside of the box. For these teachers the pacing guide was seen as a tool, and number combination fluency was seen as a mandatory skill.

Teachers with Perceived Diminished Autonomy

For the participants in this study, teacher decision-making is motivated by helping the students pass their end of year assessment or state test. The end of year achievement of passing the state exam or end of course exam is highly influenced by curricula, school programs/initiatives, and grade-level standards. For these teachers the influencers consume and, in many ways, restrict their decision-making. Teachers described getting through the curriculum as prescribed by the district as the number one constraint in their decision-making ability. These teachers often referred to the pacing guide and staying on schedule. This notion comes from their perception that if they do not follow the pacing guide they will be in *trouble*. These teachers perceive their lack of autonomy to come from the influencers. Firstly, the influence of the pacing guide limits their ability to make instructional decisions on duration of teaching a skill. Secondly, the schools have their own push for programs or initiatives, (i.e., Concrete Representational and Abstract teaching model, Differentiated Instruction, frontload, unit organizers, technology) and these influencers affect their autonomy over the *how* of their teaching. Thirdly, they describe the need to follow standards-based instruction limits the direction of their instruction; teachers believe that they can only spend instructional time on grade-level standards.

In this model, the teacher is at the genesis of the process; in fact, the decision-making process that teachers undergo starts with their vision firmly placed on student success as measured by a state test or school protocol (e.g., standardized test). The teachers in this study recognize that the district-assigned curricula is the most important influencer in their decision-making process. Curricula also includes district-pacing guides. Pacing guides are synonymous with instructional calendars and not with scope and sequence since the pacing guide tells the teacher how long they have to teach a unit. Standards-based instruction is interpreted by some teachers of the study as "if it is not a grade level standard, I cannot teach it." State, district, and school wide initiatives are also an influencer for the teachers. These initiatives could be items such as technology or instructional practices (e.g., CRA, frontload, DI). However, teachers perceived autonomy or diminished autonomy as what allows them to either break down the *brick wall* or go around it.

Core Category

The core category that emerged across the data sources was the concept of *following the curriculum*. For most teachers the decision-making process starts at the initial review of the pacing guide and a glance at the grade-level curriculum to see which skills and how many lessons must be covered. The relationship between curriculum and the instructional calendar is symbiotic and can cause mutual benefit or mutual harm, but they cannot be isolated; one informs the other. When asked, "What informs your choice on what objectives you have to cover in a school year?' and "What information do you collect and review when making instructional plans for students with MLD?" there were nine mentions of curricula and/or pacing guide. When asked, "Explain how you use curricula" there were eight mentions of *according to the pacing guide from the district*. Curricula and the district's pacing guide were overwhelmingly the number one and most important factor that informed teacher decision-making. Lunina, who is a grade level coach, explained, "The first thing we have to look is definitely at the curriculum, because we have to adhere to what it says. That is the first thing I look at." Joy stated,

> We do have a curriculum that we follow, and it's for everyone, we have to cover all the objectives in their curriculum. Okay? So even if you have disability, we still have to be able to, we should still be able to teach those kids with disabilities.

When asked, "What information is most important in this process?" teachers mentioned district curriculum.

Teachers generally believe that following the curriculum that is provided is the way to help students pass the state test or standardized test and also keeps them accountable to their employer. For some teachers, if the stringent push for curriculum was removed, they would teach differently, but most of them do not feel like that is a real option for them. Curriculum, standards, and initiatives are the essence of the core category.

Central Question

The central question of this research study asked: What is the process that teachers undertake when making instructional decisions on number-combination mathematics fluency for students with an MLD? For eight teachers in the study, number-combination mathematics fluency was not part of their instructional planning, as far as a skill they would teach. However, they planned for number combination fluency as a prerequisite skill through accommodations and thus bypassed the need to compute with automaticity. For these eight teachers, their rationale for not teaching mathematics fact fluency is that it is not in the curriculum and the pacing guides do not allow time to teach non-standard skills. These teachers feel like their job does not allow for autonomy over their instructional time. The way that these teachers internalize the influencers are as mandates that diminish their autonomy. Three teachers in the study taught number combination fluency as a warm up activity or as part of their instructional rotations. They had experiences that positively informed their practice surrounding fact fluency and viewed the skill as mandatory for mathematics achievement. These three teachers have a perceived sense of autonomy over their instructional time.

Teachers use the curriculum and pacing guide as the number one resource for their instructional decision for all of their students. Also, for the teachers in the study, the fact that a student has an MLD or not never came into play when making instructional decisions because the process lacks individualization. All students in the inclusive setting are expected to take the same exam, and the teachers in this study see this to mean that they can make instructional decisions for all in the same manner. The theoretical model that emerged from the data answered this question through the key themes that surfaced. The instructional decision-making process starts after the end goal is revealed and the teachers begin to consider all of their influencers. Once the skill is determined through the curriculum and pacing guide, they make instructional decisions about the *brick wall* of number combination fluency. For those teachers that feel like they have autonomy over their decision-making, they try to break down the *wall* by teaching mathematics fact fluency. For those teachers that feel like they have a diminished autonomy, they try to bypass the *brick wall* by giving students calculation devices or other accommodations.

Theoretical Model Themes

Each of the themes included in the theoretical model which emerged from the study is discussed below in the order in which it occurs in the teachers' decision-making process. The core category of follow *the curriculum* is what drives the decision-making model and acts as the biggest influencer in the process. The model consists of the teacher, the end goal, the influencers, and their autonomy.

Teacher. Through their professions, teachers have to become decision makers. Teachers are at the center of the decision-making process (Ikemoto & Marsh, 2007), which involves giving consideration to a matter and identifying the end result. In this process teachers decide what options they have in order to get to the end result. Teachers make countless decisions all day long; the literature separated these decisions into three categories: planning, implementing, and assessing (Ikemoto & Marsh, 2007.) Planning involves teachers making decisions about the most appropriate process to use in order to deliver effective instruction. Thus, these decisions are made before the instruction takes place and take into account all influencers and the end goal. The study reveals that a teachers' perceived autonomy over their instructional time impacts how they view the influencers and what decisions they are able to make.

Outcome/end goal. As stated previously, decision making involves considering a matter with an end goal or an outcome in mind. The end goal is really what drives the efforts and how efforts are directed. In other words, the end goal is what drives the decision-making process. In this study, the end goal for the teachers was having students pass the test. For all of the participants of this study, the end of year assessment is given to students in grades 3–8, and it is an assessment that covers math, English, and writing. When teachers were asked what their measure of success for their students is, nine out of 11 teachers (82%) answered the state test, and two mentioned a protocol specific to their private school. Even when teachers were asked to explain further how they measure their outcomes, the answers across all 11 participants referred to passing or increasing a score on a standardized assessment.

Influencers. Regardless of the philosophies that teachers hold or the views that shape their thinking, they cannot escape the world outside of their classroom. Teaching is influenced by the community, culture, and traditions of the students. But it is also influenced by school administration and district mandates. Teachers pointed out how some of the methods that they incorporate in their planning are agreed upon through collaboration during their professional learning communities or within the school's organizational culture. These methods might not be what the teacher considers to be best. However, these influencers affect a teachers' perceived autonomy or diminished autonomy over decision-making on mathematics fact fluency. When asked what influences their decision-making, nine out of 11 stated the curriculum and pacing guide. Ramon explained,

> They also give us the days, amount of days, but like some of the concepts they'll tell you 12 days, but your students might learn it in six and then another concept where they might say in three days and you know your students need maybe six days or 12 days. So I kind of change, try to adapt to the students that I have but it is almost impossible because of the schedule.

Another teacher explained that the district initiatives of using technology and front-loading material through videos consumes his planning because it impacts his yearly review. Teachers like Ramon may try to adapt the schedule by teaching some skills longer and others in a shorter period of time.

In this study, teachers explained that they look at the IEP for the accommodations list towards the end of their planning to see how they will accommodate the learning. One teacher said, “As far as the IEP, I looked at it . . . what the accommodations are. Now what happens?” Lunina explained,

> The IEP, well, what they're doing is they're giving it to me to tell me what I should do in the classroom, basically like this, it may say, "This student needs a calculation device, they need a multiplication chart. . . . They need manipulatives.”

Joy said,

> Well right now seeing that I'm a math teacher, it is kind of tough to go back and teach those, so I use technology. Every day, we use technology. Just dealing with integers, a lot of them are still kind of weak with integers. Apply technology and in the meantime, we're still doing homework daily. But in class, it's a lot of the use of the technology because taking the STAAR [State of Texas Assessments of Academic Readiness] or even the SAT and ACT, they have to be familiar with the TI calculators.

Teachers discuss their practice in enacting their plans. This is an important part of the process because this is how they feel they connect with the lesson and the unit. This category emerged from a code titled, data-based instruction. Teachers discussed how the implementation of their lessons is really where the decision-making occurs through teaching, assessing, and using that data to make instructional decisions.

Pacing guide. When looking at the curriculum, teachers stated that the first question that they try to answer is the length of time that is given for the specific skill. Noah described this concept best when she said,

> The curriculum comes into play at the beginning and then I decide how I'm going to break it down. 'Cause we have windows of how long we have to do stuff, so I always look at that first and then I say, it depends on my class. Like this class I can do these two at once. I always go with the curriculum 'cause STAARS [State of Texas Assessments of Academic Readiness] …

In addition, Stacey stated,

> Making sure that we cover the curriculum so that the kids don't go into the STAAR [State of Texas Assessments of Academic Readiness] test or the end of quarters with deficiencies or at least have not covered certain things.

For three teachers, they looked at the pacing guide as a tool or a reference guide and not a mandate. Regardless of how long teachers have to teach the skill or how the length of time is determined, teachers face increased pressures to cover all the skills that are on the yearly state test. Teachers in this study described the need to give their students access to all of the content they will be tested on. Moreover, pacing guides are often the primary source of information on what their school expects them to teach.

The comments from teachers about the use of curricula and pacing guide inform their decision-making process in the following ways: (a) The curriculum and pacing guide limit their ability to individualize instruction; (b) in most cases the curriculum and pacing guide inhibit their ability to teach to the low and high achievers; (c) students with MLD are not given special consideration; and (d) district requirements to follow curriculum are enforced through observations and some teachers feel like they do not have autonomy over their decision-making.

Test alignment. After defining the time they have, teachers look to answer how the unit is aligned to the state test. Ramon explained this idea the best, when he said, “Using the time appropriately is important because we need to make sure that every kid goes into the STAAR test without deficiencies, well, better said, having covered everything they will be tested on." Teachers review the content and compare to the state test because they think that "the district it's so stuck on what the district wants us to do on these time frames to satisfy the STAAR test." Joy said, "We look after STAAR tests, of course. It's state mandated, so we need to make time to cover and really cover these skills." The comments from teachers about their teaching being aligned to the state test or other test inform their decision-making process in the following way: (a) When time allows they will use instructional time for test items; (b) for some teachers (n=8) test prep is the focus of bell ringers and warm ups; and (c) skills that have a high percentage of coverage in the state test get more attention.

Initiatives. For all teachers in the study they looked to see if the curriculum included the district and school wide initiatives that they must include in their teaching. Initiatives include items such as using platforms for learning, smartboards or other software, and specific instructional practices. In one of the districts there was a big push for the use of moving through Concrete Representational and Abstract (CRA) in every skill, while another district had a push for frontloading material as an antecedent. Regardless of the initiative, teachers look to see if it is incorporated in the curriculum. If it is, they teach the lesson as is and if it not, then they try to add the initiative to their lesson plans. Teachers made these comments about the use of the initiatives: "Well, we all have to use it, but it's called a CRA"; "they are telling us to kind of start with a concrete example or something like that"; and "I know I'm expected to use the technology I was provided, even if I use it as a projector, I'm using the Smartboard, you know?" The comments from teachers about the use of school and district initiatives inform their decision-making process in the following way: (a) removes certain autonomy to teach *how* they see fit;

(b) Focus on the "to do list" rather than what instructional practices that best fits the skill or the student; and (c) it has a higher focus than individualizing the instruction of students with MLD.

Prerequisite skills. The next question that teachers seek to answer within the curriculum is to see what the prerequisite skills are for the skill. Prerequisite skills are those skills that are required in order to be successful in a new skill. In other words, those skills are a prior condition for success. Teachers stated that knowing what is required to know will help facilitate accommodations for students across the board in their classroom. Teachers look for the prerequisite skills in order to identify if they will "need extra materials or accommodations to help the kids learn the exact same information" (Joy). Noah said she looks at the prerequisite skills to answer the following question: "What accommodations will I need to provide to the class?" Other statements were, "Are there any additional accommodations that they would like for me to do during the math class?" and "depending on what we're doing, because some accommodations don't need much."

Eight teachers reported that they do not feel like they have the time to re-teach or review prerequisite skills, including mathematics facts. They made statements such as, "I don't take out instructional time to teach these kinds of skills"; "We just provide the chart or have the kids just make a chart [meaning multiplication table]." Ramon stated that he prefers to use the instructional time teaching kids how to use the calculator instead of prerequisite skills because "being able to use it and know when to use it and know how to use it, is very important." Lunina stated, "With stuff like that, you can't really harbor on it or spend so much time on it because that's stuff that they should have learned in elementary, you know?" Joy said, "I give them a calculator because it helps them with the basics that they're lacking so that's provided to them in math." The comments from teachers about the prerequisite skills inform their decision-making process in the following way: (a) Prerequisite means not grade-level; (b) Prerequisite is the red flag for accommodations.

Three teachers stated that they do not interpret prerequisite skills to mean mathematics fact fluency. When asked to give an example or explain further these were their answers: "when teaching conversion of fractions to decimals, division would be a prerequisite skill" ; "You have to know how to square a number before you can do its square root, so like squaring would be prerequisite"; and "like knowing greatest common factor to solve a binomial equation." They were asked how they would describe what number combinations would be, if not a prerequisite skill, and they answered in the vein of mathematics fluency being the beginning of understanding math. These teachers still felt the same constraints as the others in the study, but they prioritized the skill for all of their students, not just students with an MLD. Two teachers explained how they started their teaching time with drills, and one teacher used one of her daily rotations as a fact fluency center. These three teachers have a perceived sense of autonomy over their instructional time and make the decision to teach mathematics fact fluency to all of their students.

Autonomy. This idea of teacher autonomy refers to the professional independence teachers have with the degree to which they can make autonomous decisions about what they teach to students and how they teach it: "A positive form of autonomy represents a teacher's freedom to construct a personal pedagogy which entails a balance between personality, training, experience and the requirements of the specific educational context" (Hoyle & John, 1995, p. 92). There is no measure of autonomy; however, Pearson and Hall (1993) stated that teacher autonomy is the perception that teachers have regarding whether they control themselves and their work environment. Additionally, there is evidence that suggests that teachers can contribute towards their own diminished autonomy (Forrester, 2000; Lawn, 1996; Smyth, Dow, Hattam, Reid, & Shacklock, 2000). Teachers see the same influencers as either constraints or empowered by the same system. The perceptions of autonomy or diminished autonomy depend on how they interpret and understand the influencers.

In this study three of the teachers felt autonomous in their decision-making when it came to the use of their instructional time, while eight teachers felt like they had a diminished autonomy over decision making. Eight teachers perceived the influencers to be constraints and limiting to their ability to make instructional decisions. In recent years, teacher autonomy has become a major point of discussion and debate in American public education, largely as a result of educational policies that, some argue, limit the professionalism, authority, responsiveness, creativity, or effectiveness of teachers (Pearson & Moomaw, 2005). These three teachers attributed their perceived autonomy to administrators who empower them to make decisions. One teacher said, “He [referring to principal] wants me to be a decision-maker in the classroom,” and another teacher said, “I am supported, and my concerns are heard by the team lead.” These three teachers spoke about their specific circumstance as set of experiences or external attributes that empowered them in the classroom. The perceived autonomy to make instructional decisions gave these teachers the confidence to do something differently and still engage with all of their influencers/constraints.

Math difficulty. Teachers complained and discussed how students, regardless of identification, struggle to know basic mathematics facts. Every participant stated that they think that number combination fluency is a deficit for their students. One teacher said,

> Now that's a very important thing because to be honest with you, this is a struggle that I see. To be honest with you if you do not know those math facts, it's gonna be hard for you to really . . . to learn anything else, and most kids don't know them.

Another teacher, Lunina, stated, "You have to see it too. A lot of people would never believe. They can't tell time, that's math." In addition, Ramon said,

> Multiplication, addition: Just teaching how there are so many things that we apply multiplication too, greatest common factor, common multiple and it can help with your fluency of understanding what's going on when you have some of the foundational skills and the fact, they're multiplying a lot and they come to me without that.

Stacy also commented,

> Because a lot of, it's crazy, but a lot of the stuff we do, it may look difficult, but it's just with those four operations, adding, subtracting and they struggle, and I'll be honest with you, some of them you can struggle with adding and subtracting.

Lastly, Noah stated that the most important part of mathematics is having the basic knowledge of mathematics facts and continued to explain that "it definitely affects the learning. Because, if they all don't know it and they feel like it's just too hard. But if they know it, it makes the learning easier for them, and a lot of things to go a little bit quicker." These statements from the study point to the fact that teachers recognize the importance of number combination fluency and know that a lot of students struggle with this basic skill, yet it is not a part of their instructional day.

Interventions. When teachers were asked if they were familiar with math fact fluency interventions or the research on how students with an MLD learn, overwhelmingly the answer was no. Ten teachers out of 11 stated that they did not know what is available for students with an MLD or for any student when it comes to mathematics fluency. In addition, all of the teachers stated that if they knew this information, it would be helpful. Ricky said that he does not look for programs because he makes his own. When asked to explain, he stated that he likes to go home and create his own worksheets and his own manipulatives for each lesson. He also explained that when students need additional help to get a concept, he creates a program based on the goals and the resources available in the internet. Mrs. W said, ". . . to be honest with you. Like I said, all I know is what I experience in the classroom each year." The data about interventions reveals a true desire to know more but also an uncertainty about what is available and how to gain access to these resources.

Supporting Question One

The first supporting question asked: What constructs do teachers attribute to the development of their beliefs about the attainment of mathematics number combination fluency for students with MLD? Regardless of grade level, only three teachers in the study teach number combination fluency to students with an MLD. For these three teachers, number combination fluency was imperative to their teaching and a non-negotiable skill. They spend time daily on mathematics number combination fluency and measure their students' achievement in this domain. These three teachers had positive experiences with teaching number combination fluency and those experiences have reinforced their beliefs about teaching this core skill. One teacher worked at a school where the administrator wanted every math class to start using a specific program for number combination fluency. She said, "The increase in fluency was measurable and noticeable in class. After getting through sheet F, out of A–Z, I could see their improvements, but I could hear it too. They would start talking math aloud." She continued to explain that from this experience she has continued to use math fluency as the bell ringer. One teacher stated that every year she noticed how students would come to her "with an IEP or without but they didn't know their facts, so I said, I am going to get good at DI [differentiated instruction] and do it with all of them." These three teachers all had an experience that shaped their beliefs, and the results reinforced their beliefs. They also shared another commonality in that they felt empowered in their classroom by their administrators. They felt like they could make instructional decisions. Even though the influencers where the same for this group of teachers, they still felt like they had autonomy to make instructional decisions about their instructional time.

For the other eight teachers in the study, they felt like there was an inability to teach fluency because they were limited by pacing guides and standards-based instruction. They gave contradictory answers such as, *every kid can learn* but when asked about fluency they answered, " I don't teach those skills." Another example is one teacher that stated, "they don't have it now" but then she stated, "I just give them a calculator." I am suggesting that if they in fact believe that students who struggle with number combinations can learn, then they would teach them. Interestingly, these teachers also felt like the students should know the material by the time they reach their class and now they just have to accommodate for that deficit.

More surprisingly, nine teachers in the study could not define LD or MLD. Stacy said that "Any student outside of the regular student would be . . . in my opinion, learning disabled." Noah defined LD in the following manner: "Are there any language barriers? Can they hear? 'Cause some of them can't even hear you. Then I also look at, are they hungry?" These comments made it clear that the term LD was used to mean a learning struggle not an actual disability. However, 10 teachers spoke about disabilities within a growth mindset view.

Whether or not they teach number combination fluency, they feel that all students can learn. Jules, like most of the teachers, believes that all students can excel:

> I feel like any student, any person or whatever, they can do anything that they put their minds to. They can excel no matter what. All they need are the correct tools and someone who believes in them who's actually gonna take the time to help them get to where they need to be.

Although teachers spoke about their students' ability to learn, it is important to note that only three teachers out of 11 taught the prerequisite skill of number combination fluency. The decision to teach this skill is directly related to how teachers perceive and understand the influencers, and how they perceived their autonomy. Teachers with a perceived sense of autonomy do not see the influencers as limits or constraints and they are empowered by their role and administrators to make decisions about the use of their instructional time. While teachers with a diminished sense of autonomy perceive the influencers as limits and constraints.

Supporting Question Two

The second supporting question asked: How do teachers describe the outcomes of their instructional decision-making in mathematics fact fluency for students with MLD? Success was measured by passing the state exam or increasing a score on a specific standardized test. Since the state exam allows for calculators, teachers focused on teaching the content and having students use the technology to compute the mathematics. The sentiment for most of the teachers in this study is that since the state test allows for calculators, and if students pass the test, then they did their job as teachers. The hope is that with the use of accommodations, the students with an MLD will still access higher level mathematics and prove their knowledge through passing or increasing the score in the test. Some teachers discussed the use of data to see if they are getting the concept, but interventions for remediation are largely not used. These teachers focus on re-teaching or accommodations for equity of access; and the overall sentiment was that technology will aid in the students' ability to compute and thus pass the test.

Although three of the teachers in the study also use *passing the test* to measure the success of their students, they were unique in also wanting to see measurable improvement in number combination fluency for their students. They measure the engagement with verbalizing mathematical concepts as an outcome of teaching mathematics fact fluency. It is important to note that these three teachers still provided accommodations during grade level instruction and students' independent work.

Summary

The purpose of this systematic grounded theory study was to explain the process that teachers undergo when making instructional decisions for students with an MLD in reference to mathematics number combination fluency. The theoretical model that emerged from the data represented the process as an outcome having been identified (i.e., passing or increasing score on a test). Then teachers review the influencers to their instructional decision-making. Teachers then identify the prerequisite skill and either decide to go around the *brick wall* by providing accommodations or remove the *wall* by teaching the skill. The perception of autonomy is what allows teachers to make decisions about their instructional time. For those teachers who have a perceived sense of autonomy over their instructional time, do in fact teach mathematics fact fluency. For those teachers with a perceived diminished autonomy they see the influencers as limits to instructional time decision-making.

The key features that were revealed include the apparent lack of individualized instruction for students with an MLD and the fact that number combination fluency is largely not taught; instead, accommodations are given to these students in order to circumvent the need for computation fluency. The curricula and the pacing guide are large influencer in a teacher's decision making. The words of Noah summarize the lack of teaching fact fluency when she stated,

> You can't spend real quality class time trying to make sure they understand multiplication facts. You have to tell them, "When you go home, or the homework or something, you need to study your multiplication chart," or something like that.

However, the teachers who feel they have autonomy over their instructional time and decision-making make the choice to teach mathematics fluency. Their autonomy is derived from experiences and perceived trust from their administrators.

Asked if the constraints were removed would they teach differently, eight teachers said yes. When asked the follow up question, "Do you think that you would somehow incorporate number combination fluency?" Mrs. W's answer summarizes the thoughts of many when she said,

> Yes, because I don't think it's fair that if they can't divide and multiply that they should have to do fractions so fast. Like it's weird. They don't know how to do it and they don't understand what they are doing.

Another construct that this study revealed is the paucity of knowledge about students with an MLD and learning disabilities as a whole. Some teachers in the study do not have a belief about mathematics number fluency that is informed from their practice; however, they do in fact hold a growth mindset about their students. The overall sentiment for these eight teachers was that technology will aid in the students' ability to compute and thus pass the test while three teachers wanted to provide their student with long term practice of number combinations in order to enhance their learning trajectory.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this systematic grounded theory study was to explain the teachers' decision-making process for students with a mathematics learning disability (MLD) about mathematics number combination fluency. This chapter presents a summary of the findings that lead into the discussion of how the study findings interact within the conceptual framework presented in Chapter 2. The theories which informed the conceptual framework are radical behaviorism (Skinner, 1953, 1957, 1971, 1976), affirmation theory (Jaspars et al., 1983), concerns-based adoption model (Hall & Hord, 1987), and growth mindset (Dweck, 2000, 2012). Theoretical, empirical, and practical implications for the study are offered as well as a discussion of the delimitations and limitations of the study. A series of recommendations for future research is presented in relation to the discussions and conclusions of the study.

Summary of Findings

The theoretical model that emerged from the data represented the decision-making process as driven by the end goal of passing a standardized test. Teachers then interpret the influencers in the decision-making process. The model for decision-making on facts fluency for students with MLD places the teacher as the decision-maker, and their focus is on their students' passing the state test. The influencers for the teachers in this study are the curricula and pacing guide, the standards, IEP, school initiatives, pay for performance, and job security. When it comes to making instructional decisions about mathematics fluency, a teachers' sense of autonomy or diminished autonomy is what separates the participants of the study. For those teachers who felt autonomous over their instructional time, they taught mathematics fact fluency. For those teachers with a perceived diminished sense of autonomy adherence to the curricula, pacing guide, and initiatives consumed their ability to make decisions about their instructional time.

The first supporting question asked, what constructs do teachers attribute to the development of their beliefs about the attainment of mathematics number combination fluency for students with MLD? This question revealed the paucity of knowledge about this population and learning disabilities as a whole. The answers to the interview questions revealed that for some teachers, their perceived diminished autonomy is the reason for their lack of ability to teach mathematics number fluency due to pacing guides and other influencers. These teachers do not have a belief about mathematics number fluency that is informed from their practice; however, they do in fact hold a growth mindset about their students. These teachers also thought that number combination fluency is a skill that should be taught in elementary grades. For three teachers in the study, their perceived autonomy allowed them to make instructional decisions that coincided with their beliefs about mathematics fact fluency. These three teachers had the same influencers, but they did not see them as limits, they saw them as guidelines for instruction.

The second supporting question asked, how do teachers describe the outcomes of their instructional decision-making in mathematics fact fluency for students with an MLD? The overall sentiment for most teachers is that technology will aid in the students' ability to compute and thus pass the standardized test. However, three teachers think that mathematics fact fluency opens the window to being able to discuss mathematics verbally and to gain other mathematics skills quicker. These teachers see the students' successes in this skill transfer to other parts of mathematics learning. These beliefs come from having positive experiences teaching this content and the results reinforce their beliefs. Regardless of teaching mathematics fact fluency or not, teachers describe the outcome as the passing score on the end of the year test.

Discussion

This section discusses the study findings in relationship to the conceptual framework presented in Chapter 2. Four theories informed different aspects of the conceptual framework around the process of decision-making in relation to mathematics fact fluency. The study findings are discussed in relation to how they inform and reflect the following theories: radical behaviorism (Skinner, 1953, 1957, 1971, 1976), affirmation theory (Jaspars et al. 1983), concerns-based adoption model (Hall & Hord, 1987), and growth mindset (Dweck, 2000, 2012).

Behaviorism

Skinner's (1953, 1957, 1971, 1976) radical behaviorism explains behaviors as a continuum of positive and negative reinforcement and punishment. Teacher's instructional decisions are a set of behaviors that can be explained as being maintained by reinforcement (Skinner, 1976). The process of decision-making can be seen as a behavior class, and decision-making is either reinforced or punished. Behavior sets that are reinforced will most likely occur again, while behavior that is punished will most likely decrease, be suppressed, or discontinue altogether. For example, some teachers believe that teaching fact fluency is important but the decision to teach it is not reinforced. However, they are reinforced when they follow the curriculum and follow the pacing guide. Reinforcement may come in the form of higher ratings in evaluation, praise, and acknowledgement while punishment may come in the form of referrals back to the pacing guide. Thus, their decision-making as a behavior class is reinforced by district policies and administrators that give some teachers a sense of autonomy over their decisions. When their autonomy is not reinforced, it can actually be seen as a competing behavior with other decision making which gets the same result (i.e., bypassing fluency by giving students accommodations). Some teachers discussed how following the pacing guide is part of their evaluation and how the district checks to see if they are following the schedule. This rule-governed behavior is susceptible to deficits in discretionary effort that would possibly be present if they were able to make contingency-based decisions. However, other teachers that have the ability to make contingency-based decisions show the discretionary effort by taking time to teach a prerequisite skill and still keep up with the influencers.

Another way to examine decision-making through the lens of behaviorism is to understand that teaching mathematics number combination fluency to students who may not be motivated and who struggle is difficult work. Giving students a calculation device is a behavior that could be categorized as being maintained by the removal of the anxiety around teaching math facts, hence, negative reinforcement. Additionally, keeping with the pacing guide allows for an artificially-based sense of accomplishment and fulfilling job expectations. Although behaviorism does not explain the thinking and emotions behind the actions, it can explain the behavior set of decision-making.

Affirmation Theory

Affirmation theory speaks to the “perceived cause of an outcome; it is a person’s explanation of why a particular event turned out as it did” (Seifert, 2004, p. 138). This theory suggests that people observe others, analyze their behavior, and come up with their reasonable explanations for such actions. External attributions are those that are blamed on situational forces, while internal attributions are blamed on individual characteristics and traits (Jaspars et al., 1983). Originally, I thought that this theory could be used to examine how teachers make instructional decisions based on attributions about themselves or about their students. However, the theory would only inform on external attributions, meaning situational forces that influence the extend or ability that teachers have to make decisions. The participants of this study see themselves as following initiatives and district mandates; this allows for a separation from the outcomes. For those teachers with diminished autonomy, their actions are based on the district's philosophy and decisions. Thus, success or failure is up to the policies. The teachers who teach mathematics fact fluency contend with the same influencers as those teachers who do not, however, the difference lies in how they interpret the external influencers. Teachers who teach mathematics fact fluency have a sense of autonomy over the structure of their instructional time and feel empowered to make decisions for themselves. These teachers believe that their administrators support their decision-making and provide them with opportunities to be make decisions for themselves and their students. Interestingly, some of the teachers who teach mathematics fact fluency and those who do not are on the same campus and share the same administrator. Thus, the sense of having autonomy or diminished autonomy is how the influencers are perceived by the person.

The Concerns-Based Adoption Model

The concerns-based adoption model has been used to explain data-based decision-making. Concerns theory (Hall & Hord, 1987) is useful in understanding teachers' affective responses, such as resistance, to educational innovations or changes in what is required of the teacher. Concerns are defined as an individual's thoughts, considerations, feelings, worries, satisfactions, and frustrations related to an innovation and/or change (Hall & Hord, 1987). In other words, concerns are emotional responses to an educational innovation and/or change (Hall & Hord, 1987.) The concerns-based adoption model explains affective responses such as how teachers feel about the initiatives. Teachers in this study spoke positively about using data to make instructional choices. It does not seem as if there is resistance to using data to inform their instruction; however, in most cases the data that are used are proximal measures such as curriculum-based assessments (CBA), which can be teacher-made and inform the most recent skill only. Teachers do not use distal measures to inform progress in number combination fluency, but they do use measures such as curriculum-based measures (CBM) which are normed and take a wider scope of achievement to measure overall achievement.

Growth Mindset

Lastly, growth mindset (Dweck, 2000) is a theory that speaks about intelligence. People vary in the degree to which they assign the cause of intelligence; they can be innate/fixed factors (i.e., fixed mindset) or they can be variable factors influenced through learning, effort, training, and practice (i.e., growth mindset; Dweck, 2000). The way that teachers think about intelligence impacts their actions and how they view their students. These constructs inform how they teach and what they teach to students. Mindset allows a teacher to see struggling students as an opportunity or as having reached their potential. Nine out of the 11 teachers who took part in this study spoke about their students with a growth mindset. Teachers made comments such as, "intelligence is not fixed," "there are different ways to show what you know," "there are differences in people," "not everyone learns the same," and "they don't have it yet." It is important to note that for the eight teachers in this study regardless of their beliefs about children and disabilities and specifically children diagnosed with an MLD, they do not see it as their role to change the curriculum and mandates. They believe teaching, assessing, and re-teaching is the best they can do given the mandates. Growth mindset does not inform how they make decisions about students with an MLD.

Implications

This study presents theoretical, empirical, and practical implications for consideration. This study produced a model of the process that teachers undergo when making instructional decisions for students with an MLD in relation to mathematics fact fluency. The findings add to the literature and conversation about the lack of specialized instruction for students with disabilities in the inclusive setting, drawbacks to the value-added model, the research on pacing guides, and the research on teacher autonomy. Empirically, this study presents an example that can help stakeholders move the conversation about how we meet the needs of students with an MLD in the inclusive setting and how we address the research-to-practice gap that exists. Practically, recommendations are presented for specific stakeholders in the areas of professional development and the IEP process.

Theoretical

This section focuses on the contributions of this study to the literature on teachers' decision-making. The theoretical model produced in this study reflects the process that teachers undergo when making instructional decisions for students with an MLD in their classroom. The study revealed that teachers are mostly influenced by following the curricula and pacing guides, the value-added model; however, with a perceived sense of autonomy, teachers make the decision to teach mathematics fact fluency to all of their students.

This study adds to the body of literature surrounding the controversy of individualized instruction for students with an IEP in the inclusive settings. There are mixed results when it comes to the academic achievement of students with LD in the general education setting (Manset & Semmel, 1997; Martson, 1996; Salend & Garrick-Duhaney, 1999; Waldron & McLesky, 1998), and this study reveals the possibility of there being a lack of individualized instruction in these settings, posing the question, are students with an MLD actually receiving specialized instruction within their inclusive settings? These results also add to the existing literature that teaching to the test removes teachers' control over their professional lives and their classrooms.

In reality, the state test is important because in most situations it is the sole measure used to evaluate student progress and in turn evaluate a teacher's effectiveness. However, as this study shows, teaching to the test removed the teacher's ability to individualize instruction. This study also reveals that the pacing guides were very influential on teacher decision-making. When teacher effectiveness is measured by the results of one test, teaching changes to breadth instead of depth.

Furthermore, the study adds to the literature on the impact of pacing guides as a mainstay to teachers' professional lives. Pacing guides map out the skills that are expected to be tested on the annual state test and then schedule the skills before the spring test date. Some pacing guides specify the number of days a teacher should devote to each skill. Teachers face the mandate to cover all of the topics that will be likely covered in the spring assessment. Teachers in this study did not want to handicap their students by skipping topics or moving outside of the scope and sequence. Research on pacing guides suggests that the push for their use can intensify the pressure on teachers to cover all the material; it can also intensify the pressure to devote more time to skills that are tested (Louis, Febey, & Schroeder, 2005). The findings of this study are consistent with the literature on the influences of high-stakes testing on curriculum and instruction as well as studies of the role of pacing guides. This study adds to the Cobb, McClain, de Silva Lamberg, and Dean (2003) study where they found that most guides do not address the development of student reasoning and that teachers rarely deviate from the guides. There is literature that states that teachers are pressed for time: "Teachers with predominantly low-performing and minority students are far more likely to drop cognitively demanding activities than are other teachers. The former feel more stress and are more likely to focus on traditional forms of teacher-centered instruction" (Wills & Sandholtz, 2009, p. 32). The quality of pacing guides and how teachers respond to them vary greatly; however, research points to the fact that they can constrain the teachers' decision-making.

Moreover, the study adds to the literature on teachers' autonomy. The corpus of the literature states that given the nature of the current relentless pace of reform in education, teachers need autonomy in order to fully execute the mandates while providing the proper instruction to their students (Day, 1997; Grenville-Cleave & Boniwell, 2012; Hoyle & John, 1995; Pearson & Moomaw, 2005; Wilson, 1993). In other words, teachers need a positive form of autonomy which represents a teacher's "freedom to construct a personal pedagogy which entails a balance between personality, training, experience and the requirements of the specific educational context" (Hoyle & John, 1995, p. 92). This study also adds to the literature on diminished autonomy (Forrester, 2000; Lawn, 1996; Smyth et al., 2000). For example, teachers comply with non-statutory guidance as they feel pressured to do so (Day & Smethem, 2009; Forrester, 2000); however, Hargreaves and Shirley (2009) saw opportunities in the policy where teachers could exercise their own vision and imagination. Thus, teachers will always have hierarchical controls, however, how they understand or perceive these influencers impacts their sense of autonomy. Having a perceived sense of autonomy is how teachers feel empowered to make decisions about how they spend their instructional time. In order for teachers to feel autonomous they must understand the influencers and how each one should be addressed within the scope of their instruction. It is imperative to remember that when teachers are expected to adhere to restrictive guidelines, they will be consumed with attempting to implement initiatives that they do not necessarily agree with or understand.

Empirical

This section focuses on the contributions of this study to the empirical understanding of teachers' decision-making process about students with an MLD regarding prerequisite skills such as number combination fluency. This study adds to the literature on inclusive settings and special education as an individualized specialized model of education for students with disabilities. Students who have been identified with an MLD and placed in an inclusive setting require individualized instruction. Teachers can meet the needs of these students within their classroom setting without modifying the curricula. However, the instructional needs of students with an MLD were largely not identified in a teacher's decision-making process. There is a sense across the majority of the participants that if they are taking the same test as their peers, then the material that is being taught *can* be the same. The data revealed that only three teachers teach number combination fluency, and they teach it to all of their students regardless of disability. The other teachers use their exit tickets to determine if the majority of the class mastered the skill. They attested that once they teach, their decision-making is influenced by the assessment, and the assessment informs whether or not re-teaching is necessary. Although there is evidence to the fact that most students with an MLD can in fact learn the same skills as their peers, the IEP mandates for individualized instruction and any lack of this would mean that the IEP is not being followed and thus is a possible violation of federal law.

There is an accumulating body of knowledge about evidence-based practices in almost every facet of education. In Chapter 2, I synthesized the body of research about mathematics fact fluency interventions. The research findings support the premise that there is a gap that often exists between what is known and what is practiced. Researchers have recognized that the way in which they pursue the development of evidence-based practices often interferes with the adoption of these practices by schools and in turn by practitioners. In short, the systemic problem is that the majority of research to date has been efficacy studies, with far fewer effectiveness studies, and very few dissemination studies.

Practical

This section focuses on the practical implications of this study, which may be of specific interest to practitioners in the field. First, teachers can make a difference in their practice if they deepen their understanding of the standards. For example, a seventh-grade standard is solving real-world problems involving the four operations with rational numbers; this standard can be used as the platform for teaching number combination fluency. There is a difference between standards-based instruction and individualized instruction, and both can happen in the same setting. Teachers can also individualize the curriculum without falling behind on the pacing guide. For example, teachers can use differentiated instruction to meet the needs of students in their classroom while teaching the same material but having time to incorporate interventions. Teachers should also be empowered to be vocal about what they want and be able to advocate for what they need in their classrooms. Teachers should push for autonomy in the process of teaching their students.

Teachers should be mentored to have confidence in their expertise. They should be leaders within their classroom and understand that they can be influential, and they should have a platform to advocate for their students. However, in order to be trusted, teachers should take the time to learn about MLD and the instructional needs of students with LD and specifically MLD. Conversely, policymakers and administrators can consider the need to evaluate and redesign the use of time and school schedules to increase opportunities for professional learning and collaboration between special education and general education teachers. The use of professional learning communities (PLC) where teachers have time to plan together and discuss pedagogy was a large part of the study; however, the focus is largely placed on the curriculum and not individualizing education. Furthermore, state and district administrators could identify and develop expert teachers as mentors to implement professional development to develop the knowledge, skills, and competencies they need to thrive in the 21st century.

This study has a potential impact on the creation of professional development on the importance of automaticity in math facts, how teachers can use research databases to find evidence-based interventions for their students and pedagogy surrounding LD. Lastly, schools need to revisit their IEP writing process and move away from a check box system to a more thorough review; inclusion teachers must be trained to use the information from the IEP to make instructional decisions; teachers must be given the professional development to understand disabilities and the best practices for each profile; and teachers must be encouraged to teach prerequisite skills in math.

Districts should consider conducting a program evaluation on how writing the IEPs could be more effective and personalized. They should also consider identifying how teachers can be a larger part of the process so they can become invested in the student's learning profiles and data to later incorporate into the decision-making process. Teachers can give their feedback on the current process where they fill out a form to be given to the IEP coordinator to be included in the review and re-determination process.

Delimitations and Limitations

Delimitations are research design choices that provide context for a study in order to make the research doable. This study was delimited to adult teachers in grades 3–8 who would have access to making a decision on whether or not they would take instructional time to teach number combination computations in their mathematics class. Another delimitation was the need for teachers to have at least one student with MLD in their current classes; this delimitation was written to ensure that the research questions about MLD could be addressed. Lastly, the study was open to teachers who had the ability to make instructional decisions about their students in order to fully understand the decision-making process.

The limitations to this study include the fact that the study was comprised of volunteer participants who may have been more open to sharing and thus may have had similar experiences. Additionally, the goal was to obtain 20 participants, but I was only able to include 11 participants in the study. However, theoretical saturation was reached within the participants in the study. Another limitation is the fact that I was not able to observe the classrooms to gain deeper understanding of how the decision-making process is executed into instruction. Also, the interviews were over the phone and not in person, and this could be a hinderance to establishing a rapport. Lastly, none of the teachers in the study were teaching MLD students in the resource room. All of the teachers were assigned to an inclusive setting. More variation of settings would provide a larger data set.

Recommendations for Future Research

In consideration of the study findings, limitations, and the delimitations placed on the study, I recommend the following constructs for future research and study. These recommendations focus on the writing of the IEP process and on special education teachers. First, future research should expand the study population to include all socioeconomic differences and teacher backgrounds. In addition, the majority of the teachers were public school teachers in low SES schools; a more varied population would be ideal. An interesting idea would be to look at the process that districts prescribe for writing IEPs. Lastly, it would be interesting to run the same study with teachers that teach in the special education setting only and see if the results are similar.

Summary

The purpose of this systematic grounded theory study was to explain the process that teachers undergo when making instructional decisions for students with an MLD in reference to mathematics number combination fluency. In Chapter 2, number combination interventions were reviewed and the evidence about their effectiveness was shared. In addition, the evidence on the need to have automaticity in mathematics number combination fluency was explored. The data from this study revealed a theoretical model which represents teachers' decision-making about mathematics number combination fluency as being focused on passing an end of year test, and their decisions are dependent on how they perceive the influencers such as pacing guides, curricula, pay for performance, job security, school and district mandates, IEP, and the requirements of teaching in an inclusive setting. Once teachers face the need for prerequisite skills, they make the decision to teach it or bypass it. Teachers that have a perceived sense of autonomy teach mathematics fact fluency to all of their students. Teachers who have a perceived sense of diminished autonomy bypass teaching the prerequisite skills by providing their students with accommodations. Teachers that have developed a sense of autonomy base their position on positive experiences that have shaped their beliefs. Teachers who feel like they have a diminished autonomy are influenced by a lack of training and the need to adhere to curricula and a pacing guide.

The key features that were revealed include the perceived lack of individualized instruction for students with an MLD. Number combination fluency is largely not taught; instead, accommodations are given to these students to avoid the need for computation.

However, those teachers that teach number combination fluency do so because they have a sense of having autonomy over their decision-making over their instructional time. The curricula and the pacing guide are the number one influencer in the teachers' decision making regardless of perceived autonomy.

The first supporting question examined what constructs teachers attribute to the development of their beliefs about the attainment of mathematics number combination fluency for students with MLD. This question revealed the paucity of knowledge about this population and learning disabilities as a whole. The answers to the interview questions revealed that for eight teachers there is perceived lack of ability to teach mathematics number fluency due to pacing guides and influencers. These teachers do not have a belief about mathematics number fluency that is informed from their practice; however, they do in fact hold a growth mindset about their students. For three teachers in the study their perceptions about number combination fluency come from positive experiences teaching the skill. The experiences are reinforced by the results that their students achieve and this continues to reinforce their beliefs. For these three teachers, mathematics number combination fluency is a mandatory skill. A teacher's perception of autonomy impacts their ability to make decisions about their instructional time. The second supporting question examined how teachers describe their students outcomes. Findings demonstrate that success was measured by passing the end of year standardized test. The overall sentiment for a majority of the teachers was that technology will aid in the students' ability to compute and thus pass the test.

The stories of these 11 teachers and their accounts on their decision-making process is a call to the field to evaluate and make the necessary changes to special education, the IEP process, and inclusive settings. The three teachers that have a sense of autonomy and teach mathematics fact fluency are an example to our field of the positive results of professionalizing our profession and scaling back on mandatory pacing. Lastly, the stories of these teachers reveal the pressures of high stakes testing and pay for performance evaluation programs. My hope is that this study will inform the field on how teachers perceive influences and how stakeholders can make changes to create an environment where teachers can feel autonomous over their decisions.

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APPENDIX A

IRB Approval

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

March 19, 2019

Awilda S. Rudd
IRB Exemption 3631.031919: A Grounded Theory Study Explaining Teachers' Instructional Decision-Making on Mathematics Fact Fluency for Students with a Mathematics Learning Disability

Dear Awilda S. Rudd,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under exemption category 46.101(b)(2), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:101(b):

> (2) Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) have met the following criteria:
>
> > (ii) Any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, educational advancement, or reputation;

Please note that this exemption only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

[redacted]

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
Research Ethics Office

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APPENDIX B

Initial Email to School Principals and Department Heads

Ami S Rudd
Doctoral Candidate
Liberty University

Dear Sir or Madam:

Thank you for your interest in allowing your teachers to be part of my doctoral dissertation research. After you have looked over this information and attachments, please respond back to this email confirming your school's desire to participate in the study. If you have questions after you have reviewed the information, please do not hesitate to reach out by phone or email.

The short questionnaire / survey is intended to identify potential participants who make instructional decisions for students with a mathematics learning disability. The questionnaire / survey will be sent using Google Docs format. The document will include a short introductory email to forward to your teachers. I will then follow up with participants who fit the study criteria and volunteer for the study. This study is a qualitative methodology and am using a grounded theory approach. My goal with this study is to identify the process that teachers undertake when making instructional decisions on math fact fluency for students with a math disability, in order to identify what is needed in the field to ensure that evidence-based practices are being used in the classroom.

For this study, I need to identify about 15 to 30 teachers who have the autonomy to make instructional decisions about math fact fluency for students with a math disability. Because I am looking for this specific domain, I will need to solicit and screen a large pool to get teachers that meet my criteria.

I look forward to hearing from you at your earliest convenience to determine your school's willingness to participate in this study.

Best,

Ami S Rudd

APPENDIX C

Demographic Questionnaire

Questionnaire for demo
Demographic Questions
These questions will help me to know if I have collected insights from a wide group of people in the teaching profession.

2. How many years have you been teaching?
1-5
6-10
10-15
15-20
21+

3. What type of school do you teach in?
Public
Private
Charter
Tutoring center

4. Do you teach math to students with a diagnosed math learning disability?
Yes
No

5. How long have you been teaching math?
1-5
6-10
10-15
15-20
21+

6. Do you make decision on math curriculum?
Yes
No

7. Do you make instructional decisions about what content to teach students with a math disability?
Yes
No

APPENDIX D

Sample Consent Form

The Liberty University Institutional
Review Board has approved
this document for use from
3/19/2019 to --
Protocol # 3631.031919

CONSENT FORM

A GROUNDED THEORY STUDY EXPLAINING TEACHERS' INSTRUCTIONAL DECISION-MAKING ON MATHEMATICS FACT FLUENCY FOR STUDENTS WITH A MATHEMATICS LEARNING DISABILITY

Awilda Soto Rudd
Liberty University
School of Education

You are invited to be in a research study on the instructional decision-making process that you as a teacher undergo in reference to math combination fluency. You were selected as a possible participant because you teach math to at least one student with a diagnosed mathematics learning disability, are licensed, and have at least one year of experience teaching mathematics. Please read this form and ask any questions you may have before agreeing to be in the study.

Awilda S Rudd, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

Background Information: The purpose of this study is to generate a theory or model that will explain the decision-making process teachers undertake regarding mathematics fact fluency for students with a mathematics learning disability by answering the following question: What is the process that teachers undertake when making instructional decisions on number-combination mathematics fluency for students with MLD?

Procedures: If you agree to be in this study, I would ask you to do the following things:

1. Respond to a vignette. This should take about 30 minutes. You will turn your response in electronically.
2. Interview. This should take 1 hour, and it will be audio recorded.
3. Review of Case Load. This task should take you about 10 minutes. You will provide profile information and an academic plan for your students with a diagnosed math disability with the names redacted.

Risks: The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

Benefits: Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include the transfer of information to researchers, teacher educators, mentors, curricula writers, and district leaders about which factors influence whether or not evidence-based methods are being applied in the field and the contingencies for teachers in using them, which will provide information on the research-to-practice gap.

Compensation: Participants will not be compensated for participating in this study.

Confidentiality: The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records.

APPENDIX E

Vignettes

Vignette 1: Bryan

Bryan is a young man in the 7th grade, attending a private school for students with learning disabilities. Bryan has been diagnosed with Dyslexia, Dyscalculia, and ADHD (inattentive subtype). Bryan is 13 years old, an only child, and lives at home with both parents. His parents are very supportive and involved in his education. Below is a summary of his most recent cognitive test scores. Using the Wechsler Intelligence Scale for Children - Fourth edition (WISC-IV), Bryan scored a Full-Scale IQ of 96.

	Standard Score	Percentile Rank	95% Confidence Interval
Verbal Comprehension Index	112	79	105-118
Perceptual Reasoning	94	34	87-102
Working Memory Index	77	6	71-86
Processing Speed Index	97	42	88-106
Full Scale IQ	96	39	91-101
General Ability Index	104	61	99-109

The summary of listed accommodations in Bryan's IEP are:

1. Preferential seating
2. Frequent breaks
3. Plenty of support and encouragement
4. Extra opportunities for physical activity
5. Allowance for movement
6. Repetition of instructions
7. Reduced copying demand
8. Frequent check-ins
9. Allow extended time
10. Reduce the length of assignments
11. Keep tasks and instructions short

Bryan's end of 6th grade math report card under the data section states the following:

Bryan's beginning of the year benchmark assessment score placed him in the 56th percentile at a third - grade level. His November 2016 progress monitoring score placed him in the 61st percentile of 3rd graders. In November 2016, Bryan was given an additional benchmark assessment at the 4^{th} grade level, and he placed in the 38^{th} percentile. In February 2017, Bryan placed in the 10^{th} percentile at a fourth - grade level. In May 2017, Bryan placed in the 21^{st} percentile at a fourth - grade level. In June 2017, Bryan placed in the 12^{th} percentile at a fourth - grade level. Our final benchmark assessment was the most difficult one presented to students and many of his peers struggled on this assessment as well.

Bryan's beginning of the year assessment for common core state standards in math score was an 8/45, 18%, and 5^{th} percentile. This assessment was given at grade level. The only items that were correct were addition and his scores were variable on multiplication, subtraction and division. He missed all items that related to negative numbers, fractions, decimals, percent, area, surface, volume, triangles, ratios, unit rate, and functions.

His current teacher states the following:

Bryan struggles with multi step problems, he also does not recognize how to attack word problems. Bryan counts with his fingers and uses his finger to solve simple calculations. Bryan refuses to use a multiplication chart but does not know his facts. Bryan does not show his work and does not ask for help. His parents help with homework every day and I have gotten a lot of emails about his inability to fully understand the concepts that are being covered in class. He gets frustrated easily and shuts down. Bryan does not verbalize his answers and does not like be questioned about the process he uses.

His parents state the following:

We are concerned about how far behind Bryan is in math. He seems to have an aversion to math. He struggles to count on or use strategies to solve problems. However, it seems like he understands these ideas conceptually but cannot do the actual math. We want Bryan to go to a regular high school and be algebra ready by 9^{th} grade. We know he is bright, and we know that there is a "block" right now.

Bryan states the following:

"Math is really hard at school, but I can do math at home. Like I can help my dad with construction projects, and I understand the ideas. I also use math in my coding that I do for fun. But in the classroom, I just get lost and when I'm trying to figure out one answer the class has moved on to the next problem." When asked why he doesn't use the multiplication chart he stated "Then everyone knows that I don't know it. I'm tired of feeling stupid in math class."

Vignette 2: Nathan

Nathan is a young man in the 5th grade, attending a private school for students with learning disabilities. Nathan has been diagnosed with Dyscalculia, and ADHD (inattentive subtype). He also has a language - based disorder that has not been fully diagnosed. He will be re-tested this spring. Nathan is 10 years old, the youngest of three siblings, and lives at home with both parents. His father travels, and his mom is primarily the caregiver. His mother is supportive and involved in his education but is very busy and often opts for maintaining the role of parent in the household. Below is a summary of his most recent cognitive test scores. Using the Wechsler Intelligence Scale for Children - Fourth edition (WISC-IV), Nathan scored a Full-Scale IQ of 86.

	Standard Score	Percentile Rank	95% Confidence Interval
Verbal Comprehension Index	79	8	73-87
Perceptual Reasoning	86	18	79-95
Working Memory Index	102	55	94-109
Processing Speed Index	94	34	86-104
Full Scale IQ	86	18	81-91

The summary of listed accommodations in Nathan's IEP are:

- Preferential seating
- Allowance for movement
- Frequent check-ins
- Allow extended time
- Keep tasks and instructions short

Nathan's end of 4th grade math report card under the data section states the following:

Nathan's beginning-of-the-year benchmark assessment score placed him in the 4th percentile at a fourth-grade level. In February 2017, Nathan placed in the 22nd percentile at a fourth-grade level. In May 2017, Nathan tested at the 22nd percentile at a fourth-grade level. In June 2017, he tested at the 14tth percentile at a fourth-grade level.

Nathan's beginning-of-the-year assessment for common core state standards in math score was an 18/45, 40%, and 15th percentile. This assessment was given at grade level. Items correct were addition and geometry. His scores were variable on multiplication, subtraction and division. He missed all items that related to fractions, decimals, percent, area, surface, volume, triangles, ratios, unit rate, and functions.

His current teacher states the following:

Nathan continues to work hard in class. As discussed in our parent meeting he does well in class when a new topic introduced is broken down into clear-cut steps. He can follow the steps easily, although he may not conceptually understand the rationale behind each step or the bigger picture. Being presented with new materials used to be anxiety inducing for Nathan. Now, with teacher guidance of how to break a problem down into smaller, more manageable steps he has found success. Working on his math fact fluency will help him as the math content becomes more difficult. We will also target his ability to take what he has learned in class and transfer that into completing homework independently with ease.

His parents state the following:

We are concerned that his teachers are not concerned. We are concerned that he is entering 5th grade and he doesn't know that fractions are parts of a whole, and that there are numbers in between 1 and 2. He counts with his fingers, he doesn't solve math, he counts numbers. We were hoping that Nathan would attend middle school in a larger school where he can play sports and have the opportunity to go to a college prep high school. We have been told that his IQ is low and that he will have limits, but we think that his IQ is lower because of the verbal aspects of the test not because he is an actual standard deviation below.

Nathan states the following:

“Math is boring. I copy and do and copy and do. I don't really know why we do any of it. I remember when I went to the Montessori school math made sense to me then, because it seemed to have a story.” When asked about his future, he stated, “Everyone is worried about math facts, but I have a calculator on my phone.”

APPENDIX F

Semi-Structured Interview Questions

Teaching:

1. Why did you become a teacher?
2. Describe what or who has influenced your teaching style?
3. What do you think has shaped your views of teaching and your role as a teacher?
4. Describe your purpose as a teacher.

Learning Disabilities:

1. Please define learning disabilities.
2. What is a Mathematics Learning Disability?
3. What are your thoughts on whether MLD is underrepresented as a diagnosed disability?
4. Please describe what teaching practices a student with MLD should receive.
5. How do you define intelligence?
6. What do you believe about students with MLD's potential?

Mathematics Instruction:

1. Describe your philosophy in mathematics instruction?
2. What informs your choice on what objectives you have to cover in a school year?
3. Explain your rationale or approach to math facts
4. Explain your process for assessing math fact fluency
5. Discuss your thoughts on who is responsible to teaching math facts
6. How do you determine automaticity in math facts?
7. How long do you spend teaching math facts?
8. What programs have you used to teach math facts?

9. How do you determine what program to use?
10. Explain your use of WWC or similar database

Instructional Decision-Making:

1. What information do you collect and review when making instructional plans for students with MLD?
2. What information is most important in this process?
3. Describe your instructional decision-making process?
4. Explain how you use curricula, and what curricula choices do you have?
5. Explain how you use standards?
6. How is your success or accountability measured?
7. What are the goals for students with MLD in math at your school, your classroom? Explain how you determine which accommodations or modifications are included in the IEP and then part of the academic plan?
8. When and how do you determine if a math facts intervention is needed?
9. Explain what you know about the research on math facts?

APPENDIX G

Member Checking Instructions

Member Checking Directions:
Thank you for participating in this research study. An important part of the study process is providing you an opportunity to review your interview transcript and provide feedback. Attached to this email is a pdf document of your interview transcript. Please review your transcript, save a copy, and return the edited document back to my email.

What I am looking for:
Use track changes to make any comments to the transcript.
Review it asking yourself if it is a fair representation of your ideas and thoughts.

What I am not looking for:
Fix grammar or correct spelling
Overly critical on responses

APPENDIX H

Caseload Prompt

Please provide a copy of the instructional programming for your current caseload of students with a diagnosed math disability. The programming information should have a student profile data sheet, goals, progress monitoring, and accommodations and modifications. If you work in a public school, the IEP would have all of this information, just make sure to delete or black out all identifying information. If you work in a private school, a service plan or individual learning plan should have this information.

If you have any further questions, please call or email me.

APPENDIX I

Audit Trail

3/21/19	IRB Approval	After 3 revisions, I finally obtained IRB approval
3/22/19	Sent Questionnaire out to 30 possible participants	Nervous about this process
3/22/19	Spoke to Dr. Spaulding to confirm process and get blessing!	
3/22/19	Received 4 questionnaire’s back	
3/23/19	Reminder emails sent	Nervous that participants will slow down process
3/25/19	Reminder email sent; 4 participants didn't qualify. Found difficulty using Dedoose for data. Started Nvivo training today	
3/26/19	Received email from participant about the fact that vignette does not align with how they do it. They receive IEP and they follow it, they do not question it or look at student profiles.	This seems like a huge thing. If teachers are not using student profile to make determinations, then how do they make instructional decisions? Is this the breakdown in the system?
3/27/19	Sent out reminder emails about questionnaire and vignette	
3/28/19	Sent out reminder emails. At this point I have 10 participants and 7 that do not qualify. I have received 6 vignettes back and awaiting 4. I have coded each vignette as they come in. I have 3 interviews scheduled.	The vignette responses are shocking. The teachers seem to write how they do not have a say on the educational planning. This continues to be a theme that comes up over and over again. Questions: why their input is not requested and why do they think that the IEP tells them which instructional process to use. It seems like a large disconnect.
3/29/19	Sent out reminder emails. Conducted three interviews	The interviews were stark in difference. One person seemed tired and not really

	Sent files for transcription and received one more vignette	about the kids, used negative phrases throughout and did not seem particularly pleased that she had MLDs. The other 2 were all about the kids and everyone learns differently. However no one knows the research on the topic or how to even find it. They also do not use interventions for drill and practice.
3/30/19	Coded all the interviews	
3/31/19	Started the review of documents	
4/1/19	Constructed a model and focused the rest of the interviews based on the data	
4/2/19	Review the data and asked questions Concluded the interviews	
4/3/19	Sent for member check	
4/6/19	Created model	
4/7/19	Wrote chapter 4	
4/9-4/16	Refined analysis	
4/23	Defense	