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Descriptions of Differentiated Instruction in Mathematics in a Title 1 School District

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Walden University
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Abstract

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MA, Walden University, 2006

BS, Eastern Michigan University, 2000

Dissertation Submitted in Partial Fulfillment

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Abstract

In an urban Title 1 school district, the average number of Grade 3-5 students who scored proficient or advanced on the state standardized assessment was 37.3% below Grade 3-5 students countywide and 19.4% below Grade 3-5 students statewide. Low mathematics scores may indicate a gap in practice that affects student achievement. The purpose of this descriptive case study was to examine teachers' descriptions of instructional strategies implemented to mediate instruction for students who struggle in mathematics. This study was based on the conceptual framework of Tomlinson's differentiated instruction (DI), a means of accommodating the varied ways that students learn. The research questions guided an inquiry into how teachers of students in Grades 3-5 in the school district described DI in practice and explained their professional development on DI strategies. Data were collected from individual interviews with 8 elementary school teachers of students in Grades 3-5 and an instructional coach in the local school district with 3 or more years of experience who considered themselves knowledgeable of DI. I coded the meaningful data collected from the interviews and subsequently formed themes. Themes that emerged from the interviews included defining DI, tools for instruction, classroom set-up and transitioning, assessments, professional development, and grouping strategies. Results revealed that interviewees were confident in defining and facilitating DI grouping strategies for English and language arts but felt the need for more professional development to implement and understand DI in relation to mathematics. The study outcome may impact social change by affecting the gap in practice through professional development that helps teachers implement DI strategies in the classroom to improve student achievement in mathematics.

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Dedication

This dissertation is dedicated in memory of my mom Pearl Marie Bulley and to my dad Lofton Bulley Jr. You always led me to believe that I was capable of success and I never let go of that belief. To my children Nia, Austen, and Nathaniel II, I truly want to be an inspiration to you and an example that you can do whatever you set your mind to do. I hope I have succeeded in portraying that message.

I also dedicate this work to the memories of my two older brothers, my remaining brothers, sisters, and other family members. To Earletta, Zelda, Carla, and Christie, I could not have done it without your encouragement and support. To Dr. Charles and Donna Hawthorne and my phenomenal core group of friends, thank you for the continual prayers and the push that caused me not to give up.

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Chapter 1: Introduction to the Study

The average mathematics achievement scores of students in schools across the nation are below expected grade levels. Low achievement scores in mathematics are also a problem for students in Grade 3-5 in a small city Title 1 school district. Bergold, Wendt, Kasper, and Steinmayr (2017) explained that student scores in academic content areas are influenced by factors identified at the student, classroom, school, and country levels. Dotson and Foley (2016) affirmed that influential factors for students include socioeconomic status, home and classroom environment, and whether accommodations are effective in meeting students' special needs. The study was needed to determine effective practice happening in the classroom environment that may affect positive change in mathematics. Wan Husin et al. (2016) maintained that a strong background in mathematics is an important component of the 21st-century skill set needed to prepare students for demands in a global economy. This study is important because it may lead to the implementation of effective mathematics strategies.

The background section of this study briefly summarizes literature exploring the importance of mathematics achievement and its effect on students' future accomplishments. Chapter 1 contains the conceptual framework of differentiated instruction, including teacher practice and beliefs important to the academic progress of students. A presentation of research that informs effective differentiated instruction and professional development relevant to improving students' academic achievement in mathematics is included in Chapter 2. This study is needed to facilitate positive social change by affecting the possible gap in practice through teacher professional

development and by assisting teachers in implementing differentiated instruction in the classroom as an effective strategy for mathematics achievement in the Title 1 school district and in larger settings.

Background

Research literature indicates that mastering mathematics is critical to students' academic achievement and future career success in demanding workplaces affected by global competitiveness (Harmon &Wilborn, 2016). The demanding workplace of the future involves careers in science, technology, engineering, and mathematics (STEM; Harmon & Wilborn, 2016). The Change the Equation group's (2011) findings were consistent with other research stating that a failure to turn around the decline of U.S. student performance on education standards in mathematics and science is a threat to the economic future of the United States. The Alliance for Excellent Education (2010) stated that there is increased awareness of the long-term effect of inadequate education socially and economically on individuals, communities, and the country.

According to Capraro and Han (2014), mathematics is an important part of STEM education. Capraro and Han also stated that the aims of STEM education are to contribute to students' deeper understanding of content and inspire active engagement in lessons in STEM to strengthen success now and in the future workplace (Capraro & Han, 2014).

Realizing a shortage of workers to fill STEM positions in the workforce, researchers have explored factors that may affect the number of workers in STEM careers (Jang, 2016). These factors include experiences from early life, such as those related to

classroom interactions, as well as gender and race (Jang, 2016). Beach, Henderson, and Finkelstein (2012) suggested that courses have been teacher-centered as opposed to student-centered, which would enhance student learning. Burrus, Jackson, Xi, and Steinberg (2013) stated that it is possible that student learning expectations and school expectations of what to teach have not adapted quickly enough to changes in the economy and business.

According to Jang (2016), changes were implemented in instructional practices to help create hands-on learning environments, enhance student problem-solving skills and productivity, and enhance positive attitudes toward mathematics and other STEM topics to facilitate improved experiences. However, the changes have not been proven to have made a significant impact on the shortage, and a significant gap between student STEM skills and the STEM workplace is still evident (Jang, 2016). In fact, the largest skills gap of today exists in the areas of STEM (Workforce Education Readiness and The Global Skills Gap, 2016). Capraro and Han (2014) contended that more research is needed to determine best practices for STEM education.

Mathematics skills are important components of the STEM field and for students' future success. Low mathematics scores may indicate a gap in instructional practice that affects student achievement in mathematics. This study investigated teachers' descriptions of instructional strategies that can contribute to improved mathematics achievement for students. Further analysis of the results may reveal strategy components for effectively differentiating mathematics instruction. Teachers' descriptions of mathematics instruction and their related professional development could provide

findings to address a possible gap in instruction. The study was needed to possibly improve mathematics achievement for students and affect positive social change.

Problem Statement

In a small city Title 1 school district in the Midwest, an achievement gap is evident through state standardized assessments. Administrators and teachers in the local Charleston School District (a pseudonym) are concerned that teachers may be struggling, for undetermined reasons, to meet the instructional needs of students in mathematics. According to the 2016 Michigan Student Test of Educational Progress (M-Step), 80% of third- to fifth-grade students in the Charleston School District scored *partially proficient* or *not proficient* in mathematics. Assessments are necessary to determine if teaching strategies are effective in helping students learn necessary mathematics concepts (Mupa & Chinooneka, 2015). The following data provide insight into the scores of students in the Charleston School District, in the county Intermediate School District (ISD), and statewide (Department of Education, 2016).

Table 1

Charleston District: Students With Not Proficient Scores

School year/ assessment	Average	Grade 3	Grade 4	Grade 5
2016 M-Step	44.6%	45.5%	34.9%	53.4%
2015 M-Step	56.4%	49.8%	59.2%	60.3%
2014 MEAP	70.7%	70.2%	74.3%	67.5%

Table 2

Charleston District: Students With Partially Proficient Scores

School year/ assessment	Average	Grade 3	Grade 4	Grade 5
2016 M-Step	35.4%	30.7%	40.5%	35%
2015 M-Step	30.5%	31.5%	34.1%	25.8%
2014 MEAP	14.5%	15.7%	15.4%	12.5%

Table 3

Charleston District: Students With Proficient Scores

School year/ assessment	Average	Grade 3	Grade 4	Grade 5
2016 M-Step	15.6%	19%	19.3%	8.5%
2015 M-Step	11%	16.1%	6.7%	10.3%
2014 MEAP	13.7%	13.8%	10.4%	16.9%

The data also indicated that an average of less than 5% of third- to fifth-grade students in the district received advanced scores in 2015 and 2016.

Table 4

Average Scores for Students in Grades 3–5 in 2016

	Advanced	Proficient	Partially proficient	Not proficient
Charleston School District	<5%	15.6%	35.4%	44.6%
Intermediate School District (ISD) County	32.5%	25.4%	23.9%	18.2%
Statewide	16.2%	24.8%	31.1%	28%

Scores reveal that 80% of students in Grades 3-5 in the Charleston School District received *partially proficient* or *not proficient* scores, compared to 59.1% of students in Grades 3-5 in the county. This reveals a 20.9% deficit in students' mathematics competency compared to that of students in corresponding grades in surrounding school districts. At this point, it has not been determined whether teachers in the district have determined effective strategies that can mediate instruction for struggling mathematics students. The data serve as evidence of a problem in mathematics achievement in Charleston School District.

The achievement gap and the possible gap in instruction affect all stakeholders in Charleston School District. Teachers and administrators in the district have sought ways to improve student achievement in mathematics through various programs and instructional strategies. As a part of the new school district improvement plan at the inception of the new consolidated school district, administrators, teachers, and other stakeholders identified the low average mathematics scores of students as a problem to address when the 2013-2014 school year began.

The decision to focus on mathematics achievement led to administrators sponsoring a 3-day professional development workshop on mathematics instruction in the areas of the lowest scores. The district later implemented a new mathematics curriculum and consistent use of the Northwest Education Association (NWEA) test to keep track of students' mathematics progress. Mathematics achievement is still considered an area in need of improvement in the school district by stakeholders.

Current research addresses meaningful gaps in instruction as an area that needs to be addressed to enhance positive academic progress for students' future success. Graham and Provost (2013) posited that acquiring strong mathematics skills early in education is essential for all students as they progress toward meeting mathematics requirements in school. The researchers also noted that basic mathematics skills are needed for citizens to make certain financial decisions, problem solve in daily functions, as well as take part in STEM-based career opportunities. Hodara, Xu, and the Center for Analysis of Postsecondary Education and Employment (2014) asserted that there is a negative return in future endeavors in being underprepared in mathematics.

Mathematics Achievement in Larger Settings

The trend of lower than expected mathematics achievement locally and countywide, as revealed through M-Step data, is also prevalent in a larger setting. According to the Nation's Report Card (2015), there was a 1-point decrease in the already below-average scores of students in the state of Michigan on a national assessment taken in 2015 when compared to scores in 2013.

The national achievement data affirm the importance of addressing the gap in practice that affects students' lack of mathematics progress. Every 2 years, select schools and students across the states engage in National Assessment of Educational Progress (NAEP) assessments to gather mathematical progress data (National Center for Education Statistics [NCES], 2016). According to the NCES, Michigan students ranked lower than 32 states, higher than 4 states, and about the same as 15 states and jurisdictions nationwide (Nation's Report Card, 2016).

According to Kelly et al. (2013), the United States was ranked below 35 other educational systems in mathematics literacy. *Mathematics literacy* is defined as the ability to not just demonstrate mathematics computations, but also clearly communicate mathematics ideas (Letwinsky, 2017). Letwinsky (2017) explained that mathematics literacy also consists of knowing how to apply mathematics skills learned to daily operations. Wagner (2008) noted that students in the United States have continued to lag behind their international counterparts in mathematic skills, which reduces their ability to compete worldwide (Wagner, 2008).

The ranking of the United States on major international tests is used to drive reform in education in the United States (Turgut, 2013). The Programme for International Student Assessment (PISA) is administered every 3 years and aims to assess education systems worldwide by testing the knowledge and skills of students. Since 2003, the PISA mathematics scores of students in the United States have remained below those of at least 25 other countries (Organisation for Economic Co-operation and Development [OECD], 2003, 2012). Further, the most current U.S. PISA ranking of 35, compared to rankings of 28 in 2003 and 26 in 2012, reveals a widening mathematics achievement gap between U.S. students and students in other countries (OECD, 2012).

This study focused on identifying themes based on teacher and instructional coach descriptions of differentiated instruction and professional development that might support improved mathematics achievement for students in Charleston School District. The findings may contribute to positive social change for students in the district by addressing a gap in instruction. It was anticipated that teachers and instructional coaches in this

qualitative case study might describe and demonstrate strategies to improve differentiated instruction and professional development to positively affect student achievement in mathematics in the local setting and in larger settings.

Purpose of the Study

The purpose of this qualitative case study was to examine teachers' descriptions of instructional strategies to mediate instruction for struggling students in mathematics and professional development for differentiated instruction. To address the purpose of the study, I interviewed teachers one on one and recorded their descriptions of instructional strategies implemented to improve mathematics achievement and professional development that supports effective differentiated instructional strategies in mathematics. The mathematics focus of the district matched the commitment of this study. The study was aimed to provide insight into current practices to increase effective instruction for mathematics students and professional development for teachers that improves their ability to meet the instructional needs of students through differentiated instruction in mathematics.

The intent of this study was to use the teacher descriptions collected to describe differentiated instruction strategies that teachers implement in classrooms and the professional development provided to determine themes and findings.

Research Questions

The guiding research questions were aligned with the problem and purpose of the study.

Research Question 1: How do teachers of students in third, fourth, and fifth grades and/or instructional coaches in a Title 1 district describe the ways that they differentiate instruction for students in mathematics?

Research Question 2: How do teachers of students in third, fourth, and fifth grades and instructional coaches in a Title 1 district describe their professional development in differentiating instruction in mathematics?

Conceptual Framework

The conceptual framework for this study was Tomlinson's (2000) differentiated instruction, which is a strategy accommodating the variety of ways that students learn. A *conceptual framework* is the underlying frame, scaffolding, or structure of a study (Merriam, 2009). A framework derives from the stance that a researcher brings to the study (Merriam, 2009). Antonenko (2014) defined a conceptual framework of a qualitative study as the structure represented visually showing its alignment with all the major components of the research process. Green (2013) stated that a framework gives a rationale for a study, contributes to the development of research questions, and is considered a map for the study.

A conceptual framework guides the development of interview questions, interview protocols, and instruments to be used in a study. The framework for this study provided the meaning and important components of differentiated instruction to guide the data collection, classification, analysis, and final write-up of findings of the study (Merriam, 2009). I also used the conceptual framework of differentiated instruction to ensure the alignment of the research questions with the research design and methods of

the study. The contextual lens of differentiated instruction guided the use of literature to examine the problem of teachers possibly struggling to meet the instructional needs of students in mathematics.

Differentiated Instruction

Tomlinson's (2000) differentiated instruction conceptual framework guided this qualitative case study. The concept of differentiated instruction guided the questions of the study and helped in determining effective implementation of the strategy to enhance student learning and encourage active planning (Tomlinson, 2000). The research questions for this study helped me in gaining insight into how teachers in Charleston School District used differentiated instruction when they planned for student learning.

Differentiated instruction defined. Differentiated instruction addresses student differences in the classroom through four tenets: *content*, what the student needs to learn; *process*, the tasks that students partake in to master content; *product*, the final projects that allow students to apply and extend what they have learned; and *learning environment*, the set-up of the classroom for work (Tomlinson, 2000). Tomlinson (2000) defined *differentiated instruction* as teachers reaching out to small groups or individual students with a variety of teaching strategies to facilitate the best learning experiences. Other definitions devised by authors provide more insight into the definition of differentiated instruction. For example, Goddard, Goddard, and Kim (2015) stated that differentiated instruction is a teacher's plan for academic diversity in the classroom with a focus on attending to the needs and interests of students in instruction by providing choices and an effective learning environment. Teachers attend to the needs and interests

of students with a goal of helping students succeed (Goddard et al., 2015). Letwinsky (2017) also defined differentiated instruction as the practice of adapting and modifying content, projects, products, and assessments with the goal of meeting each student's learning needs. Differentiated instruction is a learner-focused practice (Tomlinson, 2010). *Personalized instruction* is one type of differentiation that meets the needs of individual students (Tomlinson, 2010).

Goals of differentiated instruction. Santangelo and Tomlinson (2012) stated that the goals of differentiated instruction are to maximize students' academic potential by providing experiences that address individual needs. The two authors went on to say that the learning experiences provided by the teacher are grounded in the teacher's use of the students' distinctive and common needs to maximize the learning potential of all students (Santangelo & Tomlinson, 2012). Santangelo and Tomlinson found that positive classroom environments, varied assessments that inform instruction, engaging activities, a high-quality curriculum, and flexibility all enhance the learning experiences of students. In addition, teachers can differentiate by responding to students' level, pace, or preferred instruction type to support achievement for all (Chien, 2012).

Differentiated instruction enhances students' 21st century skills by engaging them in collaboration and communication during mathematics instruction. Communication and collaboration skills are essential components of differentiated instruction (Wan Husin et al., 2016). Enhanced 21st-century skills help students to think critically, solve problems, and collaborate with other students to compete in local and global society (Witte, Gross, & Latham, 2015). Such skills support academic and societal success in

areas such as personal budgeting and decision making while increasing access to careers in STEM (Witte et al., 2015). Therefore, enhancing 21st-century skills instruction is a benefit of differentiated instruction and is beneficial for students' present and future.

Major components of differentiated instruction. While authors describe through literature what differentiated instruction and professional development look like, Tomlinson (2008) also described the major components of differentiated instruction. The following are the major components of differentiated instruction, according to Tomlinson: (a) lesson content, (b) process of learning, (c) lesson outcome products, and (d) an effective learning environment. Chien (2012) concluded that to differentiate content, teachers may provide leveled material based on presassements that determine student readiness for content. To differentiate the process, teachers may choose a variety of learning activities to present content (Chien, 2012). To differentiate the lesson outcome products for a problem, teachers may provide students with choices for how to present what they have learned (Chien, 2012). More detailed literature outlining the components introduced by Tomlinson is presented in the literature review.

Differentiated instruction (Tomlinson, 2000) appears to be a common-sense approach to promoting equity by addressing the diverse instructional needs of all students. This study may help to determine the logical connection of the key elements of differentiated instruction and academic achievement for struggling students. In Chapter 2 of this study, I also review the various research literature on differentiated instruction and professional development for differentiated instruction. The differentiated instruction framework was expected to provide a useful lens for examining the instructional practices

of teachers in Charleston School District because it defines concepts that might be present in teachers' descriptions of differentiated instruction and their professional development needs, and it might be helpful in recognizing effective strategies in lesson observations.

Differentiated instruction in mathematics. According to Ollerton (2013), the effects of differentiation that takes place in the mathematics classroom are extensive and are enhanced by quality planning and teaching. These effects could include improved mathematics achievement and future success in mathematics for students. Providing leveled, interesting tasks that elicit active engagement in students is essential to differentiating instruction in mathematics that can support change (Ollerton, 2013).

Baker and Harter (2015) noted that in the mathematics classrooms they studied, student-centered pacing was a differentiation strategy that teachers used to guide instruction for students who struggled. Student-centered pacing is based on the understanding that students' abilities should inform instructional decisions (Baker & Harter, 2015). For example, Baker and Harter noted that the use of alternative forms of assessment and scaffolding were common practices that surfaced as effective ways to differentiate mathematics instruction. Alternative assessment forms included assessing student understanding through observations and discussions along with formal assessments (Baker & Harter, 2015). Teacher scaffolding supports individual students' access to the lesson without changing the veracity of the mathematics (Baker & Harter, 2015).

The goals, components, and definition of differentiated instruction addressed in this section are key elements of the framework of differentiated instruction. The connection of these key elements is explained more thoroughly in Chapter 2 of this study.

Nature of the Study

This study was a descriptive case study. Stake (1978) described a case study as a bounded system of interest in which the researcher identifies the boundaries of a case and keeps it in focus throughout the study. In a case study, the researcher gathers data with the aim of analyzing the data by cultivating themes (Merriam, 2009). The themes help the researcher to understand what people think within a bounded system (i.e., the boundaries of the unit studied; Merriam, 2009). In this case study, the bounded system of interest was elementary teachers of students in Grades 3-5 in the Charleston School District.

Case studies help researchers understand situations in depth and the meanings involved in observations and interviews with open-ended questions (Hancock & Algozzine, 2006). A classic case study takes place in real-world situations and consists of an in-depth inquiry into a phenomenon (Yin, 2013). The phenomenon of interest in this case study was the low mathematics achievement scores of students in Charleston School District. The low achievement scores revealed a possible gap in instruction that might contribute to the problem of teachers possibly struggling to meet the instructional needs of students in mathematics.

The rationale for choosing the descriptive case study design for the study was that I sought to gather the descriptions of a specific group of teachers and instructional

coaches to determine effective differentiated instruction strategies to address the phenomenon of low mathematics achievement scores. The specific group of Grades 3-5 teachers consisted of teachers who used differentiated instruction strategies and had at least 3 years of experience in the elementary classroom, with some of that time involving teaching Grades 3-5.

The data for the descriptive study derived from teacher interviews. To analyze these data, I reviewed transcriptions of recorded individual interviews and field notes to determine themes and patterns that might emerge. The findings of the study may provide information that assists in creating positive social change in mathematics instruction in the school district and other settings.

Definitions

The following are definitions and terms used in this study. The terms are associated with academic expectations and measuring instruments.

Norm-referenced tests are tests administered to students that measure performance compared to peers (Spaulding, Szulga, & Figueroa, 2012).

The *Michigan Educational Assessment Program (M-Step)* is the state standardized test used in Michigan to compare the growth of students using academic standards (Michigan Department of Education, 2013).

Title 1, Part 1 of the Elementary and Secondary Education Act (ESEA) provides financial assistance to schools and local education agencies (LEA) with high percentages and numbers of students from low-income families to ensure that all children can meet state academic standards (U.S. Department of Education, 2015).

21st-century skills are critical thinking, contextual learning, collaborating, and problem-solving skills expected of students to support success in local and global settings (DiBenedetto & Myers, 2016).

The *Rasch Unit (RIT) scale* is a measurement system for test items that allows the teacher to compare changes in achievement between tests to other students in the same grade at a stage in a school year (NWEA, 2016).

Socioeconomic status is an individual's access to cultural, social, financial, and human capital resources. It can include parental education, parent occupation, and household or family income (NCES, 2012).

Assumptions

Assumptions are general beliefs about a study (Hancock & Algozzine, 2006). Cohen, Manion, and Morrison (2007) stated that assumptions are facts presumed to be true. Three assumptions in this study need to be acknowledged. The assumptions were (a) that participating teachers were actively integrating differentiated instruction in mathematics, (b) that the teachers who were chosen to participate were knowledgeable of differentiated instruction because of professional development participation, and (c) that teachers participated as expected in the professional development opportunities offered in the school district. The assumptions derived from my awareness of expected teacher participation in continual professional development provided by the school district.

It was assumed that interview participants responded openly and honestly to interview questions. I assumed the honesty of participants during this study. Honesty was believed but could not be determined because there is no way to guarantee that a

participant's response is honest. However, honesty was assumed. These assumptions were necessary to collect data for the study.

Scope and Delimitations

The scope and delimitations of a study include the boundaries of the research (Hancock & Algozzine, 2006). The scope of the study encompassed examining teachers' descriptions of integrating differentiated instruction into their lessons to positively affect student achievement in mathematics. The study was not about negative effects or concerns related to differentiated instruction. It was also not about determining that any other instructional strategy was ineffective or classifying teachers as ineffective for the purpose of evaluation. The scope of the study was a Title 1 school district in a small city. The site also provided the bounds of the study, which included the descriptions of Grades 3-5 teachers in Charleston School District.

Limitations

Limitations are factors that the researcher cannot control that can affect the results of a study (Handcock & Algozzine, 2006). The sample size was a factor outside my control that could have affected the study. The school district had only four elementary schools that housed Grades 3-5 teachers and students. The small number of teachers in the district schools affected the number of teachers eligible for selection to participate in the study.

There are concerns that case study findings are not always generalizable to a larger population (Merriam, 2009). This study focused only on teachers within a small school district who implemented differentiated instruction in their classrooms. Therefore,

the results can only be transferred to a larger population with similar characteristics, not to the whole population. For researchers to make data generalizable or transferable, they must provide descriptive data sufficient in detail to support the study outcome (Merriam, 2009). The data analyzed for this study can create positive social change in populations such as that of Charleston School District.

The sensitivity and integrity of the investigator limit a case study (Merriam, 2009). To ensure sensitivity and integrity, researchers must make themselves aware of any biases that could affect the outcome of the product (Merriam, 2009). In that I was an employee of the school district in this study, biases may have occurred naturally. Because I was familiar with the curriculum and the mathematics instructional practice of some teachers, the possibility of bias was present. To make myself aware of biases that might arise in the study, I had my interview questions examined by someone other than myself to confirm that the questions were open ended and that they did not lead to expected answers.

A researcher's role as the primary data collector and analyst is another limitation due to possible biases, according to Merriam (2009). In a study such as this one, in addition to being the primary data collector, the researcher also must engage in self-reporting and disseminating the data findings, which could present an ethical problem (Merriam, 2009). To address these limitations, I represented responses to interview questions carefully. I used recordings to ensure that I attended to the accurate response without adding or subtracting meaning as I searched for themes. The data will be disseminated to the district for the sole purpose of providing insight into the description

of mathematics practices within the district that could potentially improve mathematics achievement in the district.

Other limitations of this study included not having adequate time and places to conduct interviews. The interviews that I conducted involved teachers from different schools throughout the district. I had to schedule a time to meet with each teacher. I also had to determine which teachers were most suitable as participants in the study and then garner their willingness to participate. To address this limitation, I extended the invitation to participate to all current teachers of Grades 3-5, and I offered the opportunity to complete a phone interview instead of a face-to-face interview when needed.

Significance

The study may contribute to knowledge in the discipline of mathematics instruction. The outcome from examining teachers' descriptions of differentiated instruction in mathematics and teacher professional development to improve the integration of differentiated instruction may provide themes to apply when making policy in the school district. The data may identify the components of an effective implementation of differentiated instruction in the classroom and provide focused support for teachers in differentiated instruction. It is important to examine descriptions of differentiated instruction to determine aspects of its effectiveness.

The data gathered from the study may contribute to an understanding of effective professional development for differentiating instruction by providing insight into teachers' descriptions of professional development. The descriptions revealed components of professional development that teachers deem effective in supporting the

implementation of differentiated instruction in the classroom. The data also provided insight into effective instruction that increases academic achievement in mathematics and impacts social change in the local school district and larger settings.

Local Applications

This case study is important to the local setting because it may provide insight into effective differentiated instructional strategies that could be shared with policy makers and educators to enhance academic achievement in mathematics. The average M-Step scores of Charleston School District elementary students in Grades 3-5 have remained below the average scores of other school districts countywide and statewide over a 3 year period. Collecting data from interviews with teachers about their practice and professional development may enhance mathematics instruction, which could lead to closing the possible gap in instruction. The study helped to identify how differentiated instruction strategies help teachers provide effective mathematics instruction. The study findings may aid in the design and implementation of professional development that equips teachers with instructional strategies for the effective implementation of differentiated instruction. Lau and Stille (2014) stated that using description data to apply strategies that work in instruction is an example of responding to learning by responding to the needs of students. Responding to the needs of students is the reason for implementing differentiated instruction in the classroom. The application of the findings of this study to the local school district may create positive social change for students in mathematics achievement when teachers implement findings that support effective differentiated instruction in the classroom.

Social Change

Social change may happen when scholars work together to contribute to projects that facilitate equitable forms of learning and teaching to create a just democracy in education (Bang & Vossough, 2016). Democracy in education is related to John Dewey's work to address equitable education from societal and individual perspectives (Hansen & James, 2016). If schools are going to be part of social change, equitable opportunities for the immersion of the students in educational practices is needed to enable them to think critically and gain knowledge about the global society in which they live (Schirmer, Lockman, & Schirmer, 2016). Differentiated instruction provides a variety of learning opportunities that can enhance students' ability to gain knowledge (Tomlinson, 2000). This study may support positive social change locally and globally by addressing the gap in instruction in mathematics through the effective implementation of strategies in mathematics instruction. According to Witte et al. (2015), students' proficiency in mathematics is important at both individual and societal levels. The outcome of the study may also cause teachers to adjust differentiated instructional practices to effectively address student needs locally and in other school districts like Charleston School District. Finally, this research study may offer findings that other districts can adapt and incorporate to provide teachers with effective professional development for differentiated instruction to increase mathematics achievement.

Summary

In Chapter 1 of this study, I presented the introduction and background to the problem, problem statement, purpose of the study, research questions, conceptual

framework, and nature of the study. This chapter also contained definitions and assumptions that accompanied the case study. The scope, delimitations, and limitations were included as part of Chapter 1. The chapter concluded with the significance of the study and a summary.

The number of students who scored *not proficient* on M-Step in the Charleston School District was higher than the county average. Gathering teachers' descriptions of ways in which they differentiate instruction for struggling students may reveal themes that benefit the effective implementation of differentiated instruction. Effectively implementing differentiated instruction in the classroom could have a positive effect on academic achievement in mathematics. The idea that applying differentiated instruction could result in a change in student achievement in mathematics was the impetus of this case study. The outcome of this study might assist administrators in implementing policies that support the effective implementation of differentiated instruction and relevant professional development that positively affect mathematics achievement.

Chapter 2 of this research study includes the literature review. The literature review included in this study consists of literature that focuses on planning and implementing differentiated instruction and effective professional development that supports differentiated instruction. The chapter also contains the literature search strategy, conceptual framework, and review of literature related to key variables and concepts, followed by a summary and conclusions.

Chapter 2: Literature Review

Administrators and teachers in a local school district are concerned that teachers may be struggling to meet the needs of students in mathematics. In Charleston School District, 80% of students in Grades 3-5 received *partially proficient* or *not proficient* scores on the state assessment in mathematics (Michigan Department of Education, 2016). The purpose of this case study was to examine elementary teachers' and instructional coaches' descriptions of instructional strategies to mediate instruction for students struggling in mathematics and teacher knowledge gained through professional development for differentiated instruction. National and global assessment (NCES, 2013) results have revealed a need for improvement in mathematics locally, statewide, and globally. Included in the literature search strategy section below are key search terms used for the review of literature related to differentiated instruction and professional development that may provide insight into strategies to improve mathematics achievement.

The research studies included in this review help to illuminate the concept of differentiated instruction and its effect on students' mathematics achievement. The studies also address the effect professional development can have on teaching mathematics. The review comprises research about teacher perspectives on instruction and the effect that teacher perspectives on differentiated instruction for struggling mathematics students have on students' academic achievement. The information may support the need to design professional development in differentiated instruction for

teachers and administrators to address the needs of all learners and as a strategy for student improvement in mathematics achievement for struggling learners.

Literature Search Strategy

Walden's Home Library link was the main search engine used to gather resources for this study. On the link, I accessed useful research databases such as Educational Resources Information Center (ERIC), Educational Research Complete, Sage Premier, and ProQuest. To achieve a more thorough search on the topics chosen and access the multiple links mentioned in the literature review, I employed the Thoreau multi-database search tool. This tool allows researchers to gather sources from many library databases with each search. Using Thoreau to access multiple databases, I searched the terms *differentiated instruction*, *differentiation*, *professional development*, *teacher perception*, and *effective instructional strategies*. Other terms searched were *curriculum*, *mathematical thinking*, *teacher education*, *instructional explanations*, *content*, *process*, *product*, *case study*, *lesson outcomes*, *effective strategies*, *teacher perspectives*, *teacher collaboration*, *21st-century skills*, and *stimulating teaching*. The Thoreau multi-database search was used iteratively for all terms because of the ability it provides to search across various databases simultaneously.

Conceptual Framework

Differentiated instruction was the conceptual framework (Tomlinson, 2001) that guided this study. Tomlinson (2000) defined differentiated instruction as teachers providing instruction to small groups or individual students with a variety of teaching strategies to facilitate learning experiences. Content, process, product, and learning

environment that support enhanced achievement for all students are specific components of differentiated instruction (Tomlinson, 2008).

Differentiated Instruction

Differentiated instruction includes creating and adapting lesson content using students' prior knowledge and learning goals and following a process involving how students learn best (Tomlinson, 2008). Differentiated instruction is also guided by how students prefer to learn and provides expected products from students after instruction (Tomlinson, 2008). Differentiated instruction requires teachers to provide students with opportunities to access, process, and demonstrate learning through planned lessons (Goddard et al., 2015). When teachers modify instruction based on readiness, learning styles, and interests, it enables engaging, authentic, and rigorous curricula that enhance learning (Hedrick, 2012). The framework also suggests that effective learning environments are important when implementing the differentiated instruction strategy (Tomlinson, 2008). The following section provides a more in-depth look at content, process, product, and learning environment, which are the major components of differentiated instruction.

Content. The content of a lesson addresses what students need to know (Tomlinson, 2008). Teachers need varied-level content material and multiple ways of presenting the content to facilitate effective differentiated instruction (Tomlinson, 2008). Opportunity for small group instruction and reteaching should be provided (Tomlinson, 2008). In addition to having knowledge of the subject, a teacher needs to be flexible and able to represent the content in honesty, without changing the rigor of the content, to a

wide range of learners (Ball & Forzani, 2011). It is important to have clear expectations and activities in classrooms to facilitate differentiated instruction (Dobbertin, 2012). Small (2012) stated that to differentiate instruction effectively, there is a need for preassessment, choice in activity, and big ideas or fundamental principles of instruction (Small, 2012). Another two ways to differentiate content are through critical thinking and questioning (Small, 2012).

Flexible groupings are important when differentiating content in a classroom because they provide space for reteaching content and extending the thinking skills of students based on the specific needs of individuals in the group (Tomlinson, 2000). In addition to these small group opportunities, Tomlinson (2008) stated that differentiated instruction can also be facilitated through partner work, varied-leveled work, workshops, personalized rubrics, independent studies, and task and product options. Overall, differentiated instruction allows the teacher to implement any strategy that meets the needs of the student (Tomlinson, 2008).

Process. Teachers facilitate instruction the way students prefer to learn as part of the process of a lesson (Tomlinson, 2008). Tiered activities are important in this component (Tomlinson, 2000). During tiered activities, students work on the same skills but proceed at different levels (Tomlinson, 2000). Teachers use a range of expertise to support learning for all students (Davis & Boerst, 2012). A successful teacher recognizes that the diversity of the students may affect learning and will use instructional strategies that address student diversity (Chien, 2012).

Differentiation helps teachers honor students' interests during the process of instruction, which benefits students and may motivate them to learn (Wu, 2013). Culturally relevant methods and practices of teaching can also assist teachers by enhancing their ability to provide meaningful and relevant lessons for students (Timmons-Brown & Warner, 2016). Differentiated instruction in the classroom does not eliminate the expectation to address standards. The process of the lesson assists teachers in giving students the opportunity to participate in rigorous and engaging standards-based lessons based on their readiness and interests (Hedrick, 2012). To grow as much as possible, students must take charge of their learning during the process in addition to learning essential content (Tomlinson, 2008). Students should be the focal point of the process and planning so that they are connected and engaged in the lesson (Tomlinson, 2008).

Product. The product of a lesson is a display of a learning outcome of the students (Tomlinson, 2008). Projects are types of products that display learning outcomes. Altintas and Ozdemir (2015a) stated that project activities based on student learning preferences help students to create products that develop and display creativity (Altintas & Ozdemir, 2015a). Differentiating products give students a choice in how they demonstrate their learning (Kline Taylor, 2015). It is important to provide students with options to express the expected learning when creating a product (Tomlinson, 2008). Altintas and Ozdemir evaluated ways to differentiate instruction in mathematics for gifted students. The authors asserted that options for instruction and products provide students with the chance to insert their preferences while sharing projects to display the

learning outcome. Anderson (2015) suggested that teachers expand limits when they look at products of lessons as an opportunity to increase learning opportunities. Teachers need to ensure that curriculum is clear and focused on differentiated instruction to support positive learning outcomes (Tomlinson, 2008).

Learning environments. Effective classrooms are classrooms that have environments conducive to learning (Tomlinson, 2008). To ensure that an environment is effective for learning, the teacher should provide spaces for working quietly and spaces that invite collaboration (Tomlinson, 2008). Teachers should set clear guidelines for work spaces and allow students to move around as needed (Tomlinson, 2008).

Differentiated instruction approaches. According to Altintas and Ozdemir (2015), there should be different approaches and models employed when differentiating instruction. Approaches to differentiated instruction may involve ability grouping, multiple intelligences, project-based learning, and cooperative learning approaches (Altintas & Ozdemir, 2015). Research on differentiation based on gender differences has suggested that there may be learning differences between the genders (Arslan, Canli, & Sabo, 2012). This case study addressed some of the approaches mentioned later in the literature review.

Challenges to differentiated instruction. Teachers differentiate to maximize students' potential (Tomlinson, 2008). However, meeting the academic needs of students with a wide range of abilities and achievement levels is challenging (Prast, Van de Weijer-Bergsma, Kroesbergen, & Van Luit, 2015). Rubenstein et al. (2015) stated that challenges to differentiated instruction in classrooms include time, ability, and

confidence. Such challenges can sometimes cause a lack of differentiated instruction in the classroom (Rubenstein et al., 2015). Lack of differentiation can also result from teachers failing to realize the necessity for it (Santangelo & Tomlinson, 2012). This case study examined descriptions of differentiated instruction in mathematics to determine implementation strategies and effectiveness. The outcome may provide data that help to address the low mathematics achievement scores in the school district.

Finally, differentiated instruction can also be considered personalized instruction (Tomlinson, 2010). Personalized instruction is a teacher's attempt to personalize learning for each student (Prain, et al., 2013). Effective teacher differentiation guides the personalized learning of curricula to address diverse learner needs (Prain et al., 2013). Differentiated instruction is a strategy used in classrooms to ensure that all students have an enhanced opportunity to achieve. Goddard et al. (2015) defined differentiated instruction as teachers dedicating themselves to plan for academic diversity with a goal to attend to the needs and interests of students to help them to succeed academically.

Literature Review Related to Key Concepts and Variables

Differentiated Instruction in Mathematics

Teachers' implementation of differentiated instruction can be influenced by the academic subject and may differ based on student level (Ritzema, Deunk, & Bosker, 2016). This case study focused on differentiated instruction in mathematics. Ritzema et al. (2016) studied the approaches of second- and third-grade teachers in reading and math lessons and stated that the context factor of subject domain influences how a teacher differentiates due to the nature of the subject. Academic subjects are structured in

various ways (Ritzema et al., 2016). Textbooks are different and may or may not assist in the facilitation of differentiated instruction (Ritzema et al., 2016). Nurmi, Viljarata, Tolvanen, and Aunola (2012) found in their study of differentiation practices in Finnish education that mathematics lessons were structured more freely than reading lessons and included more varied instruction. In their study, Ritzema et al. noted that teachers provided instruction that extended the lesson more often in mathematics. In another study that addressed differentiated instruction in mathematics, Bal (2016) noted that in the context of mathematics, the differentiated instruction approach is important and can include various levels of differentiation, with enhanced learning environments enriching the instruction. The purpose of Bal's study was to determine the effect differentiated teaching had on students' academic success in mathematics. The findings of the study revealed that the students in the classes that adopted differentiated instruction had greater gains in mathematics than the group that did not (Bal, 2016).

Many mathematics classrooms now include learners who bring diverse cultures, languages, and mathematics competencies (Adler, Ball, Krainer, Lin, & Novotna, 2005). In their research study, Adler et al. (2005) questioned what teachers need to know to provide quality mathematics instruction in diverse settings. In a study of mathematically talented fifth graders, Maggio and Sayler (2013) noted that in mathematics, the teacher should know to meet the needs of students by matching students' readiness to the level of content presented. Teachers can match students' readiness with content level by analyzing data gathered from assessments administered to the students in the content area (Maggio & Sayler, 2013). Making this connection instead of using the one-size-fits-all

strategy can enhance acceleration in achievement (Maggio & Sayler, 2013). The facilitation of differentiation in teaching and planning is also important (Ollerton, 2014). Ollerton (2014) stated that well-planned differentiation includes addressing different depths of the lesson and creating powerful tasks that help all students progress. The tasks should be engaging and accessible (Ollerton, 2014)

Instructional group work. Teachers use a variety of grouping formats to provide instruction (Hollo & Hirn, 2015). Differentiated instruction in the mathematics classroom can consist of individual, whole-group, and small-group work that includes real-life problems and intriguing activities that meet the students' individual needs (Altintas & Ozdemir, 2015). Van Steenbrugge, Remillard, Verschaffel, and Valcke (2015) shared that the whole-group phase is teacher directed, with instruction provided to a whole group of students; this phase usually takes place when introducing a new concept, whereas the individual phase allows students to work alone on the new concept. The individual phase also gives teachers time to assist students who appear to struggle with content (Van Steenbrugge et al., 2015). Small groups allow time for students to get needed instruction on content that seemed difficult in the whole-group setting (Benders & Craft, 2016).

Whole-group instruction. During whole-group instruction, teachers can use multiple strategies to engage students and gather information to prepare for differentiated instruction (Nagro, Hooks, Fraser, & Cornelius, 2016). Nagro et al. (2016) stated that whole-group strategies provide opportunities for all students to respond in written form, verbally, with hand signals, with gestures, with response cards, and using other response

forms. The differentiated responses gathered from the whole group constitute data that can benefit preparation for differentiated instruction in small-group work. Whole-group instruction, when proactively planned, can benefit a range of student abilities and help keep track of students' growth (Nagro et al., 2016). In whole-group instruction, teachers simultaneously provide instruction to all students. During mathematics whole-group instruction, teachers engage their students in math discussions that teach them how to respond to peers (Brooks, 2016). Brooks (2016) posited that social norms during typical mathematics instruction contributed to students primarily focusing on teacher input. Based on student responses to the interview given to students before her study, Brooks stated that students felt that it was not acceptable to talk during mathematics class. During her study, students were encouraged to engage in discussions with peers more often during mathematics instruction, and based on interviews conducted after the intervention, students felt that it was acceptable to talk during mathematics class and felt empowered by the interactions (Brooks, 2016). One student interviewed for the study correlated being able to talk in mathematics to the expectation of talking in reading class. The active engagement and the social interactions of students when they engage in challenging talks during whole-group sessions cultivate reasoning skills (Fung & Leung, 2016). According to Fung and Leung (2016), these reasoning skills lead to enhanced small-group work. Fung and Leung also concluded from their investigations of other studies that small collaborative group work can in some cases be more effective than whole-group instruction.

Small/flexible grouping. Flexible grouping is a way to allow teachers to extend content while providing students with the opportunity to work with various students, including students of like readiness and like interests, as well as students with different interests. The main purpose of providing teacher-led small group instruction is to differentiate instruction for students performing at different levels (Hollo & Hirn, 2015). Flexible grouping in mathematics or "guided math" is a data-driven process intervention implemented to meet the individual needs of students in learning environments (Benders & Craft, 2016). Benders and Craft (2016), in their study of the effect of small groups on mathematics achievement, found that many mathematics instructors still deliver mathematics instruction in the traditional one-size-fits-all way. Benders and Craft's study revealed that flexible grouping is effective because it allows teachers to manage instructional time effectively and focus on the needs of smaller groups. Benders and Craft stated that flexible grouping offers an alternative to the whole-class instruction frequently used in mathematics. In some small groups, referred to as *flexible groupings*, students are placed based on academic needs as revealed by assessments for enhanced mathematics instruction (Benders & Craft, 2016).

Small group and flexible grouping during classroom instruction may not consist of grouping by ability only or the current ability of a student to perform a task. Wilkinson and Penney (2014) stated that ability grouping is sometimes biased against groups of people and expectations are sometimes lowered when students do not have the ability to move in or out of groups. These groups can include any student who may have scored low in one mathematical area but have stronger abilities in another. Ability

grouping alone does not raise standards and can constrain a student's learning potential (Wilkinson & Penney, 2014). This type of differentiation sometimes leads to the tracking of students or keeping students in a leveled group for an extended time with the same perceived academic ability (Rubenstein, Gilson, Bruce-Davis, & Gubbins, 2015).

In efforts to address the globally changing face of education, Hong Kong, and other countries have begun taking a closer look at the critical thinking and small group work in education (Fung & Howe, 2014). In their study, Fung and Howe (2014) recognized that the students who participated in group discussions and critical thinking tasks displayed improved achievement, but it was not clear if the effects stemmed from the type of group work that took place or the teacher support. There was also the question of the teacher's responsibility during the group work that surfaced in Fung and Howe's study (Fung & Howe, 2014). Teachers provide different levels of support in different types of groupings (Ritzema et al., 2016).

Homogeneous or heterogeneous grouping. There has been a fundamental question whether student grouping should be homogeneous or heterogeneous (Magajna, Zuljan, & Žakelj, 2015). Data analysis represented by Magajna, Zuljan, and Žakelj (2015) in mathematics, reveals a relation between the grouping models in external examination of knowledge (EEK) assessments (Magajna et al, 2015). External examination knowledge is tested using assessments prepared by educational and assessment experts (Magajna, et al, 2015). The purpose of EEK's is to determine a student's knowledge of a subject (Magajna et al., 2015). The M-Step and the NWEA are external examinations of knowledge administered in the Charleston School District. The data reports of Magajna

et al. revealed that the mathematics achievement outcomes of students based on EEK in the heterogeneous groups were higher than the homogeneous group, but there was no statistically significant difference (Magajna et al, 2015).

The results of Ritzema et al.'s (2016) study of teacher behavior variations in reading comprehensions and mathematics lessons indicated that teachers provided extended instruction in small groups more often during mathematics lessons when the group was heterogeneous which could affect achievement.

Independent work. Hansson (2010) argues that during independent work, students are expected to take on a large part of the responsibility for their learning and there is a low level of instructional responsibility. Hansson also correlates independent work with individualized instruction. Hansson calls for more research to address effects of the changes of instructional models for independent work and individualized instruction, highlighting the instructional responsibilities of teachers amid the changes.

Overall, Tomlinson (2015) stated that differentiating is modifying instruction to benefit diverse learners (Baker, K. & Harter, M., 2015). Results from Bal study show students who experienced differentiated teaching or instruction experienced greater mathematical success than the group that did not. Adler et al. (2005) posited that teachers need support through professional development to reach the goal of proficiency in mathematics for all students and to effectively implement differentiated instruction.

Professional Development

According to Linder, Eckhoff, Igo, and Stegelin (2013), in an increased effort to facilitate positive mathematical achievement in students, there has been an emphasis

placed on teacher professional development. Teachers take part in professional development opportunities to help improve their teaching and students' learning (Luft, Bang, & Hewson, 2016).

Traditional professional development is transmitted information to teachers (Linder et al, 2012) in a sit and get format. The one size fits all professional development is not always the most effective form of professional development (Chen and Herron, 2014).

Burrows (2015), sought to understand the structure of effective professional development and suggested that effective professional development provides time for hands on experiences. Professional development that allows time for teachers to discuss, plan, and consider the curriculums, may help teachers effectively implement content (Burrows, 2015). Professional development for mathematics teachers involves making connections between concepts and representations (Orrill & Kittleson, 2014). These types of professional development experiences connect learning with practice allowing teachers to model learning in the classroom (Orrill & Kittleson, 2014). In a study investigating the effectiveness of professional development workshop on improving mathematics knowledge and skills presented in a four-week intensive workshop format, Chen and Herron (2014) stated that teachers should constantly update their knowledge to meet the needs of students in a world of constant changes. Therefore, professional development is provided as an avenue to update teachers' knowledge (Chen & Herron, 2014). The following briefly describes three formats and purposes for professional development as described by researchers.

Curriculum professional development. Some professional development sessions are designed to equip teachers to use curriculum that is pre-differentiated (Rubenstein et al., 2015). Pre-differentiated curriculum describes curriculum that provides pre-assessments and tiered activities to accompany lessons (Rubenstein et al, 2015). Rubenstein et al (2015) studied teachers' reaction to curriculums with pre-differentiated mathematics lessons. After being observed for 16 weeks using curriculum with pre-differentiated content, teachers were able to differentiate more effectively (Rubenstein et al, 2015). The time that it takes to differentiate the lessons could inhibit teachers from differentiating instruction, but the pre-differentiated curriculum helps eliminate some of the work and the need for the inhibition (Rubenstein, 2015). Rubenstein et al, stated that professional development alone may not suffice, and a pre-differentiated curriculum supports teachers as they seek to meet the needs of all students.

Long-term professional development. In another study, Mansour, Albalawi, and Macleod (2014) stated that research reasserts the idea of long term professional development that engages teachers in the learning process is effective in mathematics learning. The long-term professional development is called continuing professional development (CPD) (Mansour et al., 2014). In their study, Mansour et al (2014) examined the views of mathematics teachers on continuing professional development to reassert its effectiveness. Continued professional development takes place during the school year and is provided in contrast to short term professional development (Mansour et al, 2014). Skilled and knowledgeable teachers facilitate high quality teaching and continuous professional development is one way to produce skilled and knowledgeable

teachers (Sabah, Fayez, Alshamrani, & Mansour, 2014). Professional development that teachers determined as engaging included participation in practices that correlated with what took place in their classrooms (Mansour et al, 2014).

Differentiation in professional development. Taking control of learning is a key element in differentiated instruction (Tomlinson, 2008). Chen and Herron (2014) expressed that just as teachers incorporate differentiated instruction, they also should take part in professional development that is differentiated to meet the need of each teacher participant. Differentiation in professional development enhances teachers' ability to provide instructional effectiveness through differentiated instruction (Chen and Herron, 2014). Chen and Herron also stated that differentiated instruction helps teachers meet the needs of learners and by experiencing differentiated professional development, teacher participants become more effective at facilitating lessons using differentiated instruction. Tobin and Tippet (2013) agree that teachers who participated in professional development opportunities to plan and practice implementing differentiated instruction with other teachers felt more effective in facilitating differentiated instruction in their classes (Tobin and Tippett, 2013). Professional development that provides an opportunity for teachers to plan and practice differentiated lessons with other teachers in a safe atmosphere enriches teachers' implementation of differentiated instruction and student learning (Polly et al., 2015).

Learning-trajectory-focused professional development. In the learning trajectory focused professional development, teacher learning includes development in the learning of how students are thinking mathematically (Wilson, Sztajn, Edgington &

Confrey, 2013). In their research study, Wilson et al (2014) rendered the explanation for the term learning trajectory devised to give characterization to paths that learning might take when students progress from start of instruction to the expected learning goal. Wilson et al. propose that learning trajectory focused professional development led to changes in teacher beliefs and knowledge of children's mathematics (Wilson et al., 2014). Research literature from Bianchini, Dwyer, Brenner, and Wearly (2014) proposed that professional development in mathematics should enhance teachers' knowledge of addressing equity issues to promote learning for all. Professional development that aims for positive achievement in students should have a focus on teaching best practices, redirecting teacher's attitudes, and improving pedagogical knowledge of the teacher (Althauser, 2015).

Other characteristics of effective professional development. Other professional development sessions support teachers as they learn effective practices, according to Allsopp and Haley (2015). In their study, Allsopp and Haley sought to determine the impact of informing teachers who teach mathematics through professional development and suggested that additional supports to teachers are important.

Effective professional development should be professionally appropriate or based on teachers' level of knowledge of content presented and aligned with standards and curriculum (Luft, Bang & Hewson, 2016). Professional development should support teachers' ability to capitalize on unexpected situations that arise in mathematics instruction to enhance learning (Foster, 2014). Per Baxter and Ruzicka (2014) and Darling-Hammond and Richardson (2009), effective professional development focuses

on changing teachers' knowledge and instruction. Krasnoff's (2014) article concerning what research says about professional development, expressed that not all professional development is effective in changing teachers' practices.

There are only a few professional developments formats that link student learning and teaching practices (Polly et al., 2015). When teachers present rich mathematical tasks, students show deeper mathematical understanding (Polly et al., 2014). Teachers can present rich tasks during differentiated instruction when they are knowledgeable of the process. Ndlovu (2014) suggested that teachers should participate in professional development training that builds the understanding of mathematics with new strategies and explicit activities that form meaning. Providing teachers with meaningful professional development experiences helps them become leaders in restructuring schools (Sahin & White, 2015).

Overall, it is important for professional development to equip teachers to facilitate mathematical learning experiences that allow students to be actively involved in the learning (Linder et al., 2012). In a study that identified characteristics of professional development through the examination of surveys of elementary school teachers, Linder et al. (2012) suggested that by engaging teachers in similar experiences during professional development, teachers may facilitate differentiated lessons more effectively. Teachers that are actively engaged in professional development take ownership of their learning (Martin, Polly, Wang, Lambert & Pugalee, 2014).

Teacher Perceptions and Beliefs

Knowing the belief, experience, and knowledge of teachers is important to the implementation of new instructional approaches with students (Rillero, 2016). In the study conducted by Polly et al (2015) linking professional development with teacher outcomes, the data revealed that a large synthesis of research has linked teachers' beliefs, perceptions, and knowledge of content to effective or ineffective instruction. Polly, Neale, and Pugalee (2014) noted in a study that focused on researching how professional development influenced elementary school teachers' pedagogies, beliefs, and knowledge, that after long term professional development sessions the teachers were more confident in their ability to instruct mathematics and the confidence led to gains in knowledge of content. Ng'eno and Chesimet (2014) agreed that personal attitudes, qualities, and positive character are important in effective facilitation of instruction. Swars, Smith, and Hart (2009) advised that teachers' attitudes and beliefs influence their behavior and thinking, which includes instructional decision making. Desoete and Stock (2013) in a study of whether classroom experience counts in mathematics instruction, augmented the idea of teacher perspectives affecting performance instruction. Teachers' perspectives and beliefs can influence the differentiated instruction in mathematics and cause instruction to differ from classroom to classroom (Desoete, 2013).

The feeling of preparedness is another issue that may affect teacher performance (Davis, Drake, Choppin, and McDuffie, 2014). Teachers may feel underprepared to teach standards or may conclude that their textbooks are not aligned to support what they are expected to teach (Davis, Drake, Choppin, McDuffie, 2014). Teachers may also

perceive that meeting the needs of a broad range of students is challenging as suggested by Tobin and Tippett (2013) in their research study of planning for differentiated instruction. This perception is due to a perceived lack of knowledge of how to adapt strategies effectively in teaching (Tobin & Tippett, 2013). Anderson and Pence (2015) state that examining students' thinking is one way that assists teachers in implementing differentiated instruction in mathematics and to embrace this type of instruction, teachers must change their perceptions and beliefs about the practice (Anderson-Pence, 2015). Changes can occur in the classroom as teachers adjust their prior goals and belief in their ability to provide effective instruction to students (Anderson-Pence, 2015).

Summary and Conclusions

There is a need to address the low mathematics achievement scores in the Charleston School District. With the rationale that the low scores are a problem that needs addressing in this population, the study examined the data from interviews with teachers who provide mathematics instruction in the school district. An expected outcome of the study after data collection and analysis was an insight into teachers' descriptions of differentiated instruction and professional development that support the effectiveness of the strategy to enhance mathematical practices. The data outcome could create social change in the local setting of Charleston Elementary School District and the larger educational setting.

Chapter 3: Research Method

The purpose of this qualitative case study was to examine teachers' descriptions of instructional strategies to mediate instruction for struggling students in mathematics and of professional development for differentiated instruction. Chapter 3 of this study includes the research design selected for the facilitation of the study. It also includes the role of the researcher and the description of the participants selected for the study. The chapter ends with an explanation of the data collection method and analysis as well as the trustworthiness of the study.

Research Design and Rationale

In a Title 1 school district, the average number of Grade 3-5 students who scored *proficient* or *advanced* on the state standardized assessment was below the state-mandated standard. Low mathematics scores may indicate a gap in practice that affects student achievement in mathematics. This means that administrators and teachers may not be meeting the instructional needs of students in mathematics. According to the 2016 Michigan Student Test of Educational Progress (M-Step), 80% of Grade 3-5 students in Charleston School District scored *partially proficient* or *not proficient* in mathematics.

The administrators and teachers in Charleston School District were concerned that teachers might be struggling to meet the instructional needs of students in mathematics. The following research questions (RQs) guided this study:

RQ 1: How do teachers of Grade 3-5 students and instructional coaches in a Title 1 district describe the ways that they differentiate instruction for students in mathematics?

RQ 2: How do teachers of Grade 3-5 students and instructional coaches in a Title 1 district describe their professional development for differentiated instruction in mathematics?

A descriptive case study was the design of this research study. Lodico, Spaulding, and Voegtle (2010) stated that case studies endeavor to discover meaning and gain insight into a situation. Case studies also help to investigate processes and provide a deeper understanding of a group or situation (Lodico et al., 2010). Researchers employ the descriptive case study design to present a complete description of a phenomenon within its context (Hancock & Algozinne, 2006). The research design for this study was a qualitative single bounded case study that took place within the school district. A bounded case is separated out regarding physical boundaries, place, or time (Creswell, 2012). Some researchers consider a case as an object, whereas others consider a case as a procedure of inquiry (Creswell, 2012). I considered this study as a procedure of inquiry into differentiated instruction and professional development.

Qualitative researchers report a few situational experiences that provide the opportunity to understand how things work (Stake, 2010). I examined teachers' descriptions of their experience with implementing differentiated instruction in the classroom and professional development to examine the possible effect on academic achievement in mathematics. I assumed the role of the researcher in the study.

Role of the Researcher

Researchers must determine the degree of involvement that they will have with participants (Lodico, Spaulding & Voegtle, 2010). My role as the researcher in this study

was as the interviewer. When disseminating findings gathered from interviews, I sought to inform readers of the themes that emerged from the descriptions of teachers' instructional strategies to mediate instruction for struggling learners in mathematics.

I have been an elementary school teacher for a total of 21 years, with 17 years in my current school community. I am currently teaching in the school district used as the setting for the study and am a colleague of the participants.

It is important in qualitative research to plan to manage researcher bias so that portrayed perspectives of participants are not influenced (Lodico et al., 2010). I managed researcher biases by allowing participants to volunteer for interviews and by using open-ended questions to gain personal insight into the participants. The nature of the study and the relationships I had with participants in this research minimized ethical issues. There were no power relationships to be managed in the study, meaning that there was an absence of any relationship involving power between myself and the participants. To further minimize bias and remain neutral as a fellow teacher, I did not analyze questions based on my prior knowledge of the teacher or the situation. I approached the questioning without an expectation of any particular outcome. In qualitative research, the researcher should develop a guide that identifies appropriate interview questions, which will help the interviewee to gain more insight into the study's main questions (Hancock & Algozzine, 2006).

Methodology

Participant Selection

The sites for the study were elementary schools in Charleston School District. Charleston School District is a school district classified as Title 1. Schools and school districts are classified as Title 1 based on the number of students in the population who qualify for free and reduced-price lunches (U.S. Department of Education, 2016). School populations in which at least 40% of students are from low-income families receive federal funds (U.S. Department of Education, 2016). The federal funds help provide additional academic support in reading, mathematics, and other extended learning programs (U.S. Department of Education, 2016).

Charleston School District, formed by the consolidation of two neighboring Title 1 school districts, was established in 2013. The 2015-2016 school year was the third school year of the newly formed district. Both school districts, before consolidation, reported low academic achievement scores in mathematics for students. Charleston School District is a Title 1 public school district in a small urban city outside a metropolitan area with a population of about 19,500 people. The city's population demographics include 61.5% Caucasian, 29.2% African American, 3.9% Hispanic, 4.3% multiethnic, and 4% Native American or Asian. There are nearly 4,000 students enrolled in the local public-school district (Edmonson, 2017). The demographics of the school district include 23% Caucasian, 61.5% African American, 7% Hispanic, 4% multiethnic, and 3% Native American or Asian (Edmonson, 2017). From the demographic data, it appears that many of the families that populate the city do not choose to have their

children attend the public schools available. The elementary schools in the district that house Grades 3-5 consist of a total of approximately 1,000 students. Using an approximate number is appropriate due to changes in student population throughout the school year. According to a report located on the school district website, the school district has 100% free and reduced-price lunch status due to the income levels of the students' families. The prospective participants chosen for the study included only current teachers and coaches within the school district.

When choosing participants for a study, a researcher has to decide whom to interview and where and when the interviews will take place (Merriam, 2009). Researchers using the qualitative study design choose purposeful sampling most often (Merriam, 2009). Purposeful sampling allows the researcher to understand, discover, and gain insight into the phenomenon researched (Merriam, 2009). It important to select the right participants for a study (Merriam, 2009).

Homogeneous sampling was chosen as the sampling strategy for this study. In homogeneous sampling, a type of purposeful sampling, the researcher samples sites or individuals based on membership in a group with similar characteristics (Creswell, 2012). This sampling type was justified for this study because I wanted to interview teachers who taught the same grade levels within the same district. There were four elementary schools within the district that had populations of students that included Grades 3-5. I chose participants from those elementary schools. Using the information gathered, I chose nine participants from schools across the Charleston District based on the following criteria: (a) 3 or more years of experience at the elementary level, (b) current

teacher of Grade 3-5 or an instructional coach, and (c) knowledgeable about differentiated instruction. I gave the teachers an email invite to take part in the study. A consent form accompanied the invite. When teachers agreed to participate, they were expected to respond to the emailed consent form stating their consent prior to the interviews.

Instrumentation

Choosing effective instrumentation is important to the purpose of a study. Semistructured interviews were the means of gathering data for this research. Semistructured interviews are effective and well suited for case study research (Hancock & Algozzine, 2006). To develop questions for the interview, a researcher must understand the purpose of the questions (Glesne, 2011). The purpose of interview questions is to gain insight into the research questions (Glesne, 2011). Interview questions tend to be contextual and specific and should be developed creatively (Glesne, 2011). Participants took part in an interview that included 10 open-ended questions. Open-ended questions allow participants to answer, expressing their experiences unconstrained by perspectives, and open-ended responses allow participants to choose options for responding (Creswell, 2012).

The types of questions used in case study research begin with the word *how* or *why* (Yin, 1994). This study included *how* and *why* probing questions to get specific descriptions of the differentiated instruction in context. It also included questions that would allow teachers and coaches to share their extent of agreement with a statement, followed by probing questions. The interview format was one-on-one interaction

between interviewer and interviewee (Glesne, 2011). Using the conventional approach, I asked questions that were important to the context and purpose of the study. The participants responded based on their disposition (Glesne, 2011). The teachers provided insight by sharing their descriptions of differentiated instruction in the classroom, which provided sufficient data to examine the problem. The instrumentation for the interview helped in gaining insight into teacher descriptions of instructional strategies that may help teachers who are struggling to meet the instructional needs of struggling students in mathematics.

Procedures for Recruitment, Participation, and Data Collection

Participant recruitment took place through an email invitation. In the email invitation, I introduced myself, the topic, and the main details of the study, as well as the consent form. The nine participants signed the consent form when they agreed to participate in the study. The nine participants gave consent to participate in the study by typing the words "I consent" in response to the email invitation. No teachers chose to opt out of the study at any point. After receiving the informed consent information in email form and consenting, the participants agreed to meet with me for the interview. We chose a date to meet and reviewed a hard copy of the consent form at the meeting before the interview began. The process minimized the time that it would take to meet multiple times to establish an interview time and sign the consent form. The participants who were not able to meet in person set up a telephone interview. The interview was recorded and transcribed in the same manner as the meetings that I conducted face to face.

Each participant interview lasted 30 to 45 minutes. The one-on-one interview method was chosen rather than another type of interviewing (e.g., group interviews) to maximize the ability to gain personal insight from the participants. Each interview took place in person at the participant's workplace, if possible, or by phone if the participant chose that option. During the interviews that took place in classrooms, I capitalized on the participants' ability to access any material they needed to support descriptions when responding to questions. Interviews in participants' workplace were scheduled when school was not in session to provide confidentiality. None of the participants chose to meet at a different location. As the interviewer, I found that the ability to experience the material was helpful in interpreting descriptions of data outcomes. However, for teachers who had difficulty with the process of scheduling, the opportunity to do a phone interview was available. In either case, the interview was recorded to ensure that the analysis included all important details and descriptions that the participant shared. I took brief notes during the interviews when possible to provide myself with reminders that would provide clarity to the responses to the questions. The participants who completed the interview received an exit to the study that included debriefing about the study's purpose. There were no plans for follow-up interviews or treatments for participants.

Data Analysis Plan

Case study researchers simultaneously gather, summarize, and interpret data while doing research (Hancock & Algozzine, 2006). In analyzing data, I used the meaningful data that related to the research questions of the study and information that the interviewees volunteered. The first five interview questions were aligned with RQ1.

The second set of five interview questions was aligned with RQ2. The data provided insight into teachers' implementation of differentiated instruction and participation in related professional development.

According to Creswell (2012), there are six steps in analyzing data in qualitative research: (a) collect data, (b) prepare data for analysis by transcribing fieldnotes, (c) read through data to gain a general sense of the material, (d) code data by locating text segments and assigning code labels, (e) code text for description, and (f) code text for themes. I recorded notes about information gathered next to groups of categorized data in my coding process. Because the coding was open to any possibilities, it was considered open coding (Merriam, 2009). The open coding process helped me facilitate the analysis of the data gathered (Creswell, 2012). Codes can cover many topics within the collected data (Creswell, 2012). The codes for this study included teacher descriptions of differentiated instruction. During the process, I created text segments for common data. Text segments are paragraphs or sentences that relate to a single code (Creswell, 2012).

To assist with analyzing data, I employed the software programs HyperTranscribe and HyperRESEARCH. HyperRESEARCH is a software program that assists with creating visuals from gathered data for coding (Creswell, 2012). I chose this program because it is designed to be used for data analysis in qualitative studies. It helped me to create codes and disseminate data into coded categories effectively. It also assisted me in the process of storing data effectively and securely.

I summarized and interpreted the relevant data that related to the study topic and questions by creating a chart that helped me distinguish relevant information from nonrelevant or discrepant information. Merriam (2009) stated that negative or discrepant information is information that does not fit the tentative hypothesis made about a phenomenon. If there is negative or discrepant information found, it can be used to reformulate any tentative hypothesis made until there is no negative or discrepant information left (Merriam, 2009). The relevant information or code was useful in the development of themes. Codes may produce ordinary themes, expected themes, or descriptions (Creswell, 2012). Themes may be layered from basic to complex, or interrelated, connected by sequence or chronology (Creswell, 2012).

The summarizing process included looking at words, themes, and concepts while interpreting data gathered. I synthesized the information to report findings. Synthesizing information includes summarizing, combining, and integrating findings (Hancock & Algozzine, 2006). The data analysis and synthesized findings helped me gain insight into the research questions from the teachers' perspective. The gained insight may aid the stakeholders of the Charleston School District in determining effective changes related to differentiated instruction and professional development that can impact mathematics achievement in the local district.

Trustworthiness

To establish credibility in this research study, I used the process of member checking. *Member checking* refers to a process whereby a researcher asks for feedback from some participants on the some of the findings (Merriam, 2009); it affords the

opportunity for participants to respond about the accuracy of the report (Creswell, 2012). Creswell (2012) stated that member checking involves sharing findings with participants and asking them about the completeness of the report and whether the findings are realistic. Member checking helps in determining whether interpretations are fair and representative of the data collected (Creswell, 2012). Member checking can also be called *respondent validation* (Merriam, 2009).

The process of triangulation of data also supported the trustworthiness or dependability of the study. Creswell (2012), defined triangulation as the process of confirming evidence from different individuals, types of data, or data collection methods in qualitative research. According to Carter, Bryant-Lukosius, DiCenso, Blythe, and Neville (2014), triangulation refers to using more than one data source or method to understand a phenomenon. Data source triangulation likely strengthened the validity of a case study evaluation (Yin, 2013). Triangulation process includes using evidence from different methods of collecting data, types of data, or individuals (Creswell, 2012). I triangulated data input from teachers from four different elementary schools in the district and across three grade levels. Collecting data in this manner allowed me to corroborate data from various sources. During the process of gathering data for the research, I critically reflected on myself as a human researcher and accounted for any bias or assumptions that I may have made in the process of the research (Merriam, 2009). The process of critical reflection while conducting a study is called reflexivity (Merriam, 2009). Reflexivity causes the researcher to share their personal biases and assumptions as well as dispositions about the topic (Merriam, 2009). The reflexivity process helped to

address issues that may affect trustworthiness and ethical issues before and during research. Addressing these issues strengthened the validity of the study.

Ethical Procedures

Ethically, the study posed minimal risk to its participants. After gaining the approval of the Institutional Review Board (IRB) to proceed with the research, I garnered permission from the Charleston School District to invite teachers to volunteer as participants. The recruitment procedure included sending the invitation and informed consent form to the participants via email to determine their willingness to volunteer. Participants gave the final consent by responding to Email invitation and informed consent form and were offered the option of opting out of the study at any time. To maintain low risk before, during, and after the research process, I applied various ethical procedures.

I shared interview procedures and garnered participant consent before the interview. Participants were also informed of the purpose of the study. For confidentiality purposes, I employed the use of pseudonyms and incorporated no other specific identifying markers when sharing data study findings. Personal information was not and will not be shared with the stakeholders of the local school district. I provided only coded finalized results that may affect positive change in the examination of teachers' descriptions of differentiated instruction in mathematics. The data collected was gathered electronically via voice recording. I stored notes taken during data collection in a locked cabinet in my residence. The data was subsequently uploaded to the computer program and is not accessible without a password. After the required

amount of time of 5 years after the study completion, I will shred all papers containing data and permanently delete all data saved on the computer program. The $5 coffee shop card incentive offered to the participants as a thank you for participation was void of connections to the work environment. I informed the participants of the ability to terminate their participation in the research study at any point. The ethical procedures shared for the facilitation of this research study helped minimize the risk to the participants.

Summary

Chapter 3 of this study contained the methodology employed to facilitate research. It also included the research design, the participant selection method, and the data collection method. This chapter included a data analysis plan and strategies to support the trustworthiness of the study. Finally, I described the ethical procedures in place during participant selection and data collection. Chapter 4 of this study will include the reflections and conclusions drawn from the research.

Chapter 4: Reflections and Conclusions

The purpose of this qualitative case study was to examine teachers' descriptions of instructional strategies to mediate instruction for struggling students in mathematics and professional development for differentiated instruction. The study addressed two research questions. The first research question was an inquiry into how Grade 3-5 teachers and instructional coaches in a Title 1 district describe the ways that they differentiate instruction for students in mathematics. The second research question was an inquiry into how Grade 3-5 teachers and instructional coaches in a Title 1 district describe their professional development for differentiated instruction in mathematics.

Chapter 4 of this study includes the setting of the research study, the process of data collection and analysis, and the results gathered from the data analysis. A summary of the chapter follows a section describing trustworthiness of the data gathered during the study.

Setting

The organizational conditions were conducive to gathering participants for the study. Participants who met inclusion criteria in the study setting were willing to participate and share their descriptions as data for the study. The sites for the study were elementary schools in Charleston School District. Charleston School District is a school district classified as Title 1. Nine participants from schools across Charleston District were chosen as participants based on the following criteria: (a) 3 or more years of experience at the elementary level, (b) current teacher of Grade 3-5 or instructional

coach, and (c) knowledgeable about differentiated instruction. These individuals agreed to participate in the study.

Data Collection

Elementary teachers and instructional coaches from schools across Charleston District were invited via email to participate in the study based on three criteria: (a) 3 or more years of experience at the elementary level; (b) current teacher of Grade 3, 4, or 5, or an instructional coach; and (c) knowledgeable about differentiated instruction. Homogeneous sampling was the sampling strategy for this study. In homogeneous sampling, a type of purposeful sampling, the researcher samples sites or individuals based on membership in a group with similar characteristics (Creswell, 2012). There were nine participants interviewed for the study. The participants read and electronically signed the consent form before taking part in the study. I reviewed the contents of the consent form at the beginning of the interview.

The data collected for this study consisted of recordings of individual interviews with the eight participants. The participants took part in one 30- to 45-minute interview in which they answered 10 semistructured questions. Tomlinson's (2000) differentiated instruction conceptual framework guided the formation of questions for this qualitative case study. I conducted seven interviews face to face and two interviews over the telephone. All interviews were audio recorded and consisted of 10 open-ended questions. Open-ended questions were used to allow the participants to describe differentiated instruction and professional development based on their experience without being constrained by my perspective as the researcher (Creswell, 2012). During the recorded

interviews, I asked clarifying and probing questions as needed to understand participants' responses. I member checked participants after the interviews for clarification and to check for accuracy (Creswell, 2012). Triangulation and member checking were helpful in validating the findings (Creswell, 2012). The interviews ended with a debrief of the study's purpose.

After I conducted each interview, I transcribed the recording using the HyperTRANSCRIBE program. The program allowed me to loop parts of the responses to transcribe them as accurately as possible. I secured the transcriptions on my personal computer with a password. Each participant was offered an emailed copy of the audio recording.

Transcribing data allowed me to read and reread the interview responses to each interview question to interpret the data. I uploaded transcriptions from HyperTRANSCRIBE to the HyperRESEARCH program to allow for organization and summarization of data. The program was used to systematically code sections of all of the transcripts. I secured transcriptions and research devices with personal private logins and passwords on my electronic devices.

Data Analysis

After all the interview transcriptions were uploaded to the HyperRESEARCH program, I began coding data based on ideas that emerged in each transcription. I ended up with 119 codes for common ideas that emerged from the interviews. After examining the codes in greater depth, I inductively determined which codes involved similar ideas and categorized those codes by those ideas. I continued that process until I had identified

six themes that addressed the research questions. The themes that emerged were defining differentiated instruction, tools for instruction, classroom setup and transitioning, assessments, professional development, and grouping strategies. After refining themes, I began to revisit the transcripts in search of more possible themes. Discrepantly, the search revealed that a couple of teachers had no recollection of professional development in mathematics outside professional development for curriculum use. The discrepant data informed the findings by giving insight into the strategies that teachers with little to no professional development with the school district in mathematics used to differentiate instruction. The data also revealed other professional development opportunities that teachers engaged in to develop strategies to differentiate instruction in mathematics.

Results

During the interviews, all participants appeared to be comfortable sharing their descriptions of differentiated instruction within lessons in their classes. I conducted all interviews one on one with participants. Each interview yielded some commonalities based on school district expectations. There was common reporting of the 90-minute math block required in the school district. Additionally, all teachers reported participating in curriculum-based professional development for mathematics.

The participants felt confident about their ability to define or describe differentiated instruction. Participants also shared that they used a variety of manipulatives and mathematics tools to support differentiated instruction. The participants expressed a need for more math professional development, as well as professional development in differentiated instruction specifically for mathematics. Data

also suggested that many strategies employed by teachers for differentiation have been adapted from professional development in English and language arts, from mentor and colleague sharing, and by trial and error. These strategies include grouping, classroom setup, and transitioning. I discuss themes in greater depth in the following section.

Research Question 1

Research Question 1: How do teachers of students in Grades 3-5 in a Title 1 district describe the ways that they differentiate instruction for mathematics students? The participants in the study shared their descriptions and definitions of differentiated instruction in response to the first interview question. There were four other questions included in addition to defining differentiated instruction to help answer Research Question 1.

Describing differentiated instruction. During the interviews, the teachers were asked to answer questions that addressed the research question. Participants were asked how they would define differentiated instruction. Overall, participants considered differentiated instruction to be a way to plan lessons and group students according to their abilities. This definition coincides with a concept of differentiated instruction that involves active planning (Tomlinson, 2000).

Differentiated instruction addresses student differences in the classroom through four tenets: content, what the student needs to learn; process, the tasks that students partake in to master content; product, the final projects that allow students to apply and extend what they have learned; and learning environment, the setup of the classroom for work (Tomlinson, 2000). The teachers and instructional coach also suggested that using

manipulatives and resources to help students to be successful independently is a part of differentiated instruction. Putting students in small groups to address the needs of each group is differentiated instruction, according to the responses of the participants. Three of the teachers considered differentiated learning to be the same as differentiated instruction, understanding this as the process of teaching the same concept or content to students in a variety of ways and for different types of learners. The participants interviewed expressed that differentiated instruction means putting students in small groups to address needs that are specific to each group. After some clarifying discussion, the instructional coach surmised that differentiation happens in a variety of ways in addition to flexible grouping. In flexible grouping, students are put in instructional groups based on their needs in differentiated instruction in the classroom. The teacher participants agreed that differentiated instruction meets the needs of students. Grouping sometimes was formed by academic levels. One teacher stated that it is important to incorporate a language piece to differentiate in mathematics instruction. As stated in Chapter 1, Ollerton (2013) suggested that the effects of differentiation that takes place in the mathematics classroom are extensive and are enhanced by quality planning and teaching.

Grouping strategies for differentiated instruction in mathematics. Santangelo and Tomlinson (2012) stated that the goals of differentiated instruction are to maximize students' academic potential by providing experiences that address individual learning needs. Three of the teachers present instruction in whole-group format first and then break the class into smaller groups. Expectations are modeled and shared. Teachers

teach the same content for all groups, but the pace may be different in leveled groups. The groups are ability leveled, with students divided into low-, medium-, and high-level groups or based on their pace. One teacher mentioned that it is also necessary to consider whether students learn differently (e.g., visual learners vs. auditory learners, etc.). Two teachers shared that challenging students who are above level is also important. One teacher said that teachers should use whatever helps most when differentiating instruction. Teachers should adjust lessons to meet students' needs. Possible lesson adjustments include making adaptions to help students succeed, as well as accommodating and modifying instructions for students. A few teachers did not instruct the whole group, instead conducting all instruction in small groups. One teacher said that she felt that it is important to know students' comfort levels academically and mathematically to differentiate for their needs. Another teacher posited that it is important not to presume that students who score high in one area of mathematics will score high in other areas. This statement supports the idea of flexible grouping, which can change as needed. One teacher even noted that differentiation does not always reflect high, medium, and low levels, in that students may learn in different ways with each lesson. The teachers felt that that it is important to remember to maintain high standards for all, even when differentiating. Scaffolding during group work is important, as suggested by three of the teachers. Overall, the teachers felt that the goal for differentiated instruction grouping strategies is to help students reach grade-level expectations.

Tools for instructing in a differentiated classroom. Teachers and the instructional coach expressed that using manipulatives is essential to differentiated instruction in mathematics. Most teachers incorporate the supplemental material that accompanies the curriculum employed within the district. Teachers occasionally find material outside the curriculum to differentiate, but this does not occur often. The curriculum includes enrichment activities for high-level students and readiness activities for the lower group, in addition to grade-level activities. Computer programs that adjust levels to users' ability are tools that support differentiating in the classroom. Some teachers use math games and other technology provided for this purpose. In six of the classes, there are additional adults used as resources that support differentiation. The additional adults provide support for students based on the adults' comfort level with the content. Teachers felt that keeping records is important for effective differentiated instruction. According to two of the teachers, posting anchor charts around the room can be helpful for some during rotations. Additionally, material that is near the students (e.g., in folders) can be helpful, according to Ian and Gail. In all of the teacher participants' classes, groups were usually composed of fewer than six students and lasted around 20 to 30 minutes during the math block. Manipulatives included visuals for students as well as hands-on tools, which included traditional tools such as pattern blocks, tape measures, rulers, and calculators, as well as some new technology such as iPads and computers using a variety of mathematics programs that differentiate based on skills detected by usage.

Describing the classroom setup and transitioning in differentiated instruction in mathematics. All participants considered group rotations to be an important part of the differentiated classrooms in the district. The mathematics materials, including manipulatives, were set up around the room, where they were easily accessible to other students during rotations while a group of students worked with the teacher in a small group. Students traveled from station to station at the prompting of a signal. Often, teachers set up a place for small groups where teachers facilitated instruction. Two teachers preferred that students sit on the floor in the front of the room for a more intimate setting for small-group instruction. A couple of teachers suggested that horseshoe tables help to facilitate instruction in small-group lessons. Three teachers stated that behavior sometimes affects the structure of rotations and the setup in class. Sometimes, student relationships play a part in the creation of groups. Assigned seats are not the norm during small-group rotations, but student interactions are considered based on social interactions. One teacher's strategy for seating during rotations included being sure that students were in groups seated heterogeneously and with different-leveled students. The teacher felt that students could be resources for differentiation. Ian shared that the most important part of differentiating instruction is being prepared in order to facilitate activities that are planned well. The setup and transitioning strategies for differentiated instruction in the classroom did not differ greatly based on teachers' years of experience.

Describing assessments in the differentiated instruction classroom. According to the participants interviewed, assessments guided the formation of small groups.

Results from the NWEA (an assessment used throughout the district three times a year) and results from the assessments included in the local curriculum within the district were the main sources of data that determined how students would be grouped.

One teacher stated that there is a need for continual assessment because students may have varied areas of strength throughout math instruction. Another teacher expressed that being in proximity to students in a small group can provide more information about students' needs. The assessments help to keep groups flexible.

Quick checks and math boxes are elements of the curriculum that help teachers to perform quick assessments. Teachers also use end-of-the-unit and cumulative tests to formulate groups and follow progress. Some teachers incorporate quick checks and forms of short practice as "exit tickets" after a lesson to determine what content to readdress in instruction. Teachers suggested that addressing some exit tickets or warm-up problems can be effective in whole groups.

Another sentiment revealed during the descriptions was that reviewing is part of the assessment process. Conferencing or having one-on-one discussions with students to check for understanding serves to assess student learning. One of the teachers incorporated a self-evaluation component in addition to the one included in the curriculum as another way to gather students' perceptions of their progress. The teacher felt that students must take part in their evaluations as well. All assessments were used formatively and to collect summative data.

Research Question 2

RQ 2: How do teachers of students in Grades 3-5 in a Title 1 district describe their professional development for differentiated instruction in mathematics? Participants were asked semistructured open-ended questions during their one-on-one interviews to allow them to share their experiences with professional development in mathematics to address Research Question 2. The following section includes some of the responses.

Describing professional development received for differentiated instruction in mathematics. The responses included in this section help to address Research Question 2. The teachers with less than five years with the district found it difficult to recall professional development for mathematics instruction or professional development with a sole focus on differentiated instruction in mathematics. Two of the teachers recall having professional development specifically for understanding, addressing, and interpreting data from assessments. All the participants recall professional development provided to teachers in the district by the curriculum supplier. The professional development for curriculum usage focused on guiding the teachers' usage of the program which included activities to differentiate the instruction.

Six out of the nine participants stated that undergraduate and graduate courses served as professional development that was helpful in coming up with ways to differentiate and to address data. One teacher recalled professional development as part of the new teacher mentor program that discussed differentiation. "I find things that are based university wise, for whatever reason, I find that to be more helpful to me." stated

one interviewee. The instructional coach recalled professional development provided at the state level that focused on meeting the needs of the student.

All teachers interviewed would like more opportunities for more professional development in mathematics and differentiated instruction in mathematics. To this point, all teachers remember taking professional development for English and Language Arts that involved leveled grouping strategies, classroom set-up, and transitioning that they transferred to mathematics instruction for differentiation.

Another professional development opportunity that three of the teachers participated in for mathematics specifically allowed teachers to discuss the different ways to address each students' approach to mathematics instruction. A math lab professional development guided teacher in facilitating discussions that enables all students to participate. Five of the participants took part in professional development training for a different type of school infrastructure program that included ideas to present inquiry-based planning and learning that enhanced flexible grouping in differentiated instruction. Discrepantly, while most teachers feel that they have not had sufficient mathematics professional development, Gail stated that over her years of experience, she had had an abundant amount of mathematics professional development opportunities that support her strategies for differentiating instruction.

There is a consensus among all the teachers that there is a need for more professional development in mathematics. All the participants agreed that there had not been much professional development provided that guided assessment, definition, room set-up, or transitions for differentiated instruction in mathematics specifically.

Participants agreed that most of the strategies incorporated as differentiated instruction in mathematics were adapted from English and Language Arts (ELA) professional development or trial and error. The realization of the transferred strategies caused questions to surface regarding how professional development in differentiated instruction for mathematics would differ from professional development in language arts.

Evidence of Trustworthiness

Trustworthiness is the credibility or accuracy of the study findings (Creswell, 2012). To establish and validate the credibility in this research study, the process of triangulation and member checking was employed. The overall findings of the study were shared with two of the participants to garner their response to whether the accounts of their interviews were interpreted accurately. There were not many adaptations needed to establish the credibility of this study based on plans in Chapter 3. The trustworthiness of the study using triangulation and member checking is explained in depth in this section.

Triangulation helped to ensure trustworthiness of the study. Triangulation includes validating data from different participants (Creswell, 2012). The triangulation was possible because the study included interviewing teachers and an instructional coach from three different grade levels providing a triangulated point of view from the perspective of the grade level experience and position. Triangulation was also prevalent in the use of multiple elementary school sites in the district. The use of multiple sites allowed me to corroborate data descriptions from individuals in different buildings. Creswell (2012), defines triangulation as the process of confirming evidence from

different individuals, types of data, or data collection methods in the descriptions in qualitative research. Data source triangulation likely strengthens the validity of a case study evaluation (Yin, 2013).

Table 5

Participants' Teaching Experience and Building Assignment

Participant pseudonym	School	Teaching experience range
Anthony	Building 3	3–10 yrs.
Brandon	Building 2	10–20 yrs.
Carrie	Building 4	3-10 yrs.
Donna	Building 4	3-10 yrs.
Evan	Building 4	3-10 yrs.
Frank	Building 4	3-10 yrs.
Gail	Building 3	20+ yrs.
Harriet	Building 1	3-10yrs
Ian	Instructional coach	20+yrs

To further establish credibility in this research study, I used the process of member checking. Member checking is when the researcher asks for feedback from some of the participants on the findings (Merriam, 2009). Using member checking gave the opportunity for the participants to respond to the accuracy of the report (Creswell, 2012). Member checking helped to determine if interpretations were fair and represented the data collected (Creswell, 2012).

I critically reflected on myself as a human researcher to account for any bias or assumptions during the process of the research (Merriam, 2009). The process of critical reflection while conducting a study is called reflexivity (Merriam, 2009). Reflexivity causes the researcher to share their personal biases and assumptions as well as dispositions about the topic (Merriam, 2009). The reflexivity process helped to address

issues that may affect trustworthiness and ethical issues before and during data collection. Addressing these issues strengthens the validity and credibility of the study. The case study findings are generalizable to a larger population like the population of Charleston School District (Merriam, 2009). The study focused only on teachers within a small school district who implement differentiated instruction in their classrooms. Therefore, the results can only be transferred to a larger population with similar characteristics, not generalized to the whole population. To make the data generalizable or transferable, I provided descriptive data with sufficient details to support the study outcome (Merriam, 2009).

Summary

Chapter 4 of this research study contained the reflections and conclusions of the study. The methodology used to gather data was explained including the setting, data collection procedure, data analysis technique, and results of the study. This section also includes the themes that yielded from the data collected that addressed Research Questions 1 and 2 of the study. In conclusion, I described the elements of the study and the procedure that supported evidence of trustworthiness. Chapter 5 includes the interpretation of the findings, the limitations, the recommendations that surfaced from the outcome, the implications, and the conclusion of the research study.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this qualitative case study was to examine teachers' descriptions of instructional strategies to mediate instruction for struggling students in mathematics and of professional development for differentiated instruction. The study was a descriptive case study in which participants shared their descriptions of differentiated instruction in mathematics in their classes and the professional development they had received to support differentiated instruction implementation. In this case study, the bounded system of interest was elementary teachers of students in Grades 3-5 and instructional coaches in Charleston School District. From the findings, I concluded that most teachers understood the differentiated instruction strategy and implemented it regularly in mathematics based on their descriptions.

Interpretation of the Findings

According to the findings, the teachers' descriptions of differentiated instruction were supported by the literature reviewed in Chapter 2. The literature (Tomlinson, 2008) suggested that differentiated instruction includes creating and adapting lesson content using students' prior knowledge and learning goals and following a process to leverage how students learn best. A couple of the teachers referenced differentiated instruction being guided by how students prefer to learn. "Whatever their need is as far as how they learn is how I would define differentiating instruction that best helps them, the students, learn math," stated Evan. The participants in Charleston School District responded in ways that revealed how they offered students opportunities to access, process, and demonstrate learning through planned lessons, as suggested by Goddard et al. (2015).

When teachers modify instruction based on students' readiness, learning styles, and interests, they enable engaging, authentic, and rigorous curricula that enhance learning (Hedrick, 2012). The participants provided descriptions of the learning environments they created by explaining the setup of the room for differentiated instruction. Tomlinson (2008) contended that effective learning environments are important when implementing the differentiated instruction strategy. Harriet stated that all material is kept accessible during differentiated instruction in the classroom and signals are provided for smooth transitions from one activity to another. According to Ian, differentiating instruction takes a lot of work, and being prepared enhances effectiveness. Ian stated, "So when you have them sitting at the small group table, you have to have what you need handy."

The literature review cited a substantial amount of literature that defines differentiated instruction to meet students' learning needs in the classroom. In the literature review, Tomlinson (2008) defined four main components of differentiated instruction as concept, process, product, and learning environment. Other studies were included in the literature review to further explain the four components of differentiated instruction (Altintas & Ozdemir, 2015; Anderson, 2015; Chien, 2012; Davis & Boerst, 2012; Hedrick, 2012; Kline Taylor, 2015; Timmons-Brown & Warner, 2016; Tomlinson, 2000; Wu, 2013).

Differentiated Instruction Approaches

The shared descriptions of differentiated instruction may contribute to other districts' success as they implement strategies for differentiated instruction. The descriptions may provide a definition that gives insight into meanings of differentiated

instruction in various classrooms from a variety of perspectives, in addition to offering information on strategies for the effective use of tools, room setup, and transitioning between groups. They may also provide insight into what constitutes effective professional development for differentiated instruction.

Differentiated instruction grouping strategies, transitions, and classroom setup. The teachers had different approaches to differentiated instruction. According to Altintas and Ozdemir (2015), there should be different approaches and models employed when differentiating instruction. Approaches to differentiated instruction include ability grouping, multiple intelligences, project-based learning, and cooperative learning approaches (Altintas & Ozdemir, 2015). Most participants in this study employed grouping strategies as a way of providing differentiated instruction. Harriet stated, "I do small group instruction, and I base my small groups off of assessment data." Researchers have also studied differentiation based on gender differences, suggesting that there may be learning differences between the genders (Arslan et al., 2012). The participants in this study did not use gender-based strategies to differentiate.

Challenges to differentiated instruction. Some teachers referred to challenges that may affect differentiation. One challenge is behavioral issues and students' social interactions. "The room setup changes according to student behavior and how they're kind of getting along with each other," shared Anthony. The instructional coach did not address challenges to differentiated instruction during the interview. Most teachers felt that meeting the academic needs of students with a wide range of abilities and achievement levels is challenging (Prast, Van de Weijer-Bergsma, Kroesbergen, & Van

Luit, 2015). The participants noted the wide range of abilities within their classrooms as the reason that they differentiated. The data outcome may determine differentiated instruction as an effective strategy to address the low mathematics achievement scores in the school district.

Many mathematics classrooms now include learners who represent diverse cultures, languages, and mathematics competencies (Adler et al., 2005). These forms of diversity encourage teachers to differentiate in many ways, including individual or independent work, small/flexible groups, and whole-group instruction. All participants in this study stated that they used these forms of grouping in their classes. The participants' use of varied grouping is supported by Hollo and Hirn's(2015) study. Teachers use a variety of grouping formats to provide instruction (Hollo & Hirn, 2015). Differentiated instruction in a mathematics class can involve individual, whole-group, and small-group work that includes real-life problems and intriguing activities that meet students' individual needs (Altintas & Ozdemir, 2015).

Small, flexible groupings used by the teachers were homogeneous and heterogeneous. Donna said that she taught the bulk of the content in three leveled groups. "It's the same content, but the pace in which I teach it and sometimes the depth varies depending on the group," she remarked. Flexible grouping is a way to allow teachers to extend content while providing students with the opportunity to work with various students, who may include students of like readiness and like interests, as well as those with different interests. All participants used teacher-led groups as the main component of the differentiated instruction in their classroom. The main purpose of

providing teacher-led small group instruction is to differentiate instruction for students performing at different levels (Hollo & Hirn, 2015). Small groups and flexible grouping in differentiated instruction in classrooms do not necessarily consist of grouping by ability only or by the current ability of a student to perform a task, according to the participants.

Overall, Tomlinson (2015) stated that differentiating is modifying instruction to benefit diverse learners (Baker & Harter, 2015). Results from Bal's (2016) study show that students who experienced differentiated teaching or instruction during the study experienced greater mathematical success than the group that did not. Adler et al. (2005) posited that teachers need support through professional development to reach the goal of proficiency in mathematics for all students and to effectively implement differentiated instruction.

Professional Development

Teachers take part in professional development opportunities to improve their teaching and students' learning (Luft, Bang, & Hewson, 2016). Many professional development formats have been reviewed by researchers, and they may offer various outcomes. The formats include traditional or one-size-fits-all, curriculum, long-term, and learner-trajectory-focused professional development (Burrows, 2015; Chen & Herron, 2014; Linder et al., 2012; Mansour, Albalawi, & Macleod, 2014; Orrill & Kittleson, 2014; Wilson, Sztajn, Edgington, & Confrey, 2013).

All participants shared that they took part in professional development provided by the district that supported the implementation of the mathematics curriculum used in

the district. Four of the eight participants had taken part in at least one other mathematics professional development outside the school district. One participant had taken part in multiple mathematics professional development sessions that were university based. The professional development took place over the course of a few years. Although all participants took part in some form of mathematics professional development, none recalled attending a professional development that was specific to differentiating instruction in mathematics. Ian had completed additional training for coaches to which the other participants did not have access. The section that follows derives from the literature review in Chapter 2.

Overall, it is important for professional development to equip teachers to facilitate mathematical learning experiences that allow students to be actively involved in their learning (Linder et al., 2012). In a research study that identified characteristics of professional development through the examination of surveys of elementary school teachers, Linder et al. (2012) suggested that if teachers are engaged in similar experiences during professional development, they may facilitate differentiated lessons more effectively. Teachers who are actively engaged in professional development take ownership of their learning (Martin et al., 2014).

Limitations of the Study

The school district has only four elementary schools that house Grades 3-5 grade teachers and students. The small school district and number of teachers and instructional coaches who fit the criteria to participate in this study made keeping the identities of the

participants important. I was limited in the ways that I could recruit and communicate with participants.

The case study findings are only generalizable to a larger population if the population is like that of the studied school district (Merriam, 2009). The study focused on teachers within a small school district who implemented differentiated instruction in their classrooms. Therefore, the results can only be transferred to a larger population with similar characteristics, not generalized to the whole population. To ensure sensitivity and integrity, I had to make myself aware of any biases that might affect the outcome of the product. As an employee of the school district, I knew that biases would naturally occur. I was familiar with the curriculum and the mathematics instructional practice of some teachers, which could have created a bias in interpreting the data. To make myself aware of possible biases, I asked the participants to share their perspectives on the interview questions after the interviews to confirm that the questions were open ended and did not lead to expected answers,

As the researcher, I was the primary data collector and analyst for the study—a situation that creates the opportunity for bias, according to Merriam (2009), which was a limitation of the study. I had to be sure to represent the responses to the interview questions accurately. I used recordings to assure that I attended to responses accurately without adding or subtracting meaning as I searched for themes. After the final study, the data will be disseminated to the district for the sole purpose of providing insight into the description of mathematics practices within the district to potentially improve mathematics achievement in the district. Another limitation of the study was the limited

time I had to conduct interviews. To address the limitation, I only interviewed outside school hours and offered the opportunity to do a phone interview instead of a face-to-face interview when needed.

Recommendations

Possible directions for research to further develop the lines of inquiry in this case study include the following:

- Examine the effect of teacher experience on the implementation of differentiated instruction.
- Conduct quantitative research with scores gathered from students of teachers who shared descriptions of differentiated instruction that happens in class.
- Interview teachers from the same grade levels in a non-Title 1 school district to compare descriptions with the data from the Title 1 school district.

Recommendation 1: Determine the Effect of Teacher Experience on Implementation of Differentiated Instruction

A finding in this study indicated that teachers with more teaching experience have had more professional development opportunities than teachers with fewer years of experience. For example, Gail and Ian shared an extensive list of professional development opportunities they had participated in throughout their careers that guided their instruction in mathematics. Teachers with fewer years of experience did not have the opportunity to participate in as many professional development opportunities because such opportunities had not been offered in abundance, according to some of the teachers. Comparing the responses of teachers with more years of experience with those of

teachers with fewer years may help to determine whether descriptions of differentiated instruction in mathematics are affected by years of experience. It may also help to determine whether the responses differ due to participation in more professional development opportunities.

Recommendation 2: Conduct a Quantitative Study of the Scores of Participants' Students

This qualitative case study gathered descriptions of differentiated instruction. Confidentially gathering quantitative data from the assessments of students of participants could help in determining the effectiveness of the implementation of differentiated instruction strategies in classes. Gathering these data could help in determining effective differentiated instruction implementation strategies to transfer to other settings to create social change in mathematics achievement.

Recommendation 3: Compare Descriptions of Teachers of the Same Grade Levels in a Non-Title 1 School District

The descriptions in this study are descriptions of teachers within the bounded system of a Title 1 school district. Comparing descriptions of teachers from a non-Title 1 school district with the descriptions of the teachers in a Title 1 school district may help in determining whether the differentiated instruction implementation strategies in the classroom are similar. It may help to determine strategies that teachers deem effective in any setting that allow opportunities to meet the needs of all students in multiple settings.

Implications

Social change may happen when scholars work together to contribute to projects that facilitate equitable forms of learning and teaching to create a just democracy in education (Bang & Vossough, 2016). The outcome of the study may create social change at the local school level by allowing schools within the school district to gain insight into the participants' practices through descriptions. The insight may change or enhance practices within the district and cause needs revealed during the research to be addressed by the school district. The study may also cause teachers to adjust differentiated instructional practices based on descriptions shared by participants. The adjustments could be a means to address students' needs locally and in other school districts like Charleston School District.

Organizationally, the study may contribute to more focus on the provision of mathematics professional development opportunities and other policies within the school district that support the revealed needs of the teachers within the district. The local district and other districts can adapt and incorporate the findings to provide teachers with effective professional development for differentiated instruction to possibly increase mathematics achievement. To create social change, the study may provide more focus on mathematics instruction that could not only increase mathematics achievement but increase the potential for students' future immersion into STEM-related careers.

Conclusion

In this study, I employed the case study research design to investigate the use of the strategy of differentiated instruction in Charleston School District to address the

problem of an achievement gap that is evident through state standardized assessments. The participants included eight elementary school teachers from Grades 3-5 in a Title 1 school district with 3 or more years of experience in education. The interviews were conducted face to face and via telephone. Member checking helped to support the validity of the study outcome.

The teachers who participated in the study were appreciative of the opportunity to express their descriptions of their implementation of differentiated instruction. All participants were eager to gain more knowledge of differentiated instruction and mathematics in order to enhance learning for students who appeared to be struggling with gathering mathematical content based on assessment scores. The participants recognized that to improve student progress in mathematics, they needed to work to meet the individual needs of students, and they understood that in order for this to occur, more professional development in differentiated instruction and mathematics was needed.

As stakeholders in education, the goal is for each student to experience optimal success in education. Teacher implementation of instructional strategies to meet the needs of students is a major key to students' optimal success. Gaining insight into teachers' perspective through descriptions can assist educational research in making social change for students. Teacher descriptions open the classroom to stakeholders and allow for dialogue that can create social change on multiple levels of education.

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Appendix A: Interview Procedure and Questions

Procedure:

A. I will introduce myself.

B. I will explain my research and ask if the interviewee has any questions.

C. I will explain the various instruments that I will use for data collection, including the use of the voice recorder and speech recognition software.

D. I will explain the consent form and obtain a signature.

Interview Questions:

Research Question 1: How do 3rd, 4th and 5th grade teachers in a Title 1 district describe the ways they differentiate instruction for mathematics students?

1. Describe how you would define differentiated instruction.
2. Describe how you differentiate instructional content in mathematics.
3. Describe the tools you use to differentiate instruction in mathematics.
4. Describe how your classroom set up helps to facilitate differentiated instruction in mathematics.
5. Describe the types of assessments used in your class to assess the mathematics content.

Research Question 2: How do 3rd, 4th and 5th grade teachers in a Title 1 district describe their professional development for differentiating instruction for mathematics students?

1. Describe professional development opportunities that you have participated in that helped you define differentiated instruction.
2. Describe professional development that assisted you in choosing and creating assessment tools that effectively assesses learning in a classroom with differentiated instruction.
3. Describe professional development that provided insight into various differentiated instruction strategies such as flexible grouping, etc.
4. Describe professional development that provided strategies for effective transitioning between activities.
5. Describe professional development that helped you physically create a classroom environment or set-up that supported differentiated instruction.