A PHENOMENOLOGICAL STUDY OF DIFFERENTIATED INSTRUCTION FOR FIFTH GRADE GIFTED AND HIGH ABILITY LEARNERS THROUGH *MATH IN FOCUS*

by

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ABSTRACT

This phenomenological study investigated the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) Singapore Mathematics program in a suburban school district. To provide an understanding of the differentiation process currently being implemented by general classroom mathematics teachers, six participants completed an open-ended questionnaire and two representative participants were interviewed, observed, and asked to provide artifacts for analysis in the study. Data analysis using transcendental phenomenological reduction, including bracketing and horizonalization, revealed several overarching lessons. Participants analyzed multiple student data sources throughout the planning and implementation stages of providing differentiated instruction to identify students' levels of readiness and appropriate task complexity. Flexible small groups were utilized to meet individual student needs through content differentiation. Diversity in enrichment and assessment resources, as well as targeted professional development and planning time were identified as necessary to improve the process of providing differentiated instruction.

Keywords: differentiation, differentiated instruction, gifted, mathematics, *Math in Focus,*

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Dedication/Acknowledgments Page

Without the love, support, and sacrifice of my family and friends, I would not have been able to complete this process. I am humbled and thankful for their unwavering belief in me. Philippians 1:2-11.

A special thank you to Robert Perrin. A long time ago, I promised to dedicate my first book to you. I hope this counts.

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List of Abbreviations

No Child Left Behind (NCLB)

Northwest Evaluation Association – Measures of Academic Progress (NWEA – MAP)

Ohio Achievement Assessments (OAA)

Partnership for Assessment of Readiness for College and Careers (PARCC)

Trends in International Mathematics and Science Study (TIMSS)

United States (U.S.)

CHAPTER ONE: INTRODUCTION

Overview

In terms of mathematical skills, the United States is falling behind the rest of the developed world. Researchers report that students in the United States in grades four and eight consistently perform below most of their peers around the world, a trend that continues into high school (Provasnik et al., 2009). Although international assessments used to make these conjectures, including the Trends in International Math and Science Study (TIMSS) assessment, do not take into account the social class inequity between the participating countries, the data produced still shows that students in the United States lag behind other developed counties, particularly in the area of mathematics (Carnoy & Rothstein, 2013). To address concerns that many students in the United States lack essential mathematics skills, attention has turned toward alternative approaches to teaching mathematics (Hu, 2010).

Background

Research studies from mathematically high-performing countries found that in order for mathematics achievement to improve in the United States, it must become substantially more focused and coherent (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010c). An international study of mathematics instructional approaches led to the development of the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010c). The Singapore math framework and curriculum syllabus heavily influenced the development of the Common Core Standards because of their consistent mathematics success (Hoven & Garelick, 2007).

Singapore's success in mathematics is reflected in 15 years of top performance by the

nation on the TIMSS and is strongly attributed to the *My Pals are Here! Maths* program, which is utilized by over 85% of the students in Singapore (Gonzales et al., 2008; Provasnik, Gonzales, & Miller, 2009). The success of Singapore's programs emphasizes traditional approaches to math education, such as explicit instruction and giving students many problems to solve, which is a stark contrast to what mathematics reform in the United States has been (Garelick, 2006). Singapore Math is designed to teach at a slower, more in-depth pace by focusing instruction on the essential math skills recommended in the Curriculum Focal Points (National Council of Teachers of Mathematics, 2006). Using strategies such as bar models, Singapore Math instruction strategies allow students to solve difficult math problems and learn how to think symbolically (Hoven & Garelick, 2007).

The Singapore math program, *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009), which was published by Marshall Cavendish Education - Singapore in partnership with Houghton Mifflin Harcourt, has been adapted from Singapore's *My Pals are Here! Maths* for implementation in the United States and follows the same scope, sequence, and pedagogy of the original curriculum (Educational Research Institute of American, 2010c). Recent research on *Math in Focus* found that the program had a positive effect on student math achievement in the United States (Bucolo, 2010; Educational Research Institute of America, 2010a, 2010b & 2010c; Great Source/Houghton Mifflin Harcourt, 2009). Hazelton and Brearley (2008) found that the philosophy and methodology of Singapore math programs are well designed, innovative, challenging for gifted learners when fully implemented.

Singapore math instructional techniques are fundamentally centered upon instruction that occurs at the mathematical understanding level of the students, with all students in a classroom at a similar readiness level (American Institutes for Research, 2005; Hoven & Garelick, 2007).

When ability-grouping practices are not utilized, teachers must differentiate instruction to meet the academic needs of the students receiving instruction outside of their readiness level (Renzulli & Reis, 2008). At the time of this research, no literature was available related to differentiation techniques for use with gifted learners when implementing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum.

School districts across the nation have policies reflecting a commitment to meeting the individual needs of students through differentiated instruction, yet few districts have the capacity to put the policies into practice (Renzulli, Smith, & Reis, 1982). While differentiating to meet the needs of learners with special needs is federally mandated, differentiated instruction for gifted learners is not nationally mandated and does not always occur (Renzulli et al., 1982; Tomlinson, 1999a).

The National Association for Gifted Children (2014b) estimates that gifted students represent approximately 6% of the total student population and have unique academic abilities and needs which require modifications to the curriculum (Assouline & Lupkowski-Shoplik, 2011; Kingore, 2008; Winebrenner & Brulles, 2012). General classroom teachers struggle to meet the needs of gifted learners due to the lack of training in differentiated instructional strategies (Archambault, et al., 1993; Reis, et al., 2004). Research has shown that gifted and talented students are rarely challenged in school, especially at the elementary level, due to ineffective or infrequent use of differentiation strategies by classroom teachers (Archambault, et al., 1993; Reis, et al., 1993; Reis, et al., 2004; Tomlinson, et al., 2003; Westberg, Archambault, Dobyns, & Slavin, 1993). To meet the unique needs of the gifted students, general classroom teachers need access to differentiation techniques that are easily implemented, positively impact

student learning, and interconnected with the curricular standards of instruction for the students' grade level (Lopez & MacKenzie, 1993).

Mathematically gifted students are naturally intuitive, making it difficult for the regular curricula to keep adequate pace with the students' desire to learn (Assouline & Lupkowski-Shoplik, 2011). Mathematically gifted elementary students exhibit advanced problem solving abilities, but still benefit from instruction that develops understanding of application strategies for problem solving skills (Budak 2012; Heinze, 2005; Renzulli, et al. 2009; Threlfall & Hargreaves, 2008). Teachers who differentiate for gifted learners must be able to identify content to use with students that is appropriately challenging, connected to instructional standards, and will develop the natural talents of the students (Kingore, 2008; Winebrenner & Brulles, 2012).

Vast amounts of remediation materials have helped teachers make necessary adjustments for lower achieving students, but similar resources are not readily available for use with students who are already achieving at well above average levels (Renzulli & Reis, 2008; Renzulli et al., 1982). According to Archambault et al. (1993), 61% of general classroom teachers, across all types of schools, have received no professional development or training on how to best serve gifted learners and therefore do not differentiate for them. More recently, Farkas and Duffet (2008) found that 58% of general classroom teachers received no professional development on how to best meet the needs of academically advanced students. Although differentiated instruction is expected of teachers, many are not prepared to provide it. Understanding the forms of instruction that are the most effective for teaching mathematics to gifted and high ability learners is crucial so that students are able to remain competitive in the global world (National Council of Teachers of Mathematics, 2009).

Situation to Self

As a former Gifted Intervention Specialist, I have a particular interest in how teachers meet the academic needs of gifted and high ability learners. Mathematics programs such as *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) require implementation fidelity in order to maximize results. During the first two years of *Math in Focus* implementation, I have observed highly effective educators struggle with how to meet program implementation standards and also differentiate to meet the academic growth needs of gifted and high ability learners. Due to a perceived lack of necessary differentiation tools, teachers were observed actively seeking help from content experts, district, regional, and national differentiation experts, and program representatives. As I have transitioned from the classroom into a curriculum role within the district, the gap in available examples of differentiation techniques and methodologies to meet the needs of gifted and high ability learners has become even more evident to me.

Problem Statement

This study sought to address the need for differentiation strategies to allow general *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) classroom teachers to meet the academic needs of gifted and high ability learners. The Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) initiative has prompted school districts across the United States to adopt mathematics standards strongly influenced by Singapore math techniques. Singapore math instructional techniques call for schools to ability group students for mathematics instruction to ensure students are learning from textbooks that match students' level of mathematics readiness (Hoven & Garelick, 2007). Within classrooms throughout the United States, students' math skills often range from two years below grade level to two years above grade level (Assouline & Lupkowski-Shoplik, 2011;

Hoven & Garelick, 2007). While Hazelton & Brearley (2008) found that the philosophy and methodology of Singapore math programs are well suited for gifted and high ability learners, the programs' requisite academic ability grouping and academic acceleration are not employed throughout the majority of the United States (Colangelo, Assouline, & Gross, 2004).

Purpose Statement

The purpose of this phenomenological study was to discover the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) Singapore Mathematics program in Badgerbrook City Schools (all participant and institutional names herein are pseudonyms, unless otherwise specified), a suburban, middle-class school district. Differentiation was generally defined as the intentional modification of the instructional content, process, product, or environment to meet the needs of students based on their readiness, interests, or learning profile.

Significance of the Study

Research supports that gifted learners require specialized instructional opportunities to meet their academic needs (Borland, 2003; Johnson, 2000; Maker, 1982; Matthews & Foster, 2006). Outside of the official *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) materials, there are limited program-specific resources available for identifying differentiation strategies that support academic growth for gifted and high ability learners. Teachers in all grade levels are seeking information related to differentiation in order to ensure student growth, particularly in light of increased student growth accountability measures (Baker et al., 2010).

Farkas and Duffet (2008) found that 58% of general classroom teachers received no professional development on how to best meet the needs of academically advanced students.

Additionally, new educators, many entering the field through alternate pathways, benefit from professional development that emphasizes pedagogy and differentiation (Ingersoll, Merrill, & May, 2012). Discovering the differentiation techniques currently being implemented by teachers may facilitate improved professional development and program implementation, both of which may have a positive impact on student achievement.

Research Questions

The heterogeneous classrooms found throughout most of the United States have made it increasingly difficult for general classroom teachers to meet the academic needs of the gifted and high achieving students without effective use of differentiation strategies (Winebrenner & Brulles, 2012). To improve the implementation of differentiated instruction for gifted and high ability leaders within *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) classrooms, it may be beneficial to consider first the techniques and methodologies currently being utilized.

Each of the four research questions used to guide this study provided information about teachers' perceptions and experiences and sought to establish the essence of general mathematics teachers' differentiation process for gifted and high ability fifth grade learners within a *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) classroom.

1. What do general classroom mathematics teachers perceive about differentiated instruction for gifted and high ability learners?
2. How do general classroom mathematics teachers employ differentiation strategies to meet the needs of fifth grade gifted and high ability learners?

3. How does the *Math in Focus* curricular methodology influence the differentiation process utilized by general classroom mathematics teachers for fifth grade gifted and high ability learners?
4. What do general classroom mathematics teachers perceive to be the programmatic obstacles and needed resources for the differentiated instruction process for fifth grade gifted and high ability learners?

The first research question sought to develop an understanding of general classroom mathematics teachers' perceptions of differentiated instruction for gifted and high ability learners. The second research question strived to develop understanding of how differentiation strategies were implemented by teachers within general mathematics classrooms. The third research question was intended to identify how the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) program influenced the differentiation strategies selected for implementation. The final research question allowed for the inclusion of both perceived obstacles and needs to the differentiation process to be included in the understanding of the phenomenon.

Research Plan

This qualitative, phenomenological study was conducted utilizing open-ended questionnaires, semi-structured interviews, classroom observations, and document analysis of teacher-documents. The purpose of this study was to identify the essence of a shared, lived experience, making a phenomenological approach an appropriate research methodology (Creswell, 2013; Garrett & Moltzen, 2011; Moustakas, 1994; Schroeder-Davis, 2009). As the human instrument, I utilized the multiple data collection methodologies, followed by trustworthy methods of data analysis, to seek the essence of how fifth grade general classroom mathematics

instructors differentiated to meet the needs of gifted and high ability students using the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) program.

Invited participants for the open-ended questionnaire included all fifth grade general classroom mathematics teachers within the identified school district who instructed mathematics classes that contained gifted or high ability learners. A smaller, stratified sample of representative participants was solicited for interviews, observations, and the collection of document artifacts. Collected data was analyzed through phenomenological reductionism, including bracketing and horizonalization.

Delimitations

The participants in this study were limited to six general fifth grade *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) instructors teaching gifted or high ability learners in general, heterogeneously mixed classrooms at a suburban school district. Teachers at this grade level were selected because the data could potentially be generalized to both elementary and middle school instructors. Only teachers with gifted or high ability learners within one or more mathematics course were selected for this study because they were able to provide detailed descriptions of differentiating instruction for gifted or high ability learners within a general mathematics classroom. Teachers from all six elementary schools within the district participated in the study.

Summary

The United States is falling behind other developed countries in terms of mathematical skills (Provasnik et al., 2009). An international study of mathematics instructional approaches revealed the consistent success of Singapore students on international measures of mathematics (Hoven & Garelick, 2007). In an effort to improve the mathematics abilities of students in the

United States, the Singapore approach to mathematics instruction heavily influenced the development of the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010c) used throughout much of the United States (Hoven & Garelick, 2007).

Mathematics students in the United States have diverse needs and abilities. To meet the diverse academic needs of students across the United States, school districts have created and adopted policies related to differentiated instruction, despite lacking the capacity to fully implement their policies (Renzulli et al., 1982). Mathematically gifted students require intentional differentiation, yet general classroom mathematics teachers often struggle to meet the needs of gifted learners (Archambault, et al., 1993; Reis, et al., 2004).

Guided by four research questions, this qualitative, phenomenological study was conducted utilizing open-ended questionnaires, semi-structured interviews, classroom observations, and document analysis of teacher-documents. The purpose of this phenomenological study was to discover the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) Singapore Mathematics program in Badgerbrook City Schools (all participant and institutional names herein are pseudonyms, unless otherwise specified), a suburban, middle-class school district. Differentiation was generally defined as the intentional modification of the instructional content, process, product, or environment to meet the needs of students based on their readiness, interests, or learning profile.

CHAPTER TWO: LITERATURE REVIEW

Overview

This chapter is comprised of four sections, including an introduction, theoretical framework, related literature, and summary. Grant and Osanloo (2014) define the theoretical framework as "the foundation from which all knowledge is constructed (metaphorically and literally) for a research study" (p. 12). This study was grounded in four theoretical frameworks, which are discussed in this chapter. According to Boote and Beile (2005), a literature review, "sets the broad context of the study, clearly demarcates what is and what is not within the scope of the investigation, and justifies those decisions. It also situates an existing literature in a broader scholarly and historical context" (p.4). This literature review focused on the background of differentiated instruction and gifted learners in the context of mathematics. An understanding of these concepts is important for educators as they strive to meet the instructional needs of gifted and high ability learners.

Introduction

Although research on the implementation of differentiated instruction was somewhat limited, a review of educational theories and related literature revealed that differentiation was a popular term in education and its practice was well-supported by foundational research in education (Algozzine & Anderson, 2007; Allan & Tomlinson, 2000; Hall, 2002). Literature further revealed that differentiation specifically designed for gifted students was ineffectively implemented. Additionally, while general information regarding differentiation was available, few studies directly analyzed differentiation efforts around *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) or similar mathematics programs have been conducted.

Theoretical framework

Theoretical relevance for providing differentiated instruction to meet the needs of all learners, including those identified as gifted, can be linked to the works of several foundational educational theorists. Each theorist identified ideal situations when learning occurs the most efficiently and effectively. Together, these theories provided the conceptual framework for this research related to differentiation and gifted students.

Constructivist Learning Theory

Vygotsky's (1978) work related to the Zone of Proximal Development, a part of his Sociocultural Theory within the broader Constructivist Learning Theory, stated that in order for instruction to be the most effective, it must be provided at a level just beyond the independent instructional level of the student and require the verbal scaffolding from an adult. The Zone of Proximal Development is the distance between the actual and potential development levels of a learner – the link between what is known and unknown (Vygotsky, 1978). In order for a learner to progress to the Zone of Proximal Development, extending and enriching skills, responsive instruction must occur, which acknowledged the learner's prior knowledge before a new skill is taught, and the learner must engage in meaningful direction with a knowledgeable adult or capable peers (Blanton, 1998; MacGillivray & Rueda, 2003; Riddle & Dabbagh, 1999). Within the Zone of Proximal Development, the teacher assumed the role of purposeful instructor and mediator of activities and experiences at an individual level (Blanton, 1998; Riddle & Dabbagh, 1999).

The Zone of Proximal Development (Vygotsky, 1978) is the foundation for differentiated instruction. Applying Vygotsky's theory to lesson design, instruction should be planned to extend students just above individual developmental levels, building on each student's prior

knowledge, and empowering students to move into areas of greater challenge (MacGillivray & Rueda, 2003; Riddle & Dabagh, 1999). Differentiated instruction is, essentially, the act of modifying instructional content so that students are receiving instruction within the appropriate zone of instruction, as described by Vygotsky.

Progressive Education Theory

Considered by many to be the father of the current educational system, Dewey's Progressive Education Theory (1938) stated that learning occurred best in situations where students were working authentically, connecting new knowledge to prior experiences. "Education, therefore, must begin with a psychological insight into the child's capacities, interests, and habits" (Dewey, 1929, Article 1, para. 7). The need for instruction that provided opportunities for new learning to occur and to enable students to connect new information to prior knowledge was emphasized by Dewey (1938). "Education must be conceived as a continuing reconstruction of experience" (Dewey, 1929, Article 3, Paragraph 17).

Dewey (1929) also discussed the role of the teacher within the educational environment. Rather than standing at the front of the classroom, providing passive students with isolated pieces of information, Dewey (1929) advocated for the teacher to assume the role of facilitator. According to Dewey (1929):

> The teacher is not in the school to impose certain ideas or to form certain habits in the child, but is there as a member of the community to select the influences which shall affect the child and to assist him in properly responding to these. Thus the teacher becomes a partner in the learning process, guiding students to independently discover meaning within the subject area. (Article 2, para. 14)

By not only advocating for a modification in the curriculum presented to students, but also a change in teaching methodologies, Dewey heavily influenced educational reforms (Prawat, 2009).

Inherit in Dewey's (1938) Progressive Education Theory was the exposure of students to novel information that could then be connected to prior knowledge. Reis, et al. (1993) found that gifted students already knew the vast majority of regular instructional content that was taught during the school day, indicating a great need for differentiated instruction to occur. Reis, et al. (1993) reasoned that in order for gifted students to be introduced to new content knowledge, which could then be connected to the prior knowledge of the students, the general classroom curriculum had to be differentiated. In a study including over 300 teachers, Reis and Westberg (1994) found that teachers were able to eliminate between 42% and 54% of the regular academic content area instruction for high ability students when prior knowledge was taken into consideration during lesson planning. These findings reinforced the results of a study conducted by Reis and Purcell (1993), which found that teachers could effectively eliminate between 35% and 50% of the general curriculum for gifted students based on the prior content knowledge of the students. In particular, mathematics instruction for gifted students was often not aligned with Dewey's assertions because it was highly repetitive and provided little conceptual depth (Johnson, Boyce, & Van Tassel-Baska, 1995; Johnson & Sher, 1997).

Recognizing the significant amount of prior knowledge that gifted learners enter school already possessing, the regular curriculum will not provide gifted learners new content without modification (Johnson et al., 1995). Differentiated educational experiences are necessary in order to ensure novel content is being provided to gifted learners based on their prior knowledge, a necessity for learning according to Dewey (1938).

Multiple Intelligence and Learning Profiles Theories

Howard Gardner's (2011) Multiple Intelligences Theory posited that intelligence was multi-faceted, as opposed to being a single, measurable item. According to Gardner (2011), intelligence could be broken down into nine facets and individuals possessed differing levels of each area. The nine intelligences Gardner (2011) identified were: (1) logical/mathematics; (2) interpersonal; (3) intrapersonal; (4) spatial; (5) verbal; (6) auditory; (7) naturalist; (8) musical; and (9) existential. Gardner (2011) asserted that students learn best when working within their strongest areas of intelligence. According to Gardner (2011), teachers should actively differentiate instructional methodologies to best match students' intelligence areas in order to provide the most effective learning experience for students.

Carol Ann Tomlinson's (2009; 2012) Learning Profiles Theory, a type of modern adaptation from Gardner's (2011) work, stated that students have a preferred modality or instructional style that best enables learning to occur and is related to how students take in and process information. Tomlinson (2001) initially explained that learning profiles were comprised of fluid aspects of learning that should be used by teachers to plan curriculum and instruction to meet the needs of individual learners, including: (a) group orientation; (b) cognitive style; (c) learning environment; and (d) intelligence preference. Tomlinson (2012) asserted that each of the learning profile factors influenced how an individual assimilated information. Each of the learning profile factors were established from research that showed the impact of the individual factors on increasing student achievement (Tomlinson, 2012), resulting in the final definition of the four aspects of the Learning Profile Theory: (a) culture; (b) gender; (c) learning styles, and (d) intelligence preferences.

The intelligence preference factor of Tomlinson's (2001) Learning Profiles Theory described the brain-based tendencies for learning and was directly linked to Gardner's (2011) Multiple Intelligences Theory and the works of Grigorenko and Sternberg (1997), Saxe (2015), Sternberg (1985), and Sternberg, Torff, and Grigorenko (1998). Gardner (2011), Grigorenko and Sternberg (1997), Saxe (2015), Sternberg (1985), and Sternberg et al. (1998) all asserted that people have strengths in various areas of intelligence and student achievement is positively impacted when instruction was matched to students' preferred intelligence.

According to Tomlinson (2010), individuals learn differently in varied contexts and thus the instruction and environment within a classroom should be differentiated to include a multitude of contexts in which learning can occur. Tomlinson (2012) asserted that an understanding of learning profiles resulted in teachers who incorporated multi-modal approaches to teaching and learning, provided student choice for processing and demonstrating mastery of content, and helped students to understand themselves as learners.

Theory of Differentiated Instruction

Findings from empirical research on the influencing factors of learner readiness, interest, and intelligence preferences led to the development of Tomlinson's Differentiated Instruction Theory (Tomlinson & Allan, 2000). Tomlinson's Differentiated Instruction Theory integrated the constructs of Vygotsky's (1978) Constructivist Learning Theory, Gardner's (2011) Multiple Intelligences Theory, and Tomlinson's (2009) Learning Profiles Theory. Tomlinson (2005) defined differentiated instruction as a philosophy of teaching based on the premise that that when teachers accommodate for the differences in students' readiness levels, interests, and learning profiles, students learn best. Tomlinson's Differentiated Instruction Theory (1999a) explained that teachers must intentionally modify the learning content, process, product, or environment in

response to students' readiness, interests, and learning profile in order for instruction to be the most effective.

The Differentiated Instruction Theory (Tomlinson, 1999a) was derived from the general educational philosophy that all students have different educational strengths and weaknesses that must be uniquely met in order for students' to have meaningful learning experiences (Loeser, 2008). Differentiated instruction required that teachers acknowledge the varied backgrounds, readiness levels, languages, interests, and learning profiles of students (Hall, 2002). The objective of differentiating instruction was to assist in the learning process, maximizing each student's growth and individual success by matching the educational experience to the individual level of each student (Hall, 2009). By differentiating the educational experience, students were offered opportunities to demonstrate skills through a myriad of assessment techniques while also having their personal, unique strengths valued by the educational process (Mulroy & Eddinger, 2003; Tomlinson, 2001; Tomlinson & Kalbfleisch, 1998; Tuttle, 2000).

Related Literature

Definition of Gifted Learners

A review of the literature related to gifted learners revealed a variety of definitions of the term *gifted*. Ziegler and Raul (2000) examined the definition of giftedness throughout research and found a lack of agreement on the conceptual and operational definition of giftedness. The Education Commission of the States (2004) documented 46 different definitions for gifted and talented students utilized by state legislatures or agencies and Gallagher (2004) found that policies related to meeting the needs of gifted learners were just as varied. The United States Department of Education's definition, located in No Child Left Behind (2001) defined gifted students as:

> Students, children, or youth who give evidence of high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services and activities not ordinarily provided by the school in order to fully develop those capabilities. (Title IX, Part A, Definition 22)

Zirkel (2005) found that each state had its own definition of giftedness, along with corresponding expectations and/or mandates for identification of gifted students and service methodologies. One commonality identified was that gifted students are typically required to have outstanding achievement in one or more academic content areas and score at or above the 97th percentile on nationally norm-referenced achievement tests (Hopson-Lamar, 2009; Rogers, 1986).

The state of Ohio defined gifted students as those "students who perform or show potential for performance at remarkably high levels of accomplishment when compared to others of their age, experience, or environment and who are identified [according to Ohio Revised Code specifications]" (Ohio Revised Code 3324 § .01, 1999, page 1). Students may be identified in one of more areas of giftedness. Students within the state of Ohio may be identified in the areas of Superior Cognitive Abilities, Specific Academic Areas (mathematics, science, reading/writing, and/or social studies), Creative Thinking Ability, or Visual or Performing Arts Ability (Ohio Revised Code 3324 § .01, 1999).

While each school district was responsible for the identification of gifted students within the district, specific guidelines from the Ohio Department of Education must be upheld (Ohio Revised Code 3324 § .03, 1999). Students were identified as superior cognitively gifted within the state of Ohio if, within the preceding 24 months, they scored two standard deviations above the mean, minus the standard error of measurement, on an approved nationally-normed intelligence assessment, performed at or above the ninety-fifth percentile on an approved

nationally-normed composite achievement assessment, or by attaining an approved score on one or more above-grade level approved, standardized, nationally-normed assessments (Ohio Revised Code 3324 § .03, 1999). If a student performed at or above the ninety-fifth percentile at the national level on an approved achievement tests within a given subject (math, reading/writing, science, or social studies), within the preceding 24 months, the student was identified as gifted in the specific academic area corresponding to the qualifying test scores, which may be in more than one area (Ohio Revised Code 3324 § .03, 1999). Specific identification criteria were also established by the state of Ohio for giftedness in creative thinking ability and in the visual and performing arts (Ohio Revised Code 3324 § .03, 1999).

It is important to note that while the state of Ohio required school districts to identify students as gifted and provided detailed guidelines for providing services to gifted students, only identification was mandated by the state (Ohio Revised Code 3324 § .07, 1999). Providing gifted services was at the discretion of each school district, but when provided, must adhere to the requirements found within Ohio Administrative Code 3301-51-15 (2008). The state of Ohio provided school districts with specific options for providing services to gifted students, including: a differentiated curriculum; cluster grouping; mentorships; accelerated course work; post-secondary enrollment option program; advanced placement; honors classes; magnet schools; self-contained classrooms; independent study; and others (Ohio Revised Code 3324 § .07, 1999). Each possible service methodology had specific requirements and guidelines provided within the Operating Standards for Identifying and Serving Gifted Students (Ohio Administrative Code 3301-51-15, 2008).

For the purpose of this study, the definition of giftedness and the accuracy of the identification procedures of the school district being studied were utilized and accepted as valid.

The school district's compliance with specific State of Ohio guidelines regarding identification and services of gifted students were also unquestioned.

Although the State of Ohio's definition of giftedness was utilized for this study, other definitions exist, each with varying requirements for gifted identification and accompanying expectations for service methodologies. While individual definitions regarding giftedness vary, each definition identified gifted learners as a specialized portion of the general population who required unique learning opportunities in order to be academically challenged (Bleske-Rechek, Lubinski, & Benbow, 2004; Reis & Purcell, 1993; Rogers, 2004; Tomlinson, 1999a; 1999b; Winebrenner & Brulles, 2012).

Mathematically Gifted Learners

Just as gifted students as a whole were recognized as different from their same-age peers, mathematically gifted students were also identified as unique from their classroom peers. Mathematically gifted students may possess reasoning abilities that are two or more years beyond the grade-level curriculum (Deal & Wismer, 2010). Students who were mathematically gifted and talented frequently exhibited an uneven pattern of mathematical development and understanding, evidenced in the disparity between unusually strong concept development and relatively weak computation skills (Rotigel, 2000; Sheffield, 1994). Mathematically gifted students identified relationships among topics, concepts, and ideas without receiving formal instruction (Heid, 1983). According to Greenes (1981), when compared to a general group of students studying mathematics, mathematically gifted students demonstrated the ability to: spontaneously form problems, flexibly handle data, demonstrate mental agility through idea fluency, organize data, interpret data with originality, transfer ideas, and generalize. Holton and Gaffney and Miller (as cited in Stepanek, 1999), identified the following indicators of

mathematical giftedness: (a) Unusual curiosity about numbers and mathematical information, (b) ability to understand and apply ideas quickly, (c) high ability to see patterns and think abstractly, (d) use of flexible and creative strategies and solutions, (e) ability to transfer a mathematical concept to an unfamiliar situation, (f) use of analytical, deductive, and inductive reasoning, and (g) persistence in solving difficult and complex problems. According to the National Council of Teachers of Mathematics' Task Force on Mathematically Promising Students (Sheffield, 1994), students with mathematical talent were not limited to a certain size, age, or grade level and may possess traits unique from other mathematical talents.

Due to the cognitive requirements associated with traditional gifted program options across the United States, mathematically gifted learners, may not be eligible to receive any gifted services. Lupkowski-Shoplik and Assouline (2011) found that over 26% of mathematically talented students within a particular study did not participate in the gifted and talented program options available within the school. Participation in a gifted program did not ensure that mathematically gifted students would receive the necessary instructional and curricular modification necessary to meet their academic needs. Rather than allowing the gifted program to be driven by the individual abilities of the participating students, the designated gifted curriculum for an individual school district often determines the instructional programming provided to students participating in the gifted program (Assouline & Lupkowski-Shoplik, 2011). This resulted in mathematically talented students participating in gifted programming options that did not provide the "advanced curricular opportunities that correspond to their mathematical talent" (Assouline & Lupkowski-Shoplik, 2011, p. 4).

Deal and Wismer (2010) found that few teachers recognized true mathematical talent or knew how to make necessary curricular accommodations for mathematically gifted students.

Mathematically gifted students need to study mathematics "in greater depth, making more connections and generalizations than others" (Sheffield, 1994, p. 15). Elementary school classrooms often lacked the level of academic challenge required to allow mathematically gifted students to be successful (McAllister & Plourde, 2008; Rotigel & Fello, 2004). Sowell, Zeigler, Bergwall, and Cartwright (1990) found that mathematically gifted students were capable of doing mathematics typically accomplished by older students and engaged in qualitatively different mathematical thinking than their classmates or chronological peers. Johnson (2000) explained that the needs of mathematically gifted students "dictate curriculum that is deeper, broader, and faster than what is delivered to other students" ("Why Should We Do Anything Different," para. 2).

This research suggests that mathematically gifted learners have unique characteristics from other gifted learners (Sheffield, 1994). These traits and approaches to learning necessitate modifications to traditional curriculum and instructional methodologies to meet the complex learning profile, pace, and content readiness of individual mathematically gifted learners (McAllister & Plourde, 2008; Rotigel & Fello, 2004; Sheffield, 1994). Additionally, traditional gifted programs may not meet the needs of mathematically gifted learners (Assouline & Lupkowski-Shoplik, 2011).

Instructional Needs of Gifted Learners

Each definition of giftedness analyzed indicated that gifted learners required a change or modification to the general curriculum in order to have their unique instructional needs met. Prior to providing the specifications for providing services to gifted learners within the state of Ohio, the Ohio Administrative Code (2008) stated:

Gifted and talented students need differentiated curriculum and instruction and support

> services in order to fully develop their cognitive, academic, creative and artistic abilities or to excel in a specific content area, including opportunities to exceed grade level academic indicators and benchmarks. (3301-51-15, D, p. 7)

Johnson (2000) stated that gifted learners differed from their non-gifted classmates in both the pace at which they learn concepts and the depth of their conceptual understanding. Additionally, Maker (1982) identified that gifted students held different intellectual interests than their non-gifted peers, which must be fostered to prevent the talent from stagnating. Gifted learners processed great amounts of information over a shorter period of time, thought in an abstract and complex manner, learned information within one learning cycle, sought and enjoyed intellectual challenges, and already knew between 50 and 60% of the general curriculum at the beginning of school year (Bleske-Rechek et al., 2004; Reis & Purcell, 1993; Rogers, 2004; Stepanek, 1999). A differentiated curriculum was necessary, according to research, in order to meet the unique needs and specific learning styles of gifted learners (Johnson, 2000).

Research offered many variations in recommendations for how to best meet the needs of gifted students. Matthews and Foster (2006) stated that gifted education should contrast the traditional mismatch between instructed curriculum and gifted students by providing a "dynamically responsive educational match" for gifted students (p.65). Borland (2003) described differentiated curriculum as the reason gifted education existed apart from general education.

Differentiated curriculum and instruction was essential and foundational for all aspects of gifted education, according to Tomlinson (2005, 2008). Recent research applied special education techniques, including Response to Intervention and tiered services models, to design interventions and specialized services for gifted students (King, Coleman, & Miller, 2011). In each of these variations, despite the establishment of relatively rigorous standards of instruction,

such as those found within the Common Core State Standards for Mathematics (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010c), modifications to instructional methodologies for gifted students, including differentiating the educational experiences based on the individual needs of gifted students, was still necessary (VanTassel-Baska, 2012a).

Research supported that gifted learners require specialized instructional opportunities to meet their academic needs (Borland, 2003; Johnson, 2000; Maker, 1982; Matthews & Foster, 2006). Instructional modifications to the general curriculum are necessary and teachers should take into consideration the pace, depth, and complexity of tasks when planning for differentiated instruction for gifted learners (Bleske-Rechek et al., 2004; Borland, 2003; Reis & Purcell, 1993; Rogers, 2004; Stepanek, 1999; VanTassel-Baska, 2012a).

Brain Research Regarding Gifted Learners

Brain research suggested that learning takes place when students' interest and abilities are stimulated by instructional tasks at the appropriate level of challenge (Caine & Caine, 1991). If instructional tasks were not sufficiently challenging, the brain did not release sufficient amounts of the chemicals needed for learning: dopamine, noradrenalin, serotonin, and other neurochemicals (Schultz, Dayan, & Montague, 1997; Stepanek, 1999). Kotulak's (1996) research on the brain found that unless the brain was continuously challenged, it lost some of the connections that were formed from previous educational experiences. This suggested that tasks must be differentiated to be sufficiently challenging for all learners, including those identified as gifted, in order to physically enable the proper brain functioning for learning to occur.

Differentiation was critical for the intellectual motivation and brain development of gifted students. "When [sic] gifted students are not presented with learning experiences that are

appropriate for their abilities, they lose motivation and in time can lose interest in school" (McAllister & Plourde, 2008, "Background," para. 1). Brain development research suggested that the current level of intellectual development would not be maintained if students were not challenged (Stepanek, 1999). Research specific to the gifted brain showed that stimulation of students' interest and abilities through an appropriate level of challenge was required for learning to take place (McAllister & Plourde, 2008). If gifted students were given tasks that were too easy, which was common in the mixed-ability classroom, they may experience decreased levels of engagement with activities, preventing learning from occurring (Stepanek, 1999).

Brain research clearly supported the need for differentiated instruction in response to students' readiness levels, interests, and learning profiles (Tomlinson & Kalbfleisch, 1998). Analysis of brain research identified three principles of instructional design that are necessary for learning to occur: (a) Learning environments needed to feel emotionally safe for learning to take place (Howard, 2006; Jensen, 2005; McGaugh, et al., 1993), (b) to learn, students needed to experience appropriate levels of challenge (Koob, Cole, Swerdlow, & leMoal, 1990; Shultz et al., 1997), and (c) each brain needed to make its own meaning of ideas and skills (Erikson, 1998; Kesner, Bolland, & Dakis, 1993; Keverne, Nevison & Martel, 1997; Pally, 1997).

The reviewed brain research related to gifted learners suggested that differentiated instruction is necessary in order for learning to occur (McAllister & Plourde, 2008; Stepanek, 1999; Tomlinson & Kalbfleisch, 1998). Studies also indicated that not providing instructional opportunities at the appropriate challenge level will not only prevent new learning from occurring, but may also impede future learning, engagement, and motivation (Erikson, 1998; Kesner et al., 1993; Keverne et al., 1997; Koob et al., 1990; Pally, 1997; Shultz et al., 1997).

Sousa (2009) explained the educational needs of gifted learners based on brain functioning as unique because:

> They make connections faster, work well with abstractions, and generally have the deep interests found in older individuals. Consequently, they need to work with the curriculum at higher instructional levels, at a faster pace, and using a variety of materials appropriate for their learning style. (p. 61)

Sousa's (2009) explanation of what gifted learners need to learn is aligns to the definition of differentiated instruction.

No Child Left Behind and Gifted Learners

A growing number of students with diverse learning needs have been placed within general education classrooms as a result of the Individuals with Disabilities Education Act (IDEA; 2004), which emphasized the needs for students with disabilities to be educated alongside children who are not disabled (Haager & Klinger, 2005). Research found that standards were lowered when students with disabilities were not achieving at the expected level, which further slowed academic performance (Quenemoen, Lehr, Thurlow, & Massanari, 2001; Thurlow, 2002). To reverse the trend of lowering standards, the US Congress enacted the No Child Left Behind Act (NCLB; 2001) and IDEA (2004) which outline increased accountability and specific educational outcomes for all students (Rock, Gregg, Ellis, & Gable, 2008). NCLB (2001) was intended to benefit every child through mandated proficiency standards and by government-imposed sanctions for schools that did not meet the needs of the lowest-performing students (Jolly & Makel, 2010; NCLB, 2001). "The primary purpose of NCLB (2001)…is to close the achievement gap between all types of students, regardless of their ethnicity, disability, socioeconomic status, or primary language" (Hopson-Lamar, 2009, p. 30).

Rothstein, Jacobsen, and Wilder (2006) argued that minimum proficiency standards such as those within NCLB (2001) could not be universally applied across students because "a standard can either be a minimal standard which presents no challenge to typical and advanced students, or it can be a challenging standard which is unachievable by most below-average students. No standard can serve both purposes" (p.2). For example, the mathematics proficiency standards emphasized by NCLB (2001) included speed, accuracy, mathematical rules, convergent thinking, and appropriate use of mathematical algorithms (Deal & Wismer, 2010). Developing the talent of mathematically gifted students required encouraging habits of mind that went beyond these basic skills and reinforced creative thinking, independent mathematical reasoning, originality, and explorations for later advancement of mathematical applications and theory (Deal & Wismer, 2010; Mann, 2006).

In an effort to prepare low-performing students to meet the NCLB (2001) proficiency standards and avoid potential sanctions, funding and resources that had previously been allocated toward gifted programs began to be relocated toward reading and mathematics initiatives designed to help low-performing students achieve minimum proficiency (Golden, 2003). Research verified that, despite the positive intentions behind NCLB (2001), the performance gains of students just below the proficiency level have been countered by performance declines in more-advanced students (Vigdor, 2013). "NCLB sacrifices the education of the gifted students who will become our future biomedical researchers, computer engineers, and other scientific leaders" (Goodkin, 2005, para. 1). In response to the accountability mandate within NCLB (2001), research indicated that teachers were narrowing the curriculum, teaching to the middle third of the students, and focusing on test-taking strategies at the expense of teaching problem-solving strategies and utilizing performance-based assessments (Amrein & Berliner, 2002;

Hamilton et al., 2007; Hopson-Lamar, 2009; Kohn, 2000; Matthews, 2006). Studies have found that students who were closest to meeting the minimum proficiency standards have benefited most from the NCLB (2001), while the lowest and highest achieving students have made little to no significant growth (Meier, Kohn, Darling-Hammond, Sizer, & Wood, 2004; Neal & Schanzenbach, 2007; Robinson, 2008; Thomas B. Fordham Institute, 2008). Goodkin (2005) concludes that "NCLB may end up producing an entire generation of merely proficient mediocre students – a generation that will end up working for the science leaders produced by other countries" (p. A45).

Although intended to positively impact the learning opportunities of all students, research suggested that the No Child Left Behind (2001) legislation was having a negative impact on gifted learners (Goodkin, 2005; Meier et al., 2004; Neal & Schanzenbach, 2007; Robinson, 2008; Thomas B. Fordham Institute, 2008; Vigdor, 2013). The emphasis on universal proficiency standards and potential sanctions for schools that were not able to bring all students to the minimum proficiency levels resulted in a shift in educational priorities, drawing attention and resources to the students within the middle third of the ability levels within classrooms (Amrein & Berliner, 2002; Golden, 2003; Hamilton et al., 2007; Hopson-Lamar, 2009; Kohn, 2000; Matthews, 2006). Research suggested that this priority shift was occurring at the expense of the brightest students as well as the low-performing students – both student groups which were the farthest from the minimum proficiency standard (Goodkin, 2005; Meier et al., 2004; Neal & Schanzenbach, 2007; Robinson, 2008; Thomas B. Fordham Institute Thomas B. Fordham Institute, 2008; Vigdor, 2013).

The Pre-K-Grade 12 Gifted Programming Standards

The National Association for Gifted Children published the revised *Pre-K-Grade 12 Gifted Programming Standards* (2010), which serve as a framework for defining benchmarks and identifying effective instructional practices. The standards were created to "provide a basis for policies, rules, and procedures that are essential for providing systematic programs and services to any special population" (National Association for Gifted Children, 2010, p. 4). Grounded in theory, research, and paradigms of practice, the *Pre-K-Grade 12 Gifted Programming Standards* (National Association for Gifted Children, 2010) provided a foundation for meeting the needs of gifted learners at all stages of development (Kitano, Montgomery, VanTassel-Baska, & Johnson, 2008). There were six standard areas within the *Pre-K-Grade 12 Gifted Programming Standards*, encompassing 36 student outcomes. The standards areas were: (a) Learning and Development; (b) Assessment; (c) Curriculum Planning and Instruction; (d) Learning Environments; (e) Programming; and (f) Professional Development (National Association for Gifted Children, 2010). The *Pre-K-Grade 12 Gifted Programming Standards* (National Association for Gifted Children, 2010), specifically addressed differentiated instruction within Gifted Educational Programming Standard 3: Curriculum Planning and Instruction, which states:

> Educators develop and use a comprehensive and sequenced core curriculum that is aligned with local, state, and national standards, then differentiate and expand it. In order to meet the unique needs of students with gifts and talents, this curriculum must emphasize advanced, conceptually challenging, in-depth, distinctive, and complex content within cognitive, affective, aesthetic, social, and leadership domains. Educators must possess a repertoire of evidence-based instructional strategies in delivering the

> curriculum to develop talent, enhance learning, and provide students with the knowledge and skills to become independent and self-aware learners. (p. 10)

This standard and its accompanying student outcomes addressed differentiated curricular planning, talent development, instructional strategies, and accessing appropriate resources to engage a variety of learners (Johnsen, 2012).

The creation of the *Pre-K-Grade 12 Gifted Programming Standards* (National Association for Gifted Children, 2010) provided legitimacy to teacher preparation programs including gifted education as an area of training and consistency regarding instructional methodologies best used with gifted learners (Johnsen, 2006; VanTassel-Baska & Johnsen, 2007). "Teachers need specialized knowledge and skills to teach learners with gifts and talents. They need to know these students' characteristics, how to identify their strengths and weaknesses, and how to effectively serve them" (Johnsen, 2012, p. 55). While the standards provided a strong framework of information for teachers, they may not have provided enough detail to allow educators to clearly understand how to integrate them with other existing academic standards within the classroom (Gubbins, 2008).

The *Pre-K-Grade 12 Gifted Programming Standards* (National Association for Gifted Children, 2010) provide a foundation for meeting the needs of gifted learners at all stages of development (Kitano et al., 2008). These standards serve as a framework for defining benchmarks and identifying effective instructional practices specifically for meeting the unique academic, social and emotional needs of gifted learners (Johnsen, 2006; VanTassel-Baska & Johnsen, 2007).

The Common Core State Standards and Gifted Learners

Until recently, academic standards and expectations varied greatly across the United States (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a). The Common Core State Standards were created to ensure that students possessed the skills and knowledge necessary for college and career readiness, regardless of where they lived. (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a). The Common Core State Standards initiative was the most successful attempt to define 21st century expectations for language arts and mathematics across the United States and was having a profound impact on curriculum, instruction, and assessment practices (National Association for Gifted Children, 2014a; VanTassel-Baska, 2012a)

VanTassel-Baska (2012a) analyzed the English Language Arts and Mathematics Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) and found them to be strongly aligned with the National Association for Gifted Children's Pre-K-Grade 12 Gifted Programming Standards (2010). The emphasis on 'reasoning' and 'the formation of an argument,' found within both the English Language Arts and Mathematics sections of the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) promoted higher level thinking and problem solving skills, making them an "excellent match to desirable outcomes for gifted learners" (VanTassel-Baska, 2012a, p. 222).

The Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) were considered to be reasonably rigorous by many members of the Gifted Education community, but not rigorous enough (Greene & Cross, 2013; VanTassel-Baska, 2012a). Although the rigor level and higher-level thinking

requirements of the Common Core State Standards are greater than most of the standards they replaced, the standards "are not sufficiently advanced to accommodate the needs of most gifted learners" (VanTassel-Baska, 2012a, p. 223). Even with the explicitly increased rigor level of the Common Core State Standards, it was critical that differentiation for gifted learners be clearly articulated and implemented within each subject area in order to meet the needs of gifted learners (VanTassel-Baska, 2012a). The developers of the Common Core State Standards clearly articulated that the standards would not meet the needs of learners on either end of the achievement spectrum (Greene & Cross, 2013). The National Governors Association Center for Best Practices and the Council of Chief State School Officers (2010b) explained that the established, grade-specific standards did not "define the intervention methods or materials necessary to support students who are well below or well above grade-level expectations" (p. 6). VanTassel-Baska's (2012a) analysis revealed that educators needed to provide advance content, acceleration options, and enrichment in order to meet the needs of gifted and high ability learners. Deliberate strategy by gifted educators was necessary to establish the necessary differentiated learning opportunities for gifted students, including multiple pathways for meeting the standards, more complex thinking applications, and real-world problem solving experiences (VanTassel-Baska, 2012a).

The research suggested that, while the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) have significantly advanced the rigor level of instructional standards in participating states across the United States, the standards were not rigorous enough to eliminate the need for differentiated instruction for gifted learners. According to Greene and Cross (2013):

Because the Common Core State Standards are benchmarks for all students, they are by

> definition insufficient for high-ability learners. To meet the needs of high-ability students, teachers need professional development that includes strategies to differentiate instruction, modify assessments, and adjust the pace of learning. (p. 46)

In their position paper, *Common Core and Next Generation Science Standards for Gifted and Talented Students* (2014a), the National Association for Gifted Children called on states, school districts, and curriculum and assessment developers to provide the necessary comprehensive curricular implementation support services to enable the Common Core State Standards to be differentiated in such a way that allows both the standards and the most advanced learners to be successful.

Although generally considered to be more rigorous than previous academic content standards, the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) were not rigorous enough to meet the needs of the most advanced gifted learners (Greene & Cross, 2013; VanTassel-Baska, 2012a). Instructional planning, curricular modifications, and differentiated instruction are all still necessary in order to meet the needs of gifted learners (Greene & Cross, 2013; National Association for Gifted Children, 2014a; VanTassel-Baska, 2012a).

Definition and Types of Differentiation for Gifted Learners

Studies showed that general classroom teachers made few, if any, instructional modifications to meet the needs of struggling or advanced learners (Bateman, 1993; Tomlinson & Kalbfleisch, 1998; Westberg et al., 1993). By utilizing only one instructional technique to provide instruction, teachers disregarded student interests, learning profiles, and ability levels (Gardner, 1995). Nehring (1992), spoke of educational practices within the United States and explained:

> We assume in this country that all kids are the same. Of course no educated adult would ever say that, but the assumption is clearly there. It is embedded in our school system…We force all kids through the same mold. Is there is one thing on which both research and common sense agree, it is that kids are not the same, that they learn in different ways, that they respond to different kinds of incentives. (p. 156)

Differentiated instruction had the potential to create learning environments that maximized learning and provided opportunities for success for students of all skill levels and backgrounds (McQuarrie, McRae, & Stack-Cutler, 2008).

In their extensive meta-analysis of 25 research studies spanning the course of three years, McQuarrie, McRae, and Stack-Cutler (2008) identified two broad categories and 11 key findings regarding effective practices in differentiated instruction. These findings suggested that pedagogies, learning supports, and project supports were necessary and enabled teachers to effectively meet the needs of the diverse populations in today's classrooms. (McQuarrie et al., 2008). These findings validated Hess (1999), who asserted that students in a mixed-ability classroom require opportunities to work on different tasks rather than completing the same task as classmates, but at a different level.

In order to best differentiate for gifted learners, teachers must pre-assess the central concepts within each instructional unit and then purposefully modify the instructional activities, eliminating the repetition and duplicate learning cycle for those students who already demonstrate concept mastery (Reed, 2004). Literature identified three primary methodologies for differentiating instruction, each related to altering the instructional process. When differentiating instruction to better align instructional practices with the needs of the students, teachers can modify the instructional content, process, and product (Park & Oliver, 2009; Tomlinson, 1999a;

Winebrenner & Brules, 2012). Each method of differentiating could be implemented individually or integrated with one or both of the other methods in order to modify classroom instruction to meet the needs of the learners. Determinations of how to make curricular modifications were guided by the readiness, interests, and learning profiles of the students, making the educational process more individualized and meaningful (Tomlinson, 1999a; Winebrenner & Brulles, 2012).

Differentiating the instructional content required the teacher to modify the information being taught. Although textbooks often provided enrichment activities for advanced learners, they rarely involve the rigor demanded by mathematically gifted students (Deal & Wismer, 2010). When implemented to meet the needs of gifted and high ability students, the content should be at a greater depth than regular instruction allows, or be focused on a topic of related, independent interest, allowing for more complex understanding of the topic to occur (Winebrenner & Brulles, 2012). Differentiation of content for mathematically gifted students included: providing more challenging problems; mathematical reasoning; working from a higher grade-level; or enriched study of advanced topics, including topology, tessellations, or mathematical history (Deal & Wismer, 2010). Deal and Wismer (2010) stated that, regardless of the differentiation methodology utilized, teachers of mathematically gifted students must uphold the Equity Principle of the National Council of Teachers of Mathematics, which demanded high expectations and rigor, with ongoing resources and support from the teacher.

When differentiating the instructional process, the instructional methodology was modified to become more appropriate for the intended learners. When implemented effectively, students acquired learning about the same topic, but utilize a different method to gain understanding. Powers (2008) found that the use of an independent study was a successful method for differentiating instruction for seventh grade gifted students who were highly

motivated and seeking an opportunity to be self-directed in their learning. This methodology may not be appropriate in all situations, but was an example of how process differentiation could be utilized to meet the needs of gifted learners. Sousa (2009) suggested differentiating the instructional process for mathematically gifted students by providing problems with multiple answers or searching for new patterns.

Product differentiation occurred when the teacher modified the manner in which learners demonstrated understanding and mastery of the concepts. Product differentiation included alternate assessment techniques and, when implemented for gifted learners, was rigorous and emphasized the utilization of higher order thinking skills, including synthesis and evaluation (Kingore, 2008). Products could be differentiated to meet the needs of mathematically gifted students by applying new applications, transferring mathematical concepts into other, non-mathematical contexts, changing strategies, or through the use of reflection and imagination (Sousa, 2009).

Instructional strategies, including the use of integrated units, student choice, and firsthand experiences were critical in keeping gifted students challenged and engaged (Linn-Cohn & Hertzog, 2007). Linn-Cohn and Hertzog (2007) noted that effective differentiation was closely linked to the classroom and school environment. Research indicated that teachers' ability to differentiate was closely linked to the autonomy and academic freedom found in self-contained classrooms, particularly when the students were homogeneously grouped by ability level (Linn-Cohn & Hertzog, 2007).

Stepanek (1999) identified four key components of modification to mathematics curricula to best meet the needs of mathematically gifted students. Mathematics instructors should: (a) provide students with content at a greater depth and higher complexity; (b) nurture a discovery

approach to instruction, encouraging student exploration of concepts; (c) emphasize complex, open-ended problems; and (d) create opportunities for interdisciplinary correlations.

Impact of Differentiated Instruction for Gifted Learners

Research suggested that differentiated instruction for gifted learners must move beyond textbook-based curriculum units designed for gifted learners, which lacked variety and the in-depth presentation of the major concepts and principles within a discipline to be an effective differentiation methodology (Erikson, 1998; Flanders, 1987; Lawrence-Brown, 2004; Renzulli, 1994; Rock et al., 2008; Tieso, 2005). The National Association for Gifted Children (2014a) suggested that teachers plan for differentiation by identifying methodologies to extend and enrich the standards of instruction, requiring gifted learners "to apply complex, creative, and innovative thinking to authentic problems" (para. 2). Research showed positive results for quality implementation of differentiation in heterogeneous classrooms (Lawrence-Brown, 2004; Rock et al., 2008).

Purposeful differentiated instruction could effectively keep high-ability students challenged in heterogeneous mathematics classrooms (Huebner, 2010). In Tieso's (2005) study of 31 mathematics teachers and 645 students, the students who were taught using a differentiated curriculum that supplemented the textbook demonstrated significantly higher achievement than students of similar ability levels who only engaged in the traditional, whole-class, textbook curriculum. Tieso (2005) concluded that purposefully differentiating the curriculum may significantly improve the mathematics achievement of gifted learners. Tieso's (2005) study led to the reasoning that students with diverse ability levels receiving differentiated interventions experienced significantly higher mathematics achievement than those who did not receive the differentiated interventions (Rock et al., 2008; Tieso, 2005). These results validated an earlier

study in which Tieso (2001) found evidence of positive affective outcomes to differentiation for gifted students, including improved level of engagement, motivation, and excitement about learning.

Research solidly supported that purposeful differentiated instruction could enable gifted students, as well as students with mild or even severe disabilities, to receive an appropriately challenging education experience in inclusive classrooms (Baumgartner, Lipowski, & Rush, 2003; Fisher & Frey, 2001; Lawrence-Brown, 2004; Odgers, Symons, & Mitchell, 2000; Tomlinson & Kalbfleisch, 1998; and Vaughn, Bos, & Schumm, 2000). The results of the research by Baumgartner, Lipowski, and Rush (2003) showed improvements to students' instructional levels, the number of comprehension strategies employed within learning, understanding of foundational skills, and attitudes toward learning. Hertzog (1998) found that differentiated instruction strategies benefited all types of learners. Research indicated that teachers should be creative and flexible in selecting the instructional methodology used to differentiate instruction to meet the needs of students (Fisher & Frey, 2001; Gamoran & Weinstein, 1998; Hertzog, 1998; Nobel, 2004; Odgers et al., 2000; Tieso, 2001; Tieso, 2005).

Longitudinal research also indicated that differentiated instruction produced positive academic effects for students. In their three year study of the application and effects of differentiated instruction in K-12 classrooms, McQuarrie et al. (2008) found that differentiated instruction produced consistently positive results across a broad range of targets groups, not limited to gifted learners, but also students with mild or severe learning disabilities.

Intentional differentiated instruction may enable gifted learners, as well as students with mild or even severe disabilities, to receive an appropriately challenging education experience in inclusive classrooms (Baumgartner et al., 2003; Fisher & Frey, 2001; Lawrence-Brown, 2004;

Odgers et al., 2000; Tomlinson & Kalbfleisch, 1998; and Vaughn, Bos, & Schumm, 2000). Gifted learners within heterogeneous classes may have their instructional needs met by well-designed and implemented differentiated instructional methodologies that are beyond the traditional extensions commonly offered by textbooks and the general curriculum (Fisher & Frey, 2001; Gamoran & Weinstein, 1998; Hertzog, 1998; Nobel, 2004; Odgers et al., 2000; Tieso, 2001; Tieso, 2005).

Planning for Differentiation

Literature revealed that planning for differentiated instruction was challenging, particularly for general education teachers (Kingore, 2008; Renzulli & Reis, 2008; Winebrenner & Brulles, 2012). Olenchak (2001) conducted an extensive case study of differentiation and found that differentiation was most effective when individualized. In order for teachers to individualize instruction for students, they not only needed to have extensive knowledge of the content they plan to differentiate, but also information about the students for which differentiation was needed. Reis (1998) asserted that students should be provided a curriculum and supporting materials that are appropriate to individual ability levels, rather than assigned grade levels, emphasizing the necessity of teachers to understand more than the content being taught, but also the individual students receiving the instruction. There was a gap in the research about what prior knowledge is needed by teachers for effective differentiation, supporting the need for this study.

Minott's (2009) literature review revealed the importance of reflection within all aspects of the differentiation process. For both teachers and students, the act of reflection, particularly in the form of journaling, played a critical role in the effective implementation of differentiation (Minott, 2009). In particular, the internal questioning process that was utilized during the

reflective process enabled the teacher and students to better identify key concepts and understanding within a differentiated learning process.

The research studied supported the need for a comprehensive understanding of both the differentiation methodologies and the readiness levels of students for teachers implementing any curricular initiative (Byars, 2011; Kingore, 2008; Olenchak, 2001; Reis, 1998; Renzulli & Reis, 2008; Winebrenner & Brulles, 2012). Teachers who were intentional and purposeful with their curricular planning and reflection were more likely to meet the individual needs of students (Minott, 2009).

Impact of Teacher's Knowledge About Gifted Learners

Research indicated that the effectiveness of differentiation techniques was limited because teachers are provided great latitude when selecting the instructional methodologies utilized within the classroom and very few teachers had been trained on how mathematically gifted learners approach and develop understanding of skills and problems (Deal & Wismer, 2010). The National Association for Gifted Children (2009) reported that, within the United States, 40 states identified the need for pre-service and current teachers to receive training in gifted education methodologies. The same research found that 20 states had low or no standards for licensure to teach gifted students (National Association for Gifted Children, 2009).

General classroom teachers modified instructional techniques for all students when professional development was provided regarding effective instructional strategies for meeting the needs of gifted learners (Page, 2000). Teachers who worked collaboratively to develop instructional units for use with gifted learners gained insights not only into methodologies best suited for gifted learners, but also ways to impact the "non-gifted" students in their classrooms. When teachers learned how to differentiate instruction for gifted learners, the instructional

practices used with all students changed and teachers implemented instructional differentiation, process and product differentiation, grouping strategies, and perfectionism management (Park & Oliver, 2009). Park and Oliver (2009) also found that when teachers were intentionally working to differentiate for gifted learners, the learning environments became more psychologically safe for students.

Johnson (2000) explained that differentiated assignments for mathematically gifted students should be intentionally designed. When differentiating, the assignment should not be more of the type of problem, but should, instead, be either a more challenging assignment or a task that was tailored to a student's interests (Johnson, 2000). Johnson (2000) further stated that classroom teachers and school districts must share the responsibility of addressing the needs of gifted students by ensuring that teachers received training and support in meeting the needs of gifted learners; mathematics instructors with a strong background in mathematics content; a coordinated and clearly articulated curriculum plan was in place; and an organized resource support system existed within each school. Rotigel and Fello (2004) summarized that "being aware and sensitive to the unique characteristics of gifted learners will assist teachers in providing a myriad of opportunities for growth in mathematical reasoning and problem solving" ("Conclusion," para. 4).

The research suggested that a teacher's awareness and understanding about the unique instructional needs of gifted learners was an important aspect to the differentiation process (Page, 2000; Rotigel & Fello, 2004). The identification of collaborative partnerships throughout the differentiation process allowed for replication of effective practices (Johnson, 2000; Park & Oliver, 2009). A collaborative approach resulting in increased awareness of the instructional

needs of gifted learners may also positively impact the learning environment for non-gifted students, as evidenced in the work of Park and Oliver (2009).

Gifted Students' Impressions of Differentiation

Research indicated that gifted students self-identify a need for differentiated instruction, seeking individualization and personalization of the curriculum and learning methodologies in order to remain challenged (Hertberg-Davis & Callahan, 2008; Kanevsky, 2011). As teachers struggled to develop and implement differentiation strategies (Loeser, 2008), it became increasingly important that the process of differentiating instruction for gifted students be critically analyzed and refined.

Hertberg-Davis and Callahan (2008) investigated secondary students' perceptions of advanced course offerings. The students in the study indicated a desire for instructional methodologies that were individualized to meet their unique needs and interests (Hertberg-Davis & Callahan 2008). Although the gifted and high-ability students preferred the rigor, pace, and learning environment within the advanced course offerings when compared to the other educational opportunities available for high school secondary students, the curriculum and instructional methodologies were found to be incompatible with the learning styles of the students (Hertberg-Davis & Callahan 2008).

In Kanevsky's (2011) research on learning preferences of gifted and non-gifted students, when compared to non-gifted learners, gifted learners wanted to learn about complex, extracurricular topics, including sophisticated, authentic concepts. The gifted learners also actively sought to identify connections between concepts (Kanevsky, 2011). The study revealed that gifted learners wanted to work with others only part of the time and desired the ability to choose how to demonstrate acquired learning (Kanevsky, 2011). Additionally, Kanevsky (2001)

found that gifted learners significantly disliked waiting for the rest of the class and having to seek help from others in order to complete a task.

Gifted learners self-recognize the need for differentiated instruction, seeking individualized curriculum and personalized learning methodologies (Hertberg-Davis & Callahan, 2008; Kanevsky, 2011). Gifted learners will seek out instructional opportunities to learn about complex, sophisticated concepts within a rigorous, fast-paced learning environment, but, in some cases, will accept less rigorous content in order to experience instructional methodologies aligned with personal learning styles, thus limiting achievement potential (Hertberg-Davis & Callahan, 2008; Kanevsky, 2011).

Summary

Foundational educational research from Vygotsky (1978), Dewey (1938), and Gardner (2011) provided the supporting groundwork for Tomlinson's (1999a) Theory of Differentiated Instruction. These theories, collectively, provided the conceptual framework for research related to differentiation, gifted learners, and this study. While a large amount of research related to differentiation itself was available, the amount of research specifically directed to differentiation for gifted learners in the area of mathematics was limited. The *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum, and the corresponding instructional methodologies of Singapore Math, is being implemented across the United States as schools respond to the need to teach math differently to raise student achievement (Hazelon & Brearley, 2008). Differentiation for gifted learners utilizing the *Math in Focus* Curriculum was not addressed in any currently available research, thus identifying this as a gap in scholarly educational literature.

For this study, the State of Ohio's definition of giftedness was utilized, but other definitions exist, each with varying requirements for gifted identification and accompanying expectations for service methodologies. While individual definitions regarding giftedness vary, each definition identified gifted learners as a specialized portion of the general population who require unique learning opportunities in order to be academically challenged (Bleske-Rechek et al., 2004; Reis & Purcell, 1993; Rogers, 2004; Tomlinson, 1999a; Tomlinson, 1999b; Winebrenner & Brulles, 2012). Mathematically gifted learners were noted to have unique characteristics from other gifted learners (Sheffield, 1994). These distinctive traits and approaches to learning necessitated modifications to traditional curriculum and instructional methodologies to meet the complex learning profile, pace, and content readiness of individual mathematically gifted learners (McAllister & Plourde, 2008; Rotigel & Fello, 2004; Sheffield, 1994).

Gifted learners required specialized instructional opportunities to meet their academic needs (Borland, 2003; Johnson, 2000; Maker, 1982; Matthews & Foster, 2006). Instructional modifications to the general curriculum were necessary and teachers needed to take into consideration the pace, depth, and complexity of tasks when planning for differentiated instruction for gifted learners (Bleske-Rechek et al., 2004; Borland, 2003; Reis & Purcell, 1993; Rogers, 2004; Stepanek, 1999; VanTassel-Baska, 2012a). Brain research related to gifted learners suggested that differentiated instruction is necessary in order for learning to occur (McAllister & Plourde, 2008; Stepanek, 1999; Tomlinson & Kalbfleisch, 1998). Studies also indicated that not providing instructional opportunities at the appropriate challenge level would not only prevent new learning from occurring, but may also impede future learning, engagement,

and motivation (Erikson, 1998; Kesner et al., 1993; Keverne et al., 1997; Koob et al., 1990; Pally, 1997; Shultz et al., 1997).

Despite being established to positively impact the learning opportunities of all students, research suggested that the No Child Left Behind (2001) legislation was having a negative impact on gifted learners (Goodkin, 2005; Meier et al., 2004; Neal & Schanzenbach, 2007; Robinson, 2008; Thomas B. Fordham Institute, 2008; Vigdor, 2013). The emphasis on universal proficiency standards and potential sanctions for schools that were not able to bring all students to the minimum proficiency levels resulted in a shift in educational priorities, drawing attention and resources to the students within the middle third of the ability levels within classrooms (Amrein & Berliner, 2002; Golden, 2003; Hamilton et al., 2007; Hopson-Lamar, 2009; Kohn, 2000; Matthews, 2006). Research suggested that this priority shift was occurring at the expense of the brightest students as well as the low-performing students – both student groups which were the farthest from the minimum proficiency standard (Goodkin, 2005; Meier et al., 2004; Neal & Schanzenbach, 2007; Robinson, 2008; Thomas B. Fordham Institute, 2008; Vigdor, 2013).

The *Pre-K-Grade 12 Gifted Programming Standards* (National Association for Gifted Children, 2010) provide a foundation for meeting the needs of gifted learners at all stages of development (Kitano et al., 2008). These standards serve as a framework for defining benchmarks and identifying effective instructional practices specifically for meeting the unique academic, social and emotional needs of gifted learners (Johnsen, 2006; VanTassel-Baska & Johnsen, 2007).

Although generally considered to be more rigorous than previous academic content standards, the Common Core State Standards (National Governors Association Center for Best

Practices, Council of Chief State School Officers, 2010a) are not rigorous enough to meet the needs of the most advanced gifted learners (Greene & Cross, 2013; VanTassel-Baska, 2012a). Instructional planning, curricular modifications, and differentiated instruction are all still necessary in order to meet the needs of gifted learners (Greene & Cross, 2013; National Association for Gifted Children, 2014a; VanTassel-Baska, 2012a).

Intentional modification of the content, process, or product within the instructional process allowed teachers to personalize instructional methodologies according to students' readiness level, interest, and learning profiles, significantly impacting the achievement, motivation and engagement of gifted learners (Linn-Cohn & Hertzog, 2007; Tomlinson 1999a; Winebrenner & Brulles, 2012). Intentional differentiated instruction may enable gifted learners, as well as students with mild or even severe disabilities, to receive an appropriately challenging education experience in inclusive classrooms (Baumgartner et al., 2003; Fisher & Frey, 2001; Huebner, 2010; Lawrence-Brown, 2004; Odgers et al., 2000; Tieso, 2001; Tieso, 2005; Tomlinson & Kalbfleisch, 1998; and Vaughn, Bos, & Schumm, 2000). Gifted learners within heterogeneous classes may have their instructional needs met by well-designed and implemented differentiated instructional methodologies that are beyond the traditional extensions commonly offered by textbooks and the general curriculum (Erikson, 1998; Flanders, 1987; Lawrence-Brown, 2004; Renzulli, 1994; Rock et al., 2008; Tieso, 2005).

Gifted learners self-identified the need for differentiation and sought out instructional opportunities to learn about complex, sophisticated concepts within a rigorous, fast-paced learning environment, if the instructional methodologies were aligned with personal learning styles (Hertberg-Davis & Callahan, 2008; Kanevsky, 2011). If the learning environment was not conducive, gifted learners stagnated (Hertberg-Davis & Callahan, 2008)

The research studied supported the need for a comprehensive understanding of differentiation methodologies and the readiness levels of students for teachers implementing any curricular initiative (Kingore, 2008; Olenchak, 2001; Reis, 1998; Renzulli & Reis, 2008; Winebrenner & Brulles, 2012). Teachers who were intentional and purposeful with their curricular planning and reflection were more likely to meet the individual needs of students (Minnott, 2009). Research suggested that a teacher's awareness and understanding about the unique instructional needs of gifted learners was an important aspect to the differentiation process (Page, 2000; Rotigel & Fello, 2004). The identification of collaborative partnerships throughout the differentiation process allowed for replication of effective practices (Johnson, 2000; Park & Oliver, 2009).

While a large amount of research related to differentiation was available, the amount of research specifically directed to differentiation for gifted learners in the area of mathematics was limited. The *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum, and the corresponding instructional methodologies of Singapore Math, is being implemented across the United States as schools respond to the need to teach math differently to raise student achievement (Hazelton & Brearley, 2008). Differentiation for gifted learners utilizing the *Math in Focus* Curriculum was not addressed in any currently available research, thus identifying this as a gap in scholarly educational literature.

The absence of differentiation research in the area of *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) presented a significant challenge for teachers seeking assistance in how to best meet students' instructional needs. The results of the current study may help fill the identified gap in literature. Additionally, this study may provide insight related to

collaboration and intentionality during the process of differentiation for gifted learners within the relatively rigid teaching environment of the *Math in Focus* program model.

CHAPTER THREE: METHODS

Overview

The purpose of this phenomenological study was to discover the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) Singapore Mathematics program in a suburban, middle-class school district. Discovering the differentiation techniques being implemented by teachers may facilitate improved professional development and program implementation, both of which may lead to greater student achievement.

This chapter describes the research design, including the four research questions, and descriptions of the setting and participants of the study. Detailed information regarding the research procedures, data collection tools, and data analysis methods are also provided.

Design

This phenomenological study was conducted utilizing open-ended questionnaires, semi-structured interviews, classroom observations, and document analysis. The purpose of this study was to identify the essence of a shared, lived experience, making a phenomenological approach an appropriate research methodology (Creswell, 2013; Garrett & Moltzen, 2011; Moustakas, 1994; Schroeder-Davis, 2009). As the human instrument, I utilized the multiple data collection methodologies and employed trustworthy methods of transcendental data analysis to seek the essence of how fifth grade general classroom mathematics instructors differentiate to meet the needs of gifted and high ability students using the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) program. The transcendental approach to phenomenological research

allowed me to bracket out pre-conceived notions related to the phenomenon of differentiation, in order to discover the essence of the participants' experience (Creswell, 2013; Moustakas, 1994).

By definition, phenomenological research explores the experiences of a group of individuals who have all experienced a phenomenon that is being studied (Creswell, 2013). Phenomenology seeks to derive the "ideas and essences" of a phenomenon, rather than presupposing or assuming them (Moustakas, 1994, p. 46). Linn-Cohen and Hertzog (2007) used a phenomenological approach to a qualitative research study in order to discover the essence of differentiation techniques utilized within self-contained gifted classrooms, providing a methodological correlation to this study. Additionally, Grafi-Sharabi, (2009) broadly studied differentiation and also used a phenomenological approach. As this study derived meaning from the experiences of individual teachers who have all participated in the phenomenon of differentiating for fifth grade high ability learners within the general classroom setting, the phenomenological research design was the most appropriate methodology.

Research Questions

1. What do general classroom mathematics teachers perceive about differentiated instruction for gifted and high ability learners?
2. How do general classroom mathematics teachers employ differentiation strategies to meet the needs of fifth grade gifted and high ability learners?
3. How does the *Math in Focus* curricular methodology influence the differentiation process utilized by general classroom mathematics teachers for fifth grade gifted and high ability learners?

4. What do general classroom mathematics teachers perceive to be the programmatic obstacles and needed resources for the differentiated instruction process for fifth grade gifted and high ability learners?

The first research question sought to develop an understanding of general classroom mathematics teachers' perceptions of differentiated instruction for gifted and high ability learners. The second research question strived to develop understanding of how differentiation strategies were implemented by teachers within general mathematics classrooms. The third research question was intended to identify how the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) program influenced the differentiation strategies selected for implementation. The final research question allowed for the inclusion of both perceived obstacles and needs to the differentiation process to be included in the understanding of the phenomenon.

Setting

This study took place within Badgerbrook City Schools, a middle-class school district located in south, central Ohio adjacent to one of the largest bases of the United States Air Force (Badgerbrook City Schools, 2015). The school district was comprised of five elementary (K-5) buildings, one elementary (preK-5) building, two middle schools (6-8) and one high school (9-12). At the time of the study, there were 7,428 students attending Badgerbrook City Schools. There were approximately 575 students per grade level within the district, with students distributed relatively equally across the elementary and middle school buildings and 98.9% of the staff were considered Highly Qualified (Ohio Department of Education, 2014). The student population of Badgerbrook schools was approximately 85% Caucasian, 14.5% Economically Disadvantaged, 2.9% Limited English Proficient, 13.9% Students with Disabilities, 30%

identified as gifted in at least one area, and 17% identified as gifted in mathematics (Badgerbrook City Schools, 2015). During the course of the study, the district was completing the third year of full *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) implementation, the first year of a 1:1 iPad initiative at grades K-8, and the first year of Partnership for Assessment of Readiness for College and Careers (PARCC) (Partnership for Assessment of Readiness for College and Careers, 2013). The 1:1 iPad initiative centered around the use of eSpark (eSpark Learning, 2015), a personalized learning tool for enrichment, intervention, and remediation in reading and mathematics (Badgerbrook City Schools, 2015).

Badgerbrook reported providing multiple levels of formal gifted services to fifth grade students at the time of the study. Students who were identified as gifted in the area of superior cognitive abilities, mathematics, and/or reading in Kindergarten through grade five were provided differentiated instruction within the general classroom using eSpark (eSpark Learning, 2015), individualized reading and mathematics learning quests, on district-issued iPads. Students in grades four and five who were identified as superior cognitive abilities also participated in a Gifted Resource Room for 225 minutes, one day per week. Students received thematic, enrichment instruction from certified Gifted Intervention Specialists related to reading, mathematics, critical and creative thinking, and social and emotional needs. Additional gifted services, including honors and AP courses, were available to students in grades six through twelve. In compliance with Ohio requirements, students at all grade levels could be whole grade or single subject accelerated.

Participants

This study initially utilized maximum variance sampling of all eligible participants for administration of an open-ended questionnaire. Maximum variation sampling, the intentional

selection of participants with significant differences, is a useful method of sampling in qualitative research because it increases the likelihood that the findings of a study will reflect differences in perspective (Creswell, 2013). All fifth grade general classroom *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) instructors of gifted and high ability students at Badgerbrook City Schools were considered eligible participants, representing the greatest variety within the setting of the study. Ten eligible participants were identified within Badgerbrook City Schools.

A smaller, stratified sample was taken from the eligible participants in order to allow for more in-depth analysis to occur. Stratified sampling is a useful method of sampling when the researcher seeks to illustrate subgroups within the population (Creswell, 2013). Stratified sampling was used within this research to provide a more complete representation of the essence of the differentiation process within the district, preventing the culture of an individual school from interfering with the accuracy of the results. The stratified sampling within this study sought 5-7 representative participants from different elementary buildings within the district to be selected for interviews, observations, and the collection of document artifacts. Two representative participants completed the more in-depth analysis of this study.

Procedures

Prior to conducting any research, I applied for and secured Institutional Review Board (IRB) approval for the study (Appendix A). Due to unforeseen circumstances, the initial school district identified for this study was replaced with Badgerbrook City Schools prior to research being conducted. IRB approval for the change was requested and granted (Appendix B). I then contacted the superintendent of the identified school district, Badgerbrook City Schools, to schedule a meeting to fully explain the purpose of the study and the procedures that would be

followed. Once the study had been clearly explained, I requested and received permission to conduct the study within Badgerbrook City Schools and secured the permission letter from the Superintendent (Appendix C).

Upon IRB approval, eligible participants were identified for participation in the open-ended questionnaire utilizing the maximum variance sampling procedure. Participation for the open-ended questionnaire was solicited using electronic communication (Appendix D). After having participants grant consent to being a part of the research study (Appendix E), they completed the open-ended questionnaires, which were be made available both electronically and in printed form to all participants. Six eligible participants completed questionnaires.

To identify the representative participants for the remaining three data collection processes, stratified sampling procedures were utilized. Using electronic communication, representative participants were solicited from the maximum variance participant pool, seeking participation from each of the six elementary school buildings within the study setting. Three observations, one individual semi-structured interview, and document artifact collection was scheduled with each representative participant. They each participated in these forms of data collection.

Using an initial maximum variance sample of participants, followed by stratified sampling to identify representative participants for data collection, supported my effort to efficiently achieve data saturation. According to Mason (2010), “qualitative samples must be large enough to assure that most or all of the perceptions that might be important are uncovered, but at the same time if the sample is too large, data becomes repetitive and, eventually, superfluous” (“1.2 Guidelines for sample sizes in qualitative research,” para. 1). Collected data

was analyzed to identify common themes or trends and to reveal the essence of the differentiation process.

The Researcher's Role

As a child, I was surrounded by research related to educational pedagogy and gifted learners. Both of my parents were educators, placed a high value on education, and continue to be advocates for specialized gifted services. I have a strong background in differentiated instruction, particularly for gifted and high ability learners. I am a certified Gifted Intervention Specialist and have received highly specialized training in differentiated instruction. I am currently in my second year as a curriculum supervisor, with an emphasis on science and gifted education. For three years prior to the time of the study, I served as a Gifted Intervention Specialist, working with students and teachers in grades three, four, and five.

Throughout the course of this research, as the human researcher, I was careful to remove my expectations and bias in order to discover the essence of the differentiation process from the participants' perspectives. I also actively safeguarded the separation between my professional role as an administrator and the research being conducted. It was especially important that I ensure the trustworthiness of my research through strategies such as triangulation, member checking, expert reviews, thick descriptive data, and external audit trails.

Data Collection

Four methods of data collection were utilized within this research study, more than satisfying the needs of triangulation. An open-ended questionnaire utilized with a maximum variance sample, as well as semi-structured interviews, observations, and the collection of document artifacts with the stratified sample, occurred.

Data collection began with an open-ended questionnaire, which provided rich information about participants' teaching history, knowledge of students, and understanding and implementation of differentiation strategies. All questionnaire participants were then invited to serve as representative participants for semi-structured interviews, observations, and document artifacts, providing greater depth of the essence of differentiated instruction. The semi-structured interviews were scheduled to occur between the first and second observations. The observations were used to gather a clear, visual picture of the participants' differentiation techniques and the semi-structured interviews provided the participants' personal perspectives and understandings related to differentiated instruction. At the conclusion of each observation, document artifacts were collected from the participants to provide information about the investigated phenomenon. Utilizing these more personal methods of data collection after the questionnaire, I was able to clarify the initial data collected and identify evidence to either support or conflict with the self-reported data contained within the questionnaire. All four methods of data collection were applied to each of the four of the research questions within this study.

Open-Ended Questionnaire

An open-ended questionnaire was administered to all eligible participants using maximum variance sampling. A qualitative questionnaire is an exploratory, open-ended document that typically includes in-depth questions (Johnson & Turner, 2003). Questionnaires are useful for eliciting content from groups of participants that may not be feasible through the other methods of data collection (Johnson & Turner, 2003). The questionnaire for this study (Appendix F) was designed to provide a general understanding of the participant's history, the composition of the class, and the participant's understanding and implementation of differentiation strategies. The questionnaire was distributed to participants after they provided

consent to take part in the study and was made available in both electronic and printed formats. Six eligible participants completed the questionnaire. The questionnaire was designed to take participants less than 25 minutes to complete. Prior to administering the questionnaire, it was analyzed by a content expert to ensure the questions were clear and did not guide the participants to provide inaccurate responses. The questionnaire was then field-tested with a small sample of fifth grade mathematics teachers from an adjacent school district that is similar to the study setting.

Questions one through four of the questionnaire were designed to establish the participants' general background. These questions provided a context for the additional information collected. The participants' understanding of the students within the mathematics class was identified through the answers to questions five through nine. The teacher must have a fundamental understanding of the readiness, interests and learning profiles of students prior to implementing any differentiation techniques (Winebrenner & Brulles, 2012). Questions ten through fifteen were designed to reveal the teachers' perceptions and understanding of the process of differentiation as well as any techniques or strategies utilized. Teachers can utilize differentiation differently, but the fundamental aspects of intentionality are universal in appropriate application (Kingore, 2008). Any obstacles or needed resources that may be preventing the participants from differentiating were identified in questions sixteen and seventeen. Question eighteen was designed to offer the participants to provide responses that did not fit within the aspects of the provided questions.

Semi-Structured Interview

Individual, semi-structured interviews were conducted with two representative participants, each from a different elementary school within Badgerbrook City Schools. Interviews were conducted

within the participants' classrooms, providing a familiar, comfortable location for each of the participants. Semi-structured interviews are a qualitative research method in which a researcher engages with participants by neutrally posing questions, listening closely to responses, and asking follow-up questions based on the responses provided (Mack, Woodsong, MacQueen, Guest, & Namey, 2005). The use of semi-structured interviews enabled me to extend established interview questions for clarification or as a result of unanticipated responses (Creswell, 2013). The individual interviews occurred after the participants had completed the questionnaire, but prior to the completion of the first observation. To ensure accuracy and cohesiveness, I recorded the interviews utilizing a recording device and transcribed each recording. A back-up recording device was present and written notes were also taken during the interview. Each interview lasted approximately 25 minutes and occurred outside of the instructional time of the participants. Prior to conducting any interviews, the initial questions were analyzed by a content expert and field-tested with a small sample of fifth grade mathematics teachers at a similar school district. The initial interview questions can be found in Appendix G.

The first five questions of the interview pertained to the participants' philosophy of education, instructional methodologies, and any training that may provide relevant background knowledge to the differentiation process. Teachers with a strong awareness of their own teaching preferences are often able to identify differentiation strategies that are best suited for their teaching style (Kingore, 2008). Question six was designed to determine if the participants had a strong understanding of their students. Differentiation, by design, is based on students' readiness, interests, and learning profiles, making it necessary for teachers to identify this information prior to being able to differentiate instruction (Tomlinson, 1999). Questions seven and eight were designed to reveal the differentiation techniques and implementation strategies employed by the

teachers. Both the methodologies and how they are utilized are critical to the effectiveness of differentiation (Winebrenner & Brulles, 2012). The participants' perspective on how the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) program itself, as well as any unidentified factors, impact the differentiation process was identified through the answers provided for questions nine through eleven. The effectiveness of differentiation is influenced by more than just an individual teacher the students (Winebrenner & Brulles, 2012). Question twelve was designed to allow participants to provide information about the phenomenon being studied that may not have been addressed by the previous eleven questions. Phenomenological studies seek to describe, rather than explain, thus requiring the researcher to provide participants with the opportunity to reveal novel information that was not addressed by the researcher's initial questions (Moustakas, 1994).

Observations

Observations are a key method of data collection, particularly for phenomenological research (Creswell, 2013). Within the context of qualitative research, observation is the use of the researcher's senses to note a phenomenon within the field setting (Angrosino, 2007). The data collected from the observations within this study allowed me to derive meaning from the information gathered from the other data collection sources. The data collected from observations also provided an opportunity to reveal additional aspects of differentiation that were not identifiable from the other methods of data collection.

For the purpose of this study, three observations were scheduled over the course of a 9-week time period for each of the representative participants. The first observation was scheduled prior to the individual semi-structured interview and the remaining two observations were scheduled after the semi-structured interview. This allowed me to collect a portion of the

observational data and then seek clarification within the individual semi-structured interview. Each observation was between 50 and 75 minutes in length and was scheduled to occur during a general fifth grade mathematics class that included students who were identified as gifted or high ability learners. During the observations, I assumed the role of a non-participating observer. This allowed me to observe and record data without direct involvement in the activities (Creswell, 2013).

To facilitate reliable observation of differentiated instruction, I utilized The William and Mary Classroom Observation Scales Revised (VanTassel-Baska, et al., 2003). The COS-R (VanTassel-Baska, et al., 2003) includes "the most critical behaviors for general teachers and differentiation features culled from research-based evidence of effective classroom-based instructional behaviors" (VanTassel-Baska, 2012b, p. 47) and has been found to be a statistically valid and highly reliable observation tool (VanTassel-Baska, 2012b; VanTassel-Baska, Quek, & Feng, 2005; VanTassel-Baska, Quek, & Feng, 2007). The permission to utilize the COS-R, granted by VanTassel-Baska, can be found in Appendix H. The complete COS-R can be found in Appendix I.

To further aid the observation processes, a classroom map, noting the students who have been pre-identified by the participant as gifted or high ability learners, was utilized to ensure differentiation implementation was not overlooked. Additional information directly related to how the participant differentiated instruction was gathered from the observation was scripted for later coding, but no audio or video recording was taken during any of the observations.

As a result of the overlap between the study and end of year assessments, only two observations were conducted with each of the representative participants. While the third observation with each participant was scheduled, each participant had to cancel due to

scheduling conflicts. Data from the two observations conducted revealed that data saturation had been achieved for these participants, making a third observation unnecessary.

Document Artifacts

Documents are produced by individuals and groups as a part of everyday practices and are geared exclusively for their own immediate practical needs (Scott, 1990). Individual documents provide information about the investigated phenomenon and exist independently of the researcher's actions (Corbetta, 2003; Payne & Payne, 2004). The analysis of document artifacts provides the researcher of a phenomenological study with immediate access to information about the past behavior related to the phenomena being studied (Baily, 1994; Scott, 1990).

Document artifacts for this study included the lesson plans and instructional activities utilized for all observation periods, along with documents noted or referenced by the representative participants during their interviews. Supplementary document artifacts included additional lesson plans, instructional activities, instructional planning resources, and supplementary instructional tools utilized by the participant to differentiate mathematics instruction for gifted and high ability learners. Document analysis was utilized to corroborate and augment data collected from other sources (Yin, 2003).

Data Analysis

Data analysis within phenomenological research involves phenomenological reductionism, which is the process of obtaining a pure perspective of the phenomena being studied (Shutz, 1967). For this study, Moustakas' (1994) approach to transcendental phenomenology will be followed, which requires the focus to be on the description of the experiences of participants rather than on the interpretations of the researcher (Creswell, 2013).

Color-coding was used throughout the data analysis process in order to ensure thorough consideration of the phenomenon.

Bracketing

Moustakas (1994) emphasized the importance of researchers to be open and receptive when hearing research participants describe their experiences. Bracketing, the first step of phenomenological reductionism, is the process of suspending judgment from a phenomenon in order to consider it outside of general contexts (Creswell, 2013). Because I have been a classroom teacher and have differentiated instruction for gifted and high ability learners, I had experience with the phenomenon being studied. It was important that I set aside my personal experiences related to the phenomenon to prevent personal bias from clouding the data collected for this study. To bracket my experiences, I created a reflective journal regarding the phenomenon being studied. Once my personal and professional experiences and opinions were set aside, I began the next portion of data analysis.

Phenomenological Reduction

Following the completion of bracketing, the data collected for this study was next analyzed using horizonalization. Horizonalization assigns equal value to each significant statement (Merriam, 2009; Moustakas, 1994; Van Manen, 1990). Moustakas (1994) describes horizonalization as the process of highlighting meaningful statements from collected data in order to provide an understanding of how the phenomenon was experienced by study participants. When considering the participants' experiences, I considered all relevant statements as significant aspects of the lived experience. I listed all significant statements from each participant and data source and then recorded statements that were consistent across more than one data source. Statements that were not relevant to the research questions were deleted.

The process of horizonalization revealed meaningful statements, or horizons, that were color-coded and analyzed to identify trends and commonalities in responses, creating clusters of meaning and themes within the data (Merriam, 2009; Moustakas, 1994). The clusters were analyzed to create a textural description of the phenomenon from a variety of perspectives, ensuring that the most critical aspects of the phenomenon were included in a description (Creswell, 2013; Moustakas, 1994).

Synthesis of Essence and Meanings

The combined process of phenomenological reductionism allowed me to integrate descriptions across multiple pieces of collected data to determine commonalities and themes and establish a description of the essence of the phenomenon (Moustakas, 1994; Schutz, 1967). By composing a synthesis of the universal themes in the lived experiences of the participants, I was able to create a description that may provide readers with knowledge about the phenomenon studied through an understanding of the experiences of the participants.

Trustworthiness

The trustworthiness of a study addresses four criteria: credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Shenton (2004) describes the credibility of a study as the internal validity, while transferability relates to the external validity and generalizability of a study. Dependability is the reliability of a study and the objectivity of a study is known as the confirmability (Shenton, 2004).

Credibility

Credibility is defined as the confidence in the accuracy or truth of the findings provided by the research (Lincoln & Guba, 1985). In this study credibility was addressed through the use of triangulation, member checking, and peer debriefing.

Triangulation ensures that multiple data collection methodologies have been utilized and member checking refers to the practice of allowing the participants to review the collected data for accuracy (Lincoln & Guba, 1985). In this study, data was collected from four data sources: (a) questionnaire; (b) interview; (c) observation; and (d) document artifacts.

Member checking allows participants to critically analyze the findings and affirm the accuracy and completeness of the study (Creswell, 2013). In this study, representative participants were asked to read the findings and determine the accuracy of the description of the phenomenon. Other than grammatical corrections, the participants believed the transcripts, findings, and descriptions of the phenomenon were accurate.

Peer debriefing is the "process of exposing oneself to a disinterested peer in a manner paralleling an analytical sessions and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's mind" (Lincoln & Guba, 1985, p. 308). A peer familiar with differentiated education for gifted and high ability learners was asked to review the content and procedures for accuracy of the content, methodology and interpretation. This colleague provided written feedback during the research process and provided me with the opportunity for catharsis (Lincoln & Guba, 1985).

Transferability

Transferability, which considers the external validity of the study and if the findings can be applied to other contexts, was addressed by providing thick, rich detail about both the setting and the context of the study (Lincoln & Guba 1985). The thick, rich detail provided include lengthy descriptions of the setting, participants, methodology and processes, sampling, and data analysis information. By providing extensive detail and descriptions, readers will be able to draw conclusions about the transferability of the findings because the provided information places

them into the context of the research (Creswell, 2013). Yin (2011) states that, despite the difficulty of determining transferability within a qualitative study using traditional methodologies such as statistical generalizations, it is appropriate for a qualitative study to address the transferability aspect of trustworthiness using analytic generalizations. Both Giorgi (2008) and Thomas and Pollio (2002) stated that when thick, detail-rich descriptions are provided, phenomenological studies are generalized by those that read them.

Dependability and Confirmability

Dependability refers to the consistency of the study and confirmability refers to the objectiveness of the researcher. Both of these aspects of trustworthiness were addressed through an audit trail to show appropriate handling of the data (Lincoln & Guba, 1985). An audit trail provides an external auditor the necessary means to analyze the research findings and ensure they are supported by the study data (Creswell, 2013). As discussed by Lincoln and Guba (1985), I have information within six information categories to inform an audit trail: (a) raw data; (b) data reduction and analysis notes; (c) products from data reconstruction and synthesis; (d) process notes; (e) materials related to intentions and dispositions; and (e) initial development information.

Ethical Considerations

Prior to collecting any data, IRB approval was obtained. Informed consent forms (Appendix E) were utilized to ensure participants understood their rights as participants, that their participation in the research study was not connected to any evaluative efforts within the school district, and that they may remove themselves from study participation at any time. To ensure the anonymity throughout the study, pseudonyms were utilized for the school district, school buildings, as well as the individual participants. Additionally, to maintain data security

and protect the confidentiality of the study participants, all information related to the study was kept in either a locked filing cabinet or on a password-protected electronic device and coding information was kept in a separate location.

Summary

This chapter presented the procedures, research design, and methods of data analysis for this research study. Descriptions of the research design, procedures, methodology, population, sampling method, instrumentation, data collection processes, and data analysis procedures were discussed. The following chapter will discuss the findings from the anonymous questionnaire, semi-structured interviews, observations, and document artifacts.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this phenomenological study was to discover the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) Singapore Mathematics program in Badgerbrook City Schools. Creswell (2013) defined a phenomenological study as one that describes the shared meaning of the lived experiences of a phenomenon for several individuals. The purpose of this study was to identify the essence of a shared, lived experience, making a phenomenological approach an appropriate research methodology (Creswell, 2013; Garrett & Moltzen, 2011; Moustakas, 1994; Schroeder-Davis, 2009).

The transcendental phenomenological method was used to study fifth grade general classroom teachers who experienced differentiated instructional techniques for gifted and high ability students using the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curricular program. The phenomenon studied was differentiated instruction for gifted and high ability fifth grade students.

Research Questions

Each of the four research questions used to guide this study provided information about teachers' perceptions and experiences and sought to establish the essence of general mathematics teachers' differentiation process for gifted and high ability fifth grade learners within a *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) classroom.

1. What do general classroom mathematics teachers perceive about differentiated instruction for gifted and high ability learners?

2. How do general classroom mathematics teachers employ differentiation strategies to meet the needs of fifth grade gifted and high ability learners?
3. How does the *Math in Focus* curricular methodology influence the differentiation process utilized by general classroom mathematics teachers for fifth grade gifted and high ability learners?
4. What do general classroom mathematics teachers perceive to be the programmatic obstacles and needed resources for the differentiated instruction process for fifth grade gifted and high ability learners?

Participants

Badgerbrook City Schools had 10 teachers who were eligible to serve as participants in this study. Six teachers, with varying ranges of teaching experience, agreed to participate in this research. Each participant was a general classroom fifth grade mathematics teacher at a different elementary school within Badgerbrook City Schools, utilized the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) mathematics program, and taught classes containing gifted and high ability students.

After obtaining permission from the superintendent of Badgerbrook City Schools, I discussed the research study with all 10 eligible fifth grade mathematics teachers within the district and distributed informed consent forms. Additional information was provided upon request and six teachers agreed to participate in the study by signing the consent form. Each of the six participants worked at different elementary schools within Badgerbrook City Schools. All six participants completed the anonymous questionnaire and two agreed to serve as representative participants for the interview, observations, and collection of document artifacts.

The representative participants taught at two different elementary buildings within Badgerbrook City Schools.

The anonymous questionnaire was completed by six participants. Each of the six participants worked at different elementary schools within Badgerbrook City Schools and described their mathematics classes as being heterogeneously mixed. Table 1 provides an overview of the demographics of Badgerbrook City Schools and each elementary school.

Table 1

Setting Demographics

Setting	Total Students	Identified Gifted	Identified Gifted in Mathematics	Students with Disabilities	Limited English Proficient	Economically Disadvantaged	Caucasian
Badgerbrook City Schools	7428	30%	17%	14%	3%	15%	85%
Tiger Elementary	648	33%	25%	10%	14%	17%	70%
Cheetah Elementary	462	31%	22%	12%	3%	17%	88%
Lion Elementary	448	37%	29%	13%	8%	16%	89%
Puma Elementary	557	30%	23%	16%	4%	23%	88%
Panther Elementary	414	26%	19%	24%	3%	24%	89%
Lynx Elementary	634	38%	29%	13%	3%	4%	86%

Chloe had five years of teaching experience. This was Chloe's fourth year teaching fifth grade and she reported being very comfortable with the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum. Chloe served as a Math Coach during the first year of the text adoption for Badgerbrook City Schools and she attended numerous workshops on how to

implement the program into her classroom. At the time of the study, Chloe taught mathematics to a class of 23 fifth grade students. Chloe also taught 27 fourth grade mathematics students as a part of her instructional day.

Aubrey had spent the last nine years teaching fifth grade and had been teaching 16 years total. At the time of the study, she taught two fifth grade mathematics classes. There were 24 students in Aubrey's first fifth grade mathematics class, and 26 students in the second class. Aubrey characterized herself as only moderately comfortable with the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum.

Amy had 17 years of teaching experience, with the last six years spent teaching fifth grade. There were 27 students in each of Amy's two classes of fifth grade mathematics. When Badgerbrook City Schools initially adopted the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum Amy was selected to serve as a Math Coach. She reported being very comfortable with how to implement the program with fidelity.

Lilly had 12 years of teaching experience. This was Lilly's eighth year teaching grade five. During her instructional day, Lilly taught three classes of fifth grade math, each consisting of 25 students. Lilly did not receive any training in *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) prior to beginning to teach with the program, and stated that she learned the curriculum by teaching it. Despite her lack of training, Lilly reported being moderately comfortable with the *Math in Focus* curriculum.

Rose had been teaching 15 years and had spent 13 years of those years teaching fifth grade. Rose taught one class of fifth grade mathematics, comprised of 28 students, and also taught one class of fourth grade mathematics, comprised of 28 students. Rose described her

comfort level with the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum as being average.

Stacey had been teaching for seven years, with the last four being spent teaching fifth grade students. There were approximately 27 students in each of Stacey's three classes of fifth grade mathematics. When Badgerbrook City Schools was completing their mathematics course of study and textbook adoption process, Stacey was selected to pilot the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum. She reported being very comfortable with the implementation expectations associated with the curriculum, having received significant professional development related to the *Math in Focus* program and Singapore mathematics methodologies.

Two of the six participants that completed the anonymous survey agreed to serve as representative participants for additional data collection procedures. New pseudonyms were assigned to the representative participants in order to preserve the anonymity of their survey responses. The representative participants taught at different elementary schools within Badgerbrook City Schools, providing different perspectives on the phenomena of differentiated instruction.

The first representative participant was Ana. Ana held a degree in elementary education for grades one through eight with a specialization in reading and holds a reading endorsement. At the time of the study Ana was completing 17 years of teaching, with the last 6 occurring in grade five. Ana taught mathematics and science to two heterogeneously mixed classes of 27 students each. Within Ana's observed mathematics class, there were 27 students. While 11 students in the class were identified as gifted in at least one area, only six of the students were identified as gifted in mathematics. This was Ana's third full year using the *Math in Focus* (Great

Source/Houghton Mifflin Harcourt, 2009) curriculum and she was a part of the Course of Study adoption team that selected the curriculum.

Ana taught at Tiger Elementary School, which had a total population of 648 students at the time of the study, 33% of which were identified gifted in at least one area and 25% were identified gifted in math (Badgerbrook City Schools, 2015). Tiger Elementary School student population was comprised of approximately 13.7% Limited English Proficient, 16.9% Economically Disadvantaged, 10% Students with Disabilities, and 70% Caucasian (Badgerbrook City Schools, 2015). The fifth grade class at Tiger Elementary School was comprised of 103 students; 42% of the fifth grade students were identified gifted in at least one area and 37% were identified as gifted in mathematics (Badgerbrook City Schools, 2015).

Becca was the second representative participant. Becca held a degree in elementary education for grades one through eight with a specialization in science, and was making preparations to earn her Gifted Intervention Specialist license at the time of the study. Becca completed 15 years of teacher at the time of the study, 13 of which occurred at grade five. Becca taught mathematics and science to the 28 heterogeneously mixed students in her homeroom class, and also taught mathematics and science to 28 fourth grade students. There were 28 students within Becca's observed fifth grade class. A total of 16 students in the class were identified as gifted in at least one area. Becca's class contained eight students identified as gifted in mathematics. This was Becca's third full year using the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum. Becca was a part of the Course of Study adoption team that selected the curriculum and served as the grade level math coach for her building during the initial implementation of the curriculum.

Becca taught at Cheetah Elementary School, which contained a total student population of 462 at the time of the study (Badgerbrook City Schools, 2015). Cheetah Elementary School student population was comprised of approximately 3% Limited English Proficient, 17% Economically Disadvantaged, 12% Students with Disabilities, and 88% Caucasian (Badgerbrook City Schools, 2015). A total of 31% of the students at Cheetah Elementary School were identified gifted in at least one area and 22% were identified gifted in math (Badgerbrook City Schools, 2015). The fifth grade class at Cheetah Elementary School was comprised of 82 students; 50% of the fifth grade students were identified gifted in at least one area and 36% were identified as gifted in mathematics (Badgerbrook City Schools, 2015).

The six participants of the anonymous questionnaire for this study were: (a) Chloe; (b) Aubrey; (c) Amy; (d) Lilly; (e) Rose; and (f) Stacey. Each participant was from a different elementary school at Badgerbrook City Schools and represented 60% of the fifth grade general classroom teachers within the district. The two representative participants who were observed, interviewed, and provided document artifacts for this study were: (a) Ana; and (b) Becca. These participants were from different buildings at Badgerbrook City Schools, providing diversity in experience with the phenomenon of differentiated instruction.

Questionnaires, Interviews, Observations, and Document Artifacts

The purpose of this phenomenological study was to discover the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) Singapore Mathematics program in Badgerbrook City Schools. Data collection began with an open-ended questionnaire distributed to participants after they had given consent to take part in the study. The questionnaire was made available to participants in both electronic and printed

formats. The anonymous questionnaire was completed by six participants. The questionnaire took participants less than 25 minutes to complete and all were completed electronically using an online survey tool. I used the questionnaire to establish a general understanding of the participant's teaching history, knowledge of students, and their understanding and implementation of differentiation strategies. Questionnaire responses were coded for analysis.

All questionnaire participants were invited to serve as representative participants for additional data collection. Two participants, Ana and Becca, agreed to serve as representative participants and the remaining four participants declined. Representative participants were contacted to schedule three dates and times for observations, and one time for the semi-structured interview, which was scheduled to occur between the first and second observations. Each interview lasted approximately 25 minutes and occurred outside of the instructional time of the participants. Interviews provided the participants' personal perspectives and understandings related to differentiated instruction. To ensure accuracy and cohesiveness, I recorded the interviews utilizing a recording device and transcribed each one. To ensure accuracy, transcriptions were emailed to the participants for review. Upon the correction of grammatical mistakes, the transcriptions were coded for later analysis.

Representative participants selected three dates and times for observations. The first observation for each participant occurred prior to the semi-structured interview, while remaining observations occurred after. As a result of the overlap between the study and end of school year state and district assessments, only two observations were completed with each of the representative participants. While the third observation with each participant was scheduled to fulfill methodological expectations, each participant had to cancel due to scheduling conflicts and was unable to reschedule prior to the conclusion of the academic school year. Data analysis

from the two observations conducted revealed nearly identical data for each participant, indicating that the third observation may have been unnecessary due to achieving data saturation from the first two observations.

Each observation lasted approximately 60 minutes and was used to gather a clear, visual picture of the participants' differentiation techniques. Observations began at the start of the mathematics instructional time and ended when the participant completed the mathematics instruction for the day. Acting as a non-participating observer, I utilized the COS-R (VanTassel-Baska, et al., 2003) to facilitate reliable observations of differentiated instruction for gifted students. To further aid the observation processes, a classroom map identifying gifted or high ability learners was utilized to ensure differentiation implementation was not overlooked. Additional information directly related to how the participants differentiated instruction was scripted, but no audio or video recording was taken during any of the observations. All data from the observations were coded for later analysis.

At the conclusion of each observed lesson, document artifacts were collected from the participants to provide information about the investigated phenomenon. Document artifacts for this study included the lesson plans and instructional activities utilized for all observation periods, along with documents noted or referenced by the representative participants during their interviews. Supplementary document artifacts included additional lesson plans, instructional activities, instructional planning resources, and supplementary instructional tools utilized by the participant to differentiate mathematics instruction for gifted and high ability learners. All collected document artifacts were coded for later analysis.

Significant Statements

The transcripts and coded data from the questionnaires, interviews, observations, and document analysis were then analyzed using Moustakas' (1994) phenomenological reduction. To identify significant statements, the process of horizonalization was utilized. During this process, meaningful statements were highlighted from collected data and equal value was assigned to each (Merriam, 2009; Moustakas, 1994). I listed all significant statements from each participant and data source and then recorded statements that were consistent across more than one data source. Statements that were not relevant to the research questions were deleted.

Meaningful Units

The process of horizonalization revealed horizons, "the textural meanings and invariant constituents of the phenomenon" (Moustakas, 1994, p. 97). Horizons were color-coded and analyzed to identify trends and commonalities in responses. This analysis revealed clusters of meaning within the data (Merriam, 2009; Moustakas, 1994). The clusters of meaning were analyzed to create a textural description of the phenomenon from a variety of perspectives, ensuring that the most critical aspects of the phenomenon were included in final descriptions (Creswell, 2013; Moustakas, 1994). I then provided the transcripts, meaningful units, and themes to the representative participants and a peer who served as a content expert for this study. This action of member checking and peer debriefing allowed for accuracy of the findings to be ascertained. No changes were suggested from either of the representatives or the peer expert, other than grammatical revisions, so no significant changes were made.

The following is a discussion of the meaningful units that were discovered through an analysis of all four data collection methods. Representative sample responses are offered to provide thick, rich detail to the context of the identified meaningful units. The thorough analysis

of these meaningful units led to the identification of the themes of this study, which are discussed in chapter five. Table 2 shows the frequency of the open-codes and resulting themes.

Table 2

Open-Codes and Themes

Open-Codes	Enumeration of open-code appearance across data sets	Themes
Individualized	10	Flexible small groups, within safe and supportive classrooms, enable teachers to utilize content differentiation to respond to the individual needs of students.
Classroom environment	14	
Content differentiation	15	
Flexible small groups	13	
Student data	19	Analyzing student data from multiple sources, including measures of general mathematics understanding and pre-assessments of content and readiness, is essential to planning for differentiated instruction, which responding to classroom performance is critical to implementing differentiated instruction.
Pre-assessments	12	
Foundational structure	9	A variety of instructional resources, including diverse enrichment and assessment materials, are needed to compliment *Math in Focus* resources in order for teachers to effectively differentiate instruction to meet the needs of gifted and high ability learners.
Extension resources	14	
Common Core State Standards alignment	9	
Ancillary resources	21	
Elementary advanced math courses	8	
Time	11	Time is needed for teachers to identify and create differentiated resources, plan differentiated activities, and collaborate with other teachers.
Time consuming	7	
Challenging	11	
Professional development	15	Teachers desire professional development on meeting the needs of gifted and high ability learners through effective differentiated instruction.
Importance	16	

Research Question One

Research question one asked: What do general classroom mathematics teachers perceive about differentiated instruction for gifted and high ability learners? This question was designed to develop an understanding of general classroom mathematics teachers' perceptions of differentiated instruction for gifted and high ability learners. Five meaningful units were revealed after a thorough analysis: (a) importance; (b) individualized; (c) time consuming; (d) challenging; and (e) classroom environment.

Importance. All participants communicated the importance of differentiating instruction and indicated that they differentiated mathematics instruction for their students. Lilly shared, "Kids learn in different ways so you need to adapt your instruction - what is taught, how it's taught, and the product. I incorporate a variety of strategies to meet the needs of all students" (personal communication, 2015). Aubrey stated, "I differentiate my mathematics instruction…so that my students are being challenged at their level" (personal communication, 2015). Becca's detailed explanation described her perception of the importance of differentiated instruction:

> Everybody needs something different to learn. I don't believe that the same for everyone is fair. I work really hard with the kids to teach them that everybody should do something different and that it's okay if they're not doing the same thing. (personal communication, 2015)

The importance of differentiation was also evidenced within the observations and document artifacts collected. Differentiation appeared as a natural process within the classroom and an expectation of the students and the teachers. Each observation clearly showcased the procedure for students to transition from whole group instruction to differentiated, small group activities. Students were observed anticipating and expecting different assignments based on

their needs. Students in both Ana's and Becca's classes clearly knew expectations for individual and small group work and were observed engaged in meaningful discussions with both peers and the teacher regarding their work. Lesson plans articulated the different assignments and activities prepared for students at different levels of readiness and content mastery.

Individualized. Participants described the process of differentiation as a way to meet the needs of individual students. For example, Ana explained that differentiated instruction occurred when teachers sought "to vary instructional strategies and techniques to meet the needs of individual learners" (personal communication, 2015). Lilly's definition was similar, identifying differentiated instruction as "the way in which a teacher anticipates and responds to a variety of student needs" (personal communication, 2015). Stacey defined differentiated instruction as an action taken by the teacher, "To differentiate instruction is to address the needs of all learners by tailoring instruction to meet differing learning styles and abilities" (personal communication, 2015). Aubrey provided a more formal definition, but the emphasis on individual needs of students was still clear, "Differentiation means to adjust the content, process, and products to meet individual students' needs and styles. I believe it is when the teacher takes into account the students' needs and styles and adjusts the lessons, speed, and content accordingly" (personal communication, 2015). Although each participant described the process of differentiation in a different manner, individualization was included in each of the definitions provided.

Time consuming. The participants within the study conveyed that differentiating instruction, while essential to meeting the needs of students, was a time consuming process and required significant planning, particularly to identify appropriate resources. Aubrey explained, "Sometimes time constraints and the amount of content to cover causes me to differentiate less than I would like" (personal communication, 2015).

Participants identified a correlation between the time necessary to differentiate and the size of classes. Chloe explained, "It's difficult to do with large class sizes, but so worth it when you put the time into it" (personal communication, 2015). Amy stated, "Time and resources are concerns – there's only one of me and there are 27 of them!" (personal communication, 2015). Becca explained, "Time to find resources is really important. It's really hard to do this all the time because I have 28 students" (personal communication, 2015).

Participants also shared that other initiatives compete with the time needed to effectively plan for differentiation. Aubrey reflected on the amount of time spent during this school year focusing on PARCC (PARCC, 2013) preparation and the district's new iPad initiative and noted, "I felt I only had time for whole group instruction time" (personal communication, 2015). Aubrey further elaborated on this concern, explaining that the necessity to spend time planning and preparing for these new initiatives "took away time that I would have used to plan for small group instruction" (personal communication, 2015).

Challenging. All participants described the process of differentiation for gifted and high ability learners as challenging, especially when first beginning to differentiate. Aubrey shared, "It is easier to differentiate with students who are below level by adjusting the amount of content and reducing part of their assignments" (personal communication, 2015). Participants shared that persistence may make the process of differentiated instruction feel less challenging. Lilly explained, "It's overwhelming in the beginning, but once you do it for a while, it seems easier than whole-class instruction" (personal communication, 2015).

Participants also noted that they were not experts at differentiation and improvement was a continued goal. Aubrey expressed a desire to improve differentiation techniques "I would like to do a better job with this. I could use ideas and training on how to differentiate with limited

time" (personal communication, 2015). When Becca was asked about the process of differentiating for her math class, she explained that it was a tedious process, "If I do any differentiating, it's me going and finding all those materials and planning and copying and getting those together" (personal communication, 2015).

Classroom environment. Each representative participant within the study discussed in great detail the importance of the classroom environment when differentiating instruction. The participants perceived a correlation between the classroom environment and students' willingness to take risks and attempt challenging tasks. Ana explained:

> All kids are capable of learning and it's my job to create an atmosphere that fosters that in them. I want kids to feel safe, comfortable, and not afraid to take risks. They need a structured and supportive environment. They need things broken down for them. We use a lot of modeling. If you show them that they can be successful, they will be successful. I show them that I respect them and I value them as an individual and they return that. (personal communication, 2015)

The supportive classroom environment was evident during observations, when students were encouraged to express their thoughts, reflect on what they had learned, and develop and elaborate on ideas, all of which were evidenced on the COS-R tool for both Ana and Becca. In particular, Becca evidenced a high level of rapport, personal accountability from students, and a clear willingness to take risks. Students were observed openly seeking assistance from peers, providing step-by-step guidance to peers, willingly pointing out errors to the teacher after self-checking practice problems, articulating questions for clarification and understanding to peers and the teacher, and attempting challenges with persistence. The sample dialogue exchange between Becca and a gifted student provided below demonstrates the type of supportive

environment evidenced within both classrooms. In this situation, the student had just completed self-grading the initial portion of the challenge packet and was reporting results to Becca prior to being assigned the second portion of the challenge.

"Why did you miss this one?" (Becca pointed to missed problem on student's paper), Becca asked.

The student responded, "I made a stupid mistake."

"Be specific. How can we learn from this?" Becca said.

The student said, "I made a subtraction mistake here, so I know why I got off there. But what I don't understand, is why this isn't correct." (The student pointed to specific portion of the paper).

Becca responded, "Okay. That is something we can work toward. Think about this. (Becca underlined a portion of the problem's directions). Ask Kevin if you still can't get it setup and see if he can give you a different clue."

Similar conversations were observed occurring with each student during the course of the lesson. Becca worked with several students multiple times, but each dialogue included similar reflective questioning techniques.

Both Ana and Becca also evidenced having structured, organized classrooms when differentiating. Transitions were observed to occur with minimal prompting from the participants and students appeared to both expect and anticipate the shifts from whole group instruction to differentiated small groups. The use of a consistent classroom code of conduct was also observed in both classes. Expectations for student behavior and engagement were visibly posted within the learning environment and students were observed complying with expectations and appropriately re-directing peers who were off-task. In Ana's class, one student was observed quietly

redirecting another student, “We can’t talk about that right now because we have to share our method for solving the problem. Can you tell me what method you used?”

Research Question Two

Research question two was designed to develop an understanding of how differentiation strategies were implemented by teachers within general mathematics classrooms. The question asked: How do general classroom mathematics teachers employ differentiation strategies to meet the needs of fifth grade gifted and high ability learners? Three meaningful units for this question were revealed after a thorough analysis of all data collected: (a) content differentiation; (b) student data; and (c) flexible small groups.

Content differentiation. Across all of the forms of data collection, participants described content differentiation as the method used to meet the needs of gifted and high ability learners. Each participant described providing some form of whole-group instruction followed by small group work that had been leveled to the meet the needs of the students. Participants described providing gifted and high ability learners enrichment activities that were directly linked to the topic of the whole group instruction but at a greater difficulty level. The use of the electronic enrichment opportunities on students’ iPads was also discussed. Ana described how she differentiated the content for her students:

> Assignments are modified for struggling learners. Students who struggle are retaught concepts in a smaller group setting while students who are on level work with partners to practice concepts. Gifted and above level students complete enrichment activities and questions that go along with the curriculum. (personal communication, 2015)

Chloe described a similar procedure for differentiating, noting “Students [that are] above level start with story problems in the workbook pertaining to the lesson…then students move onto

enrichment pages." Stacey described differentiation in a similar manner, specifically noting the need for students to collaborate:

> I differentiate for my gifted and high ability learners with flexible grouping. I move at a faster pace through the standard lessons for my strongest students. Once we finish the lessons within a chapter, we spend a significant amount of time working on enrichment and problem solving. I often have the students work with small groups and partners to have the opportunity to collaborate and share ideas about the math. (personal communication, 2015)

Document analysis evidenced content differentiation consistent with the data collected from questionnaires, interviews, and observations. The content of the activities from the document artifacts collected was consistent with the descriptions provided by the participants within the questionnaire, reflecting enrichment activities of more difficult problems, all in word problem format, related to the content being taught.

The concepts of differentiating the instructional process and product were both mentioned by the participants in separate instances, but only content differentiation for gifted and high ability learners was consistently evidenced for all participants and all data sources. Aubrey stated, "I try to vary lesson delivery, instruction methods, and even content and products so that my students are being challenged at their level" (personal communication, 2015). Lilly explained, "I use small group, individual instruction, whole class instruction, games, technology, partner learning, content modification, [and] volume of work required, to meet the needs of the individuals in my class" (personal communication, 2015). Only Stacey provided specific information related to the three types of differentiation, "I differentiate using a variety of delivery methods (lecture, visual models hands-on, partner, and group work). I also have the

students flexibly grouped for each chapter. Tests and assignments vary per group" (personal communication, 2015).

Becca was the only participant to use the term "compacting" as the type of differentiation being utilized with gifted and high ability learners. In describing this methodology, Becca explained, "There's no reason to take two weeks to teach a chapter when there's just one or two lessons that need to be taught. Again, with pre-testing, I can weed out the things that are already known" (personal communication, 2015).

Participants also referenced the perceived impact of the district's first year of implementation of the iPad enrichment program, eSpark (eSpark Learning, 2015), for mathematics. Beginning in October, students used the program for at least an hour per week in reading and mathematics as an intervention, enrichment, and remediation tool. Activities were assigned to students based on assessment data. All participants indicated that gifted and high ability learners were successfully completing mathematics learning quests and demonstrating understanding of advanced mathematics concepts through this resource. Each of the six participants provided positive descriptions of the complexity of the tasks and the opportunity for students to work on concepts beyond those in the grade-level curriculum. At the time of the study, document artifacts showed some gifted and high ability students had successfully completed eSpark mathematics tasks correlated to Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) goals up to the eighth grade level. Figures 1 and 2 illustrate the grade levels of the mathematics goals for the students within Ana and Becca's classes. In each class, students were evidenced working at levels two grades below and three levels above the fifth grade level. When discussing the goal grade levels of the students Becca noted, "some of my students may have the ability to

go even farther, but the program doesn't go beyond 8th grade without changing format" (personal communication, 2015).

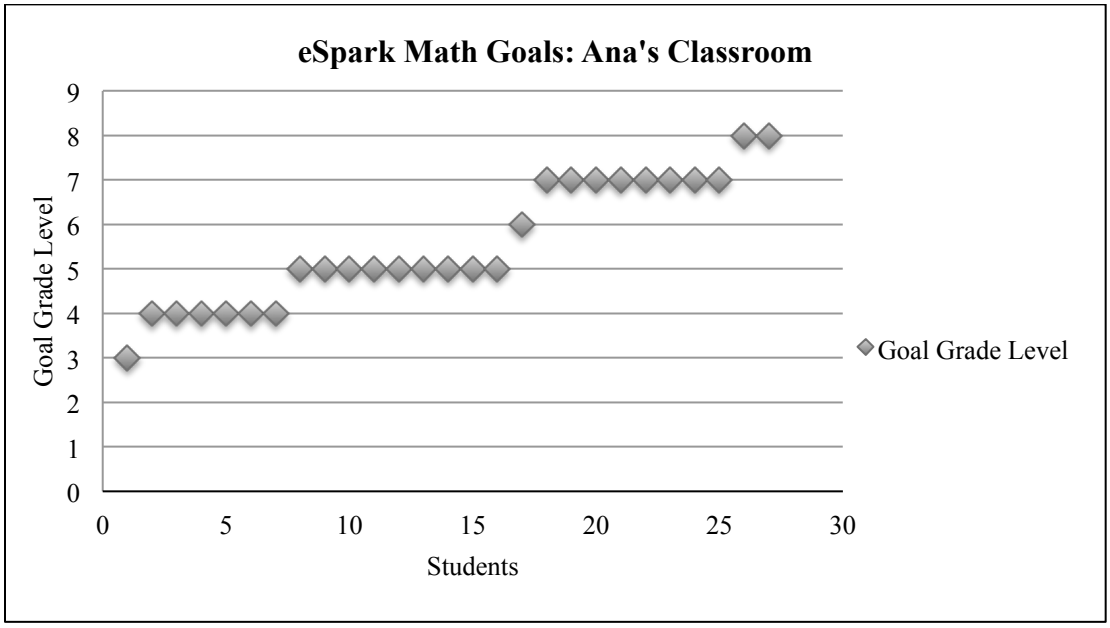

Figure 1. Mathematics eSpark goal areas for Ana's students.

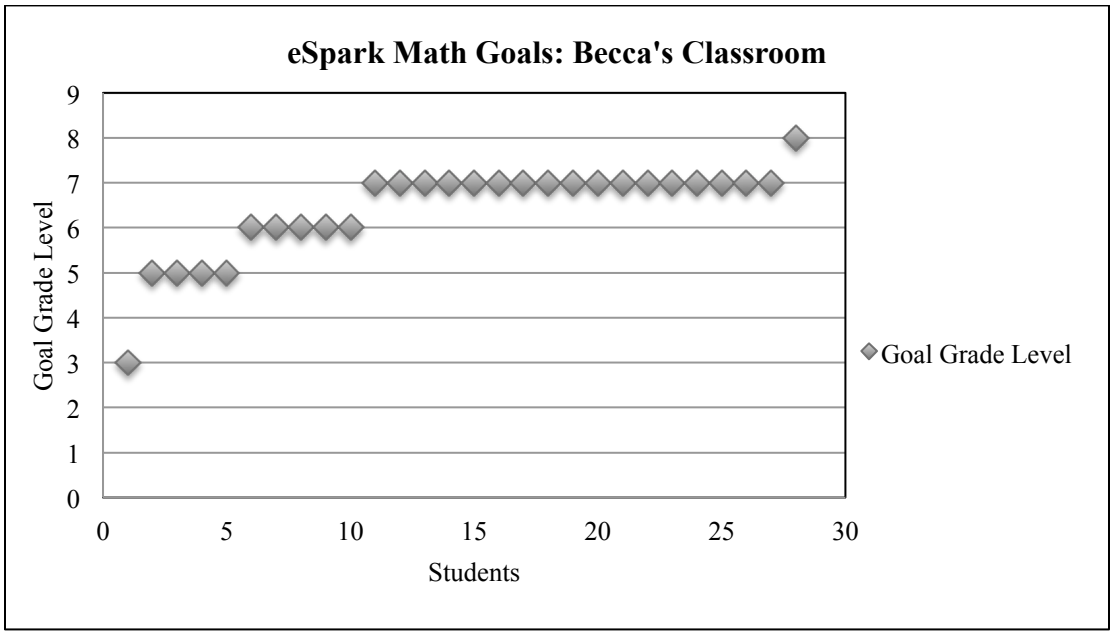

Figure 2. Mathematics eSpark goal areas for Becca's students.

Student data. All participants and data sources evidenced a need for student data. Participants universally noted the need for multiple data sources in order for effective planning and implementation of differentiation. Each of the six participants indicated the need to gather information from the following sources of student data prior to planning for differentiated instruction: (a) *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) pre-assessments; (b) classroom assessments, such as tests and quizzes; (c) Northwest Evaluation Association's Measures of Academic Progress (NWEA – MAP) (Northwest Evaluation Association, 2015) scores in the topic area; (d) Ohio Achievement Assessments (OAA) (Ohio Department of Education, 2015) results; and (e) in-class observations during group work and discussions. NWEA-MAP assessments (Northwest Evaluation Association, 2015) are district-administered, nationally-normed assessments given three times per year to students in Kindergarten through eighth grade. The OAA (Ohio Department of Education, 2015) were the annual state assessments administered to students in grades three through eight and were replaced with the PARCC (PARCC, 2013) assessments during the 2014-2015 academic school year. Aubrey summarized the data sources used:

> I used formal and informal assessments throughout the year, as well as, past OAA scores and [NWEA]MAP scores from this year. I also looked for how they solved complex problems and how they could do on math problems that required them to extend their learning. (personal communication, 2015)

Observations and document analysis confirmed the use of each of these data sources. Ana and Becca both had student data noted in lesson plans and had printed copies of data readily available, which were observed being referenced during the lesson. During both lessons observed of Becca, she was seen cross-referencing students' mastery of work completed in class with

previously collected pre-assessment data in order to determine what activity students would transition to next. As students completed tasks, they brought their work to Becca and she prompted the students to share a self-analysis of their understanding of the task. Becca then viewed the student's pre-assessment test, the student's NWEA MAP assessment data, and the student's recent scores on related tasks in order to identify the next task for the student to complete. Becca was observed sifting through these separate data sources for each individual student.

Three additional data sources were also identified within the data collected. Becca and Chloe both identified student surveys of interests and learning styles as additional important student data sources when planning for differentiation. Ana described, reluctantly, the use of Aimsweb (Pearson, 2014) mathematics subtests as supplemental data sources utilized in planning for differentiation. The Aimsweb assessments were used as universal screening and progress monitoring tools for students who were receiving special education services. After the adoption and implementation of NWEA-MAP (Northwest Evaluation Association, 2015) assessments, Badgerbrook City Schools no longer required Aimsweb assessments to be administered to students not receiving special education services. Ana explained:

> I still do the [Aimsweb] Math Computations (M-COMP) and Math Concepts and Applications (M-CAP) tests, even though, you know, I don't have to. I'm old fashioned! I just think they're good information for just, 'Do they have the basics?' I know *Math in Focus* goes way beyond that and the M-COMPs and M-CAPs aren't exactly correlated to the Common Core, but they are the basics, so I look at that information to see how [the students] are doing on those. (personal communication, 2015)

Flexible small groups. Each participant identified the use of small, flexible groups as critical to differentiating instruction. The groups were described as being established based on available student data and were subject to change, based on classroom performance within individual lessons. Chloe described the role small groups played in differentiation within the mathematics classroom, "I create new groups every chapter and even lessons within chapters. I use pre-tests, knowledge of students, teacher observation to see if my pre-set groups need to mold and change – if students pick up quickly or drop behind" (personal communication, 2015). Stacey provided a similar description:

> I create flexible groups within each of my classes, based on the pre-testing for each chapter. Within the class groups, I use small group instruction to address the needs of the individuals in my classes. Assignments are given within the small groups to remediate and accelerate as necessary. My strongest students often work with a partner to work on complex problem solving using the enrichment work from the *Math in Focus* curriculum. (personal communication, 2015)

Observations supported the descriptions of small groups reported within the questionnaires and interviews. Students were observed transitioning from whole-group instruction into small groups based on student need. During observations, Ana and Becca were observed deviating from the small groups scheduled to occur, in response to student performance during initial portions of the lesson.

Ana was observed changing one student from the on-level group, into the extra support group. Orange enrichment packets, red on-level packets, and green extra-support packets were given to applicable students for use during the "You Do" portion of the lesson prior to the start of the lesson. Headings on the papers identified the concepts being taught, but not the level of the

content contained on the paper. When the class was transitioning to "You Do" activities, Ana requested that a specific student, who had received a red packet, join her with the students completing green packets, instead of going with the other red packet students. After a few minutes, the student was asked to join the red group to work on the red packet. When asked about the transition after the observation ended, Ana indicated that she saw the student demonstrate a misconception during the guided practice portion of the whole group lesson. Ana corrected the misconception by giving the student extra practice with the green packet. When the student demonstrated understanding, the student transitioned back to the on-level red group for the appropriate level of challenge.

During Becca's initial observation, two students were observed changing from the on-level group to the enrichment group. Students completed the initial assignment demonstrated concept mastery during the individual student de-briefing with Becca. Rather than having the students continue with the next activity for the on-level group, the students were given the enrichment activity and received brief directions regarding the expectations for the newly assigned activity. Becca was observed meeting with the two students individually at a later point in the lesson to check for understanding on the more complex task. When asked about the change after the observation, Becca indicated that it was clear the students were ready for more challenge, so she gave them the opportunity to move on.

Across all data collection tools, participants identified the need for the small groups comprised of gifted and high ability learners to be self-directed as a result of the demands of the remainder of the class. Aubrey shared:

> Usually, I do not have much time to work with these groups. They are often very self-directed and motivated. They work on some [problems] independently and then consult

> with one another when stuck. They would [then] come see me for further explanations. (personal communication, 2015)

This was also observed in both Ana and Becca's classrooms, where direct instruction and teacher interaction was primarily directed to the students working on activities below-level or on-level. When the students working in the enrichment groups sought assistance from Ana or Becca, it was provided in a timely manner, however the students were encouraged to seek guidance from each other prior to soliciting guidance from the teacher. Ana noted, "Sometimes I get stuck with the re-teach kids and I don't even have a chance to check in with the others. That's so hard" (personal communication, 2015).

Research Question Three

Research question three asked: How does the *Math in Focus* curricular methodology influence the differentiation process used by general classroom mathematics teachers for fifth grade gifted and high ability learners? This question was designed to identify how the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) program influenced the differentiation strategies selected for implementation by teachers. Four meaningful units were revealed after a thorough analysis: (a) foundational structure; (b) extension resources; (c) Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) alignment; and (d) pre-assessments.

Foundational structure. Participants indicated that the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum had a clear foundational structure. "The text is a solid starting point for instruction," explained Rose (personal communication, 2015). Observation and document artifacts revealed that the *Math in Focus* text provided multiple methods to solve problems, which was cited as a benefit to differentiating for gifted and high

ability learners. During her interview, Ana noted "The gifted kids like to find other ways to explain things…they like to share if they had another method" (personal communication, 2015).

Aubrey and Lilly also shared that, while the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum is challenging, there are some students who are far beyond the curriculum and need to be accelerated in mathematics in order to be challenged. All participants stated that the gifted and high ability students from their mathematics classes were being recommended for Honors Math courses in grade six to ensure they were in a rigorous math course for the following school year. Aubrey, Lilly, Ana, Becca, and Stacey noted that many of their gifted and high ability learners has been recommended for single-subject acceleration for the following school year due to their high ability levels. At the time of the study, honors courses were not available until grade six within Badgerbrook City Schools, but each participant mentioned the need for an advanced math course at the elementary level. Students could be single-subject accelerated in mathematics but the configuration of the elementary buildings made it difficult because each elementary at Badgerbrook City Schools only goes to grade 5. Aubrey and Lilly both indicated that they had students in their fifth grade math classes that had been accelerated into sixth grade math.

All participants, across all data collection methods, demonstrated the use of the Gradual Release Method (Pearson & Gallagher, 1983) of mathematics instruction recommended for *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) instruction. The Gradual Release Method of instructional design transitions the responsibility for learning from teacher-as-model, to joint responsibility of teacher and learner, to independent practice and application by the learner. (Pearson & Gallagher, 1983). These transitions are commonly referred to as "I do", "We

do it together", and "You do it" (Fisher & Frey, 2013). Chloe described the process in great detail:

> I start the lesson whole group to introduce vocabulary and topic. I do one round then students do "We Do" on white boards or iPads. I go around and write harder computations for my students who move through quickly. Sometimes I have alternative "We Do" questions for them to work on while they are waiting for peers. After a few "We Do's," then we break off into sections. Students are given groups, pairs, or individual work depending on ability level in that specific topic area. (personal communication, 2015)

A nearly identical methodological process was found in each of the observations and within the questionnaire responses of all participants. Ana noted that understanding of how to utilize the Gradual Release Method of instruction stemmed from initial district-level professional development. Ana discussed the importance of the *Math in Focus* professional development training during her interview:

> Watching one of the *Math in Focus* trainers come was very helpful. She did a lesson and I watched her. That's where I got this 'don't throw the book up there [projected on the screen] word for word,' but maybe show them parts of the book and go through that way. That really impacted what I'm doing now with *Math in Focus*. (personal communication, 2015)

The importance of professional development on the recommended instructional methodology was also evidenced through Lilly, who expressed initial difficulty in understanding and implementing the *Math in Focus* curriculum. Lilly did not participate in the initial training provided by the district during the *Math in Focus* adoption because Lilly did not teach math at

the time of the district's *Math in Focus* adoption. Lilly explained, "I was never trained in *Math in Focus*. I just learned by doing and talking to other teachers" (personal communication, 2015). Despite these challenges, the differentiation methodology described by Lilly within the questionnaire was consistent with the Gradual Release Method.

Extension resources. All participants shared that the enrichment problems provided on with *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) were useful tools for differentiating instruction for gifted and high ability learners. Chloe explained the use of the *Math in Focus* resources for all ability levels, "I use the *Math in Focus* Re-Teach [book], student workbook, and enrichment pages [for] each lesson depending on student ability level" (personal communication, 2015). Expanding on the specific use of *Math in Focus* curricular resources for gifted and high ability students, Chloe explained, "I tend to focus on the problem solving and 'Thinking Cap' questions for these students because computation comes easily to most of them" (personal communication, 2015). Ana described the enrichment pages in greater detail during her interview:

> Those are the same concepts that we are learning in the chapter, but they are *way* harder (laughs), And the good thing about those is that a lot of the questions are comprehensive so…they're going to have to pull what we did in other chapters and kind of synthesize it to answer one of the questions. They are multi-step, they're really kind of tough…. And those enrichment packets are so challenging that I think they really help meet their needs. And they love them. They love the challenge. (personal communication, 2015)

Analysis of document artifacts revealed that *Math in Focus* enrichment activities were worksheets consisting of several multi-step word problems related to the concept being addressed within the lesson. Participants were evidenced utilizing the enrichment pages

individually and also creating enrichment packets of multiple enrichment pages for the chapter of study.

All participants evidenced use of the enrichment pages within the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum for the gifted and high ability learners, but also noted that there was no variety in the type of enrichment opportunities, which limited the type of differentiation that could occur using only *Math in Focus* resources. Ana, who positively shared about the *Math in Focus* enrichment packets being used nearly exclusively as the differentiation tool with gifted and high ability learners in her classroom, also noted the lack of variety within the provided *Math in Focus* resources. Ana commented, "I need more ideas for how to work with [gifted learners]…besides *Math in Focus* problems. What else is there out there? I really don't know" (personal communication, 2015). Becca expressed a similar concern within her interview, "I don't think there are very many enrichment opportunities in *Math in Focus*. The only thing they really offer are word problems" (personal communication, 2015). This was also supported from the observations and within the document artifacts collected. All enrichment opportunities provided to gifted and high ability learners consisted of either: (a) *Math in Focus* enrichment packets, comprised wholly of word problems; or (b) enrichment activities not affiliated or correlated with the *Math in Focus* curriculum.

Common Core State Standards alignment. Becca, Lilly, Aubrey, and Chloe shared their perceptions about the order in which content was presented within the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum and the implementation requirements of the mathematics Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010c), PARCC (PARCC, 2013) assessments. Each of the four explained that they felt it was necessary to supplement the text and teach

concepts out of the order the text presented in order to ensure certain concepts were taught prior to being assessed on the mid-year assessment. Aubrey noted:

> I found that I had to use a lot of time finding supplements for math to help cover all the Common Core State Standards that I knew were coming for students on the PARCC assessments. We ended up having to bounce around the book as well as getting lessons and sample problems for areas that were missing from *Math in Focus*. (personal communication, 2015)

Becca expressed a similar concern: "It is frustrating that the *Math in Focus* curriculum, that supposedly influenced the Common Core State Standards, is not fully aligned to the standards and does not work with the time frames of the two PARCC assessments" (personal communication, 2015). Chloe shared that the apparent misalignment between the *Math in Focus* text and the Common Core State Standards has provided an unexpected enrichment opportunity for the gifted and high ability learners. According to Chloe, "Occasionally I let the small group work on another chapter in the *Math in Focus* book – one that was an extension in the book and would not get covered during the year" (personal communication, 2015).

Pre-assessments. All participants, across all data sources, shared the importance of pre-assessments for differentiated instruction. Stacey explained, "I create flexible groups within each of my classes, based on the pre-testing for each chapter" (personal communication, 2015). Participants noted that the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) pre-assessments are designed to provide information about students' readiness for a chapter or unit, providing information about if students have the requisite skills for the upcoming chapter. Participants articulated the importance of the information provided by these pre-assessments, but

also identified the need for additional information before providing instruction to students. Ana explained:

> The pre-test is more of a prerequisite test, so it doesn't necessarily tell me that they know what we are going to learn, it just tells me that they are ready. And so, that gives me good information because I know who has the readiness and who doesn't, and then, I go to other assessments to get information about what they know about the content I am going to teach. (personal communication, 2015)

Becca also discussed the pre-assessments when sharing how the *Math in Focus* curriculum influences differentiation methodologies. "The pre-tests give good information about readiness, but not what students already know about the topic" (personal communication, 2015).

Research Question Four

Research question four asked: What do general classroom mathematics teachers perceive to be the programmatic obstacles and needed resources for the differentiated instruction process for fifth grade gifted and high ability learners? This question was designed to develop an understanding of the perceived programmatic obstacles and needs to the differentiation process to be included in the understanding of the phenomenon. Four meaningful units were revealed after a thorough analysis: (a) time; (b) ancillary resources; (c) elementary advanced math courses; and (d) professional development.

Time. Across all data collection procedures, all participants identified a lack of time as a significant obstacle to the differentiation process. Participants identified the need for planning time to identify resources and plan for differentiated instruction as well as time to collaborate with other teachers to share resources and instructional methodologies. According to each participant, time for these activities would have a positive impact on the challenging process of

differentiating instruction. Each participant also voiced the need for additional instructional time during the school year as a result of the instructional time lost due to new initiatives, including PARCC (PARCC, 2013) and 1:1 iPads.

In her interview, Becca expressed a strong need for time in order to improve differentiation techniques. “Time to find other resources would be important - even time to look at a unit and then research things, projects, to go with the unit” (personal communication, 2015). Amy also voiced the need for more time, “More time for planning and collaboration with other math teachers is needed” (personal communication, 2015). Rose stated “[I need] materials with TIME TO PLAN” (participant’s emphasis) (personal communication, 2015).

Participants also expressed time-related needs resulting from the implementation of new initiatives, including PARCC (PARCC, 2013) testing and the district-level 1:1 iPad initiative. Aubrey shared, “The time constraints were a hindrance this year. We spent a large amount of time testing and preparing for testing. We also had to adjust time to fit eSpark in” (personal communication, 2015). This concern was echoed by Chloe, “I feel as though some topics are more difficult than others, but to maintain balance of the schedule so we don’t miss content before the testing window, I am limited in how long I can stay on a given topic” (personal communication, 2015).

Chloe also offered a unique time-related need, “If schedules allow (there’s that time piece again) [co-teaching] makes for an atmosphere where differentiation can blossom” (personal communication, 2015). Stacey also identified a need for co-teaching to better meet the individual needs of students:

> It would always be helpful to have a second teacher or aid in the room. I co-teach with a Special Education Intervention Specialist for one class every day and am able to do much

more differentiation with that class than with the other two. Many differentiation methods require groupings and are much more time-effective when two teachers are in the room. (personal communication, 2015)

Ancillary resources. Each participant identified the need for ancillary resources to the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum in order to improve the process of differentiating instruction for gifted and high ability learners. Resources identified as being needed included a Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) alignment plan, greater variety of enrichment resources, additional assessment tools, and support materials for new students who had not previously utilized the *Math in Focus* curricula and were unfamiliar with the methodologies included.

Aubrey expressed the need for an alignment plan for the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum with the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) and the PARCC (PARCC, 2013) assessment timeline "I had to use a lot of time finding supplements for math to help cover all the Common Core State Standards that were coming for the students before each portion of the test…we had to bounce around the book as well as. . .[supplement] for areas that were missing" (personal communication, 2015). In addition to identifying the need for general Common Core State Standards alignment, Chloe identified a need for improved *Math in Focus* instructional content related to a specific topic, "Measurement conversions, specifically metric, are by far the weakest area for all my students" (personal communication, 2015).

All participants identified a need for greater variety in available enrichment resources. Chloe explained:

> I always worry I'm not giving enough to my advanced students. I don't want my students to only be working on worksheets every day. They need a creative challenge per chapter that they can look forward to. I would like more resources to give them outside of enrichment pages. They need a good combination of enrichment pages, problem solving, activity-based instruction, and eSpark explanations. (personal communication, 2015)

Becca expressed a similar need and offered her rationale for why the ancillary resources are so important to differentiation:

> I have to look other places for enrichment. Math enrichment games, math enrichment projects, and those are not available for *Math in Focus*. And if I just give the gifted kids or the high ability learners even, word problems time after time, when they already know the material, then…I feel like it would impact them and they would stop performing. (personal communication, 2015)

The participants in the study identified the new opportunities for enrichment that the 1:1 iPad initiative provided. Aubrey specifically expressed a desire for additional enrichment resources that were compatible with mobile technology. "I wish we had more iPad resources to use with the students. This is such a powerful tool and I am sure I am not using it as effectively as I probably could" (personal communication, 2015).

The need for additional assessment resources within *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) was voiced by all participants and across all forms of data collection. Each participant specifically noted that *Math in Focus* pre-assessments are designed to determine if students have the pre-requisite skills for the concepts of the chapter, as

opposed to determining what concepts of the chapter have already been mastered by the students. The topic of assessments within *Math in Focus* was most-deeply discussed during the interviews with the representative participants.

Becca expressed concern about assessment resources within *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009), "The [assessments] that I can grade or access are very limited with *Math in Focus*" (personal communication, 2015). Becca then identified very specific needs:

> I would like to have a pre-test that is similar to the post-test, other than just what's in the back of the book. I would also like to have additional post-tests because, if I teach and they fail the post-test, then I feel like I need to go back and teach again….So I need an additional post-test. (personal communication, 2015)

Becca also identified a need for more frequent assessments, such as quizzes, to enable formative assessment to occur more often. "There need to be quizzes. Like lessons one through three, and then a quiz for those lessons; and that allows for quick assessment so I know what they know" (personal communication, 2015).

Ana expressed the need to have a method for students participating in differentiated activities to provide evidence of content mastery. She explained:

> I think they know it, but I just want them to prove it to me….so at least I have my evidence, because there is always that, in the back of your mind, 'Do they REALLY know it? Can they REALLY explain it?'(participant's emphasis), even though they are gifted and can give me the answers. (personal communication, 2015)

Ana also identified a unique ancillary need, which was evidenced within the observations and discussed within the interview. The unique *Math in Focus* (Great Source/Houghton Mifflin

Harcourt, 2009) programmatic characteristics, including an emphasis on non-traditional problem solving strategies such as bar modeling, are developed over the course of the K-5 program. Ana voiced concern for students who transferred to Badgerbrook City Schools from school districts not utilizing the *Math in Focus* curriculum, "The kids that have moved into Badgerbrook just this year, some of them mid-way through this year; they need a lot of scaffolding. They are not always ready [to learn]" (personal communication, 2015).

Elementary advanced math courses. Despite differentiation occurring within the mathematics classes, participants expressed concern that they were not sufficiently challenging the highest ability students in their classes. At the time of the study, honors courses were not available until grade six within Badgerbrook City Schools, but each participant mentioned the need for an advanced math course at the elementary level. Students could be single-subject accelerated in mathematics but, due to building configurations (grade five was the highest grade level offered within each elementary at Badgerbrook City Schools), it was difficult. Aubrey and Lilly shared that, while the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) is challenging, there were some students who were far beyond the curriculum and had been accelerated in mathematics in order to be challenged. Aubrey and Lilly both indicated that they had students in their fifth grade math classes that had been accelerated into sixth grade math. Ana, Becca, Rose, and Stacey noted that some students would benefit from a more challenging mathematics class, but would not be strong candidates for acceleration. Stacey explained, "One of my students is exceptionally strong in mathematics, but lacks the social skills and maturity to accelerate. It is difficult to keep him challenged and engaged in a general fifth grade math class" (personal communication, 2015). All participants stated that the gifted and high ability students from their mathematics classes were being recommended for Honors Math courses for the

following year to ensure they were in an appropriately rigorous math course. Aubrey, Lilly, Ana, Becca, and Stacey noted that many of their gifted and high ability learners had been recommended for single-subject acceleration for the following school year due to their high ability levels.

Professional development. Each participant voiced the need for professional development. The participants identified individual professional development needs, as well as suggested topics for district-wide professional development.

Each participant provided at least one reference to needing professional development related to gifted or high ability learners and identifying appropriate enrichment resources. Ana explained the need for professional development:

> I feel like we get a lot of training on things when we first start teaching and then people just assume we know what we are doing. But sometimes I feel like we get stale and we want to learn new things. So, any work, in-services or workshops or trainings,…especially [for] those enrichment kids. More ideas for how to work with them, or things to do, besides IXL (online computer program), and besides *Math in Focus* problems, like what else is out there? Because I really don't know. (personal communication, 2015)

Chloe revealed a similar need, "I try [to differentiate] the best I can. Honestly, teaching gifted students, in my opinion, is one of my weaker areas within my teaching set" (personal communication, 2015).

Professional development that was unique to the needs and teaching situation of each participant was addressed the most frequently and also represented the greatest variety of topics. Chloe voiced a need for professional development on co-teaching options to improve

differentiation implementation. Aubrey identified the need to learn differentiated instruction techniques that are effective with limited time for planning and instruction. Lilly expressed a desire to receive formal *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) training to develop a greater understanding of the program and implementation strategies.

Both representative participants identified the professional development experiences that most impacted their ability to differentiate as being pedagogical and not mathematics or *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) related. The impactful professional developing opportunities included methodological and organizational strategies and provided opportunities for modeling and guided practice. Ana identified the training that led to her Reading Endorsement as having the greatest influence on her differentiation techniques. "I think having my Reading Endorsement helped with everything, even though I don't teach reading right now, but just learning how to implement either centers or small groups where I work with them" (personal communication, 2015). Becca identified the professional development associated with being a STEM Fellow (specialized training for teachers on best practices for teaching science, technology, engineering and mathematics) as being the most influential differentiated instruction training. "I was a STEM Fellow for several years and then a STEM Fellow Lead person. I think that was just another element to just let kids get in and maneuver things and look at things differently" (personal communication, 2015).

Synthesis of Essence and Meanings

The process of phenomenological reductionism led me to integrate descriptions across multiple pieces of collected data to determine commonalities and themes and establish a description of the essence of the phenomenon (Moustakas, 1994; Schutz, 1967). A synthesis of

the universal themes in the lived experiences of the participants, provided knowledge about the phenomenon studied through an understanding of the experiences of the participants.

An analysis of participants' perceptions of differentiated instruction for gifted and high ability learners revealed the importance of differentiating instruction to individualize instruction for all students. Participants expressed a strong belief that all students were capable of learning when instruction is provided appropriately and scaffolding is in place. Collected data evidenced the perception that instruction should be designed and implemented based on the individual readiness and ability of the students within the class. Participants felt it was challenging to differentiate for gifted and high ability learners, particularly when first beginning the process and all participants identified the classroom environment as an important factor to the successful implementation of differentiated instruction. All data sources evidenced the need for a safe, supportive, and organized learning environment where expectations were understood and respected. The process of differentiation was reported to be time-consuming, particularly with large class sizes. Participants voiced time needs associated with planning for differentiated lessons and identifying and locating differentiated resources to use with students. Other time-consuming initiatives, including planning and implementing the new PARCC (PARCC, 2013) assessments and the district's new 1:1 iPad initiative were noted as competing with the time available for planning for differentiated instruction.

Data analysis revealed that participants utilized content differentiation to meet the needs of the gifted and high ability mathematics students. Participants organized students into flexible small groups, based on student readiness and ability. A variety of student data sources were used to identify the needs of students, including *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) pre-assessments, classroom assessments, NWEA-MAP (Northwest Evaluation

Association, 2015) scores, OAA results, and in-class observations. Additional data sources utilized by participants included interest inventories, learning style surveys, and Aimsweb (Pearson, 2014) mathematics subtests. Participants utilized the collected student data holistically to determine the readiness and needs of students for mathematics lessons. Students were assigned into small groups based on determined readiness levels for lessons or entire chapters, but the groups were flexible. Participants were observed transitioning students in and out of different groups in response to classroom performance.

Participants identified four ways in which the curricular methodology of *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) influenced the differentiation process they utilized with the fifth grade gifted and high ability learners. The foundational structure of the *Math in Focus* program, including the emphasis on multiple methods for solving problems, was identified as a programmatic strength for differentiation. The use of the Gradual Release Method (Pearson & Gallagher, 1983) of instruction to teach the *Math in Focus* curriculum was recommended to the participants during professional development and was identified as an effective method for differentiating instruction. All participants shared that extension resources provided by *Math in Focus* consisted of multi-step word problems and were utilized with gifted and high ability learners individually and as packets. In order to meet the needs of gifted and high ability learners, participants also utilized additional extension resources, outside of those provided by *Math in Focus*. Participants stated that the *Math in Focus* curriculum does not align with the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) and the testing schedules for PARCC (PARCC, 2013), resulting in the need to supplement the text and complete sections out of the order in which they are presented in the book. This has also provided sections of the book that

will not be taught to the whole class, but can be utilized as enrichment lessons for gifted and high ability students. Participants, across all data sources, shared the importance of pre-assessments to the process of differentiation. The *Math in Focus* pre-assessments were identified as being important to determine students' readiness for lessons, but insufficient as the only data source for planning for differentiation.

When considering the programmatic obstacles and needed resources for differentiation, participants identified a need for time to planning, collaboration with other teachers, and locating resources. Participants identified the need for planning time to identify resources and plan for differentiated instruction as well as time to collaborate with other teachers to share resources and instructional methodologies. Time for these activities would have a positive impact on the challenging process of differentiating instruction. Participants also voiced a need for additional mathematics instructional time to compensate for time spent implementing the district's new 1:1 iPad initiative and preparing students for the new PARCC (PARCC, 2013) assessments. The time for co-teaching and the potential impact that would have on participants' ability to differentiate was also shared. All participants identified the need for additional ancillary resources with the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum. An alignment plan between the *Math in Focus* curriculum, the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a), and the PARCC assessment, was identified as a need to ensure all content was taught in the correct order to meet assessment timelines. A broader variety of enrichment activities was also identified as a programmatic need to differentiating instruction for gifted and high ability learners. Participants voiced a need for enrichment opportunities that were creative, diverse, and possibly digitally compatible. Participants identified multiple assessment-related

assessment needs. Content-based pre-assessments, additional post-assessments, short-cycle assessment tools, and content mastery assessments for differentiated instruction were all reported as needed resources. A way to ease the transition to *Math in Focus* programmatic characteristics for new students was also identified as a need. Despite describing effective differentiation for gifted and high ability learners occurring, participants voiced a need for an advanced math course at the elementary level to effectively challenge gifted and high ability students. Participants shared that top students were placed into honors math course for sixth grade or were accelerated into seventh grade math courses. Students could be accelerated into sixth grade math classes, but scheduling was difficult and honors courses were not available at the elementary level. Participants requested additional professional development on meeting the needs of gifted and high ability learners, efficient and effective differentiation techniques, and *Math in Focus*. General pedagogical professional development was also evidenced as a way to improve the effectiveness of differentiated instruction.

Summary

Through anonymous questionnaires, semi-structured interviews, observations, and document analysis, the six participants in this study shared multiple stories about their perceptions of and experiences with differentiating general classroom mathematics instruction for fifth grade gifted and high ability students. Analysis of the collected data revealed numerous meaningful units: (a) importance; (b) individualized; (c) time consuming; (d) challenging; (e) classroom environment; (f) content differentiation; (g) student data; (h) flexible small groups; (i) foundational structure; (j) extension resources; (k) Common Core State Standards alignment; (l) pre-assessments; (m) time; (n) ancillary resources; (o) elementary advanced math courses; and

(p) professional development. Trustworthiness was achieved through member checking and peer debriefing to ensure the accuracy of the meaningful units and resulted in no necessary changes.

The first research question revealed the importance of providing differentiated instruction to gifted and high ability learners. The process of differentiation was reported as being challenging and time-consuming, particularly with larger classes, but resulted in meeting the individual needs of students. The need to create a safe, supportive, and organized classroom environment was also identified.

Analysis of the second research question revealed the emphasis on content differentiation among participants. Multiple student data sources provided participants with information about students' readiness and needs. The student information was used to create flexible small groups to provide students with differentiated activities and practice with mathematics concepts. Small groups were fluid, allowing students to move between groups in response to lesson-specific, demonstrated need.

The third research question revealed the importance of the foundation structure of the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum, including providing multiple methods for solving problems and the recommended use of the Gradual Release Method (Pearson & Gallagher, 1983) of instruction. The enrichment activities provided within the *Math in Focus* curriculum were supplemented with additional extension resources by participants in order to meet the needs of the gifted and high ability learners. Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) alignment and the testing schedules for PARCC (PARCC, 2013) were found to conflict with the *Math in Focus* text and the *Math in Focus* pre-assessments were identified as

being important to determine students' readiness for lessons, but insufficient as the only data source for planning for differentiation.

Analysis of the fourth research question revealed the meaningful unit of time. Participants identified needing time to plan, collaborate with other teachers, locate resources, and compensate for instructional time lost due to implementation of initiatives. The need for ancillary resources, advanced math classes at the elementary level, and additional professional development, were also voiced by participants.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Overview

Researchers reported that United States students consistently perform below most of their international peers, particularly in the area of mathematics (Provasnik et al., 2009; Carnoy & Rothstein, 2013). The Common Core State Standards initiative (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) has prompted school districts across the United States to adopt mathematics standards strongly influenced by Singapore math techniques. While the philosophy and methodology of Singapore mathematics programs are well suited for gifted and high ability learners, the programs' requisite academic ability grouping and academic acceleration are not employed throughout the majority of the United Stated (Colangelo et al., 2004; Hazelton & Brearley, 2008).

Teachers at all grade levels are seeking information related to differentiation and positive impacts on student achievement, particularly in response to increased accountability measures within education (Baker, et al., 2010). The heterogeneous classrooms found throughout much of the United States have made it increasingly difficult for general classroom teachers to meet the academic needs of the gifted and high ability learners without the effective use of differentiated instruction (Winebrenner & Brulles, 2012). Gifted learners require specialized instructional opportunities to meet their academic needs (Borland, 2003; Johnson, 2000; Maker, 1982; Matthews & Foster, 2006), yet Farkas and Duffet (2008) found that 58% of general classroom teachers received no professional development on how to best meet the needs of academically advanced students.

The purpose of this phenomenological study was to discover the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom

mathematics instructors utilizing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) Singapore Mathematics program in Badgerbrook City Schools, a suburban, middle-class school district. Differentiation was generally defined as the intentional modification of the instructional content, process, product, or environment to meet the needs of students based on their readiness, interests, or learning profile. Discovering the differentiation techniques currently being implemented by teachers may facilitate improved professional development and program implementation, both of which may have a positive impact on student achievement.

Each of the four research questions used to guide this study provided information about teachers' perceptions and experiences and sought to establish the essence of general mathematics teachers' differentiation process for gifted and high ability fifth grade learners within a *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) classroom.

1. What do general classroom mathematics teachers perceive about differentiated instruction for gifted and high ability learners?
2. How do general classroom mathematics teachers employ differentiation strategies to meet the needs of fifth grade gifted and high ability learners?
3. How does the *Math in Focus* curricular methodology influence the differentiation process utilized by general classroom mathematics teachers for fifth grade gifted and high ability learners?
4. What do general classroom mathematics teachers perceive to be the programmatic obstacles and needed resources for the differentiated instruction process for fifth grade gifted and high ability learners?

These research questions were answered with data gathered from anonymous questionnaires, semi-structured interviews, observations, and document artifacts. Collected data was transcribed,

organized, coded, and analyzed. Using Phenomenological Reduction (Moustakas, 1994), significant statements and meaningful units were identified and themes were revealed. The essences of the lived experiences for the six participants in this study were described in narrative form in chapter four.

This chapter will synthesize and discuss the results of the research in light of the research questions, theoretical framework, and literature review (Bloomberg & Volpe, 2012). A brief summary of the findings will be provided, followed by a discussion of the findings related to the theoretical framework and related literature. Additionally, implications of the study, recommendations, delimitations and limitations, and future research suggestion are included.

Summary of Findings

Guided by the four research questions of this research study, analysis of the collected data revealed numerous meaningful units. The identified meaningful units each related to perceptions of and experiences with differentiating general classroom mathematics instruction for fifth grade gifted and high ability students.

The first research question revealed the importance of providing differentiated instruction to all students, including gifted and high ability learners. The process of differentiation was reported as being challenging and time-consuming, particularly with larger classes, but resulted in meeting the individual needs of students. A classroom environment that was safe, supportive, and organized, was also identified as a meaningful unit related to differentiating instruction.

Analysis of the second research question revealed the significant use of content differentiation to meet the needs of gifted and high ability learners in mathematics. Participants relied on multiple student data sources to provide information about students' readiness and needs, including *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) pre-

assessments, NWEA-MAP (Northwest Evaluation Association, 2015) and OAA test results, classroom performance, and observations. The student information was used to create flexible small groups to provide students with differentiated activities and practice with mathematics concepts based on demonstrated needs.

The third research question revealed the importance of the foundation structure of the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum. The inclusion of multiple methods for solving problems and the recommended use of the Gradual Release Method (Pearson & Gallagher, 1983) of instruction were both identified as positive aspects of the *Math in Focus* curriculum. The *Math in Focus* pre-assessments were identified as being important to determine students' readiness for lessons, but insufficient as the only data source for planning for differentiation. The enrichment activities provided within the *Math in Focus* curriculum were supplemented with additional extension resources by participants in order to meet the needs of the gifted and high ability learners. Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) alignment and the testing schedules for PARCC (PARCC, 2013) were found to conflict with the *Math in Focus* text.

Analysis of the fourth research question revealed the need for time. Participants identified needing time to plan, collaborate with other teachers, and locate resources. Participants reported concern over lost instructional and planning time as a result of the implementation of district and state level initiatives. Participants also identified needing ancillary resources, advanced math classes at the elementary level, and additional professional development.

To develop a holistic understanding of the phenomenon and the findings in the study, the meaningful units presented within chapter four were synthesized into five overarching themes.

These statements reflect a holistic understanding of the research questions and theoretical framework for this study. The five themes identified were:

1. Flexible small groups, within safe and supportive classrooms, enable teachers to utilize content differentiation to respond to the individual needs of students.
2. Analyzing student data from multiple sources, including measures of general mathematics understanding and pre-assessments of content and readiness, is essential to planning for differentiated instruction, while responding to classroom performance is critical to implementing differentiated instruction.
3. A variety of instructional resources, including diverse enrichment and assessment materials, are needed to compliment *Math in Focus* resources in order for teachers to effectively differentiate instruction to meet the needs of gifted and high ability learners.
4. Time is needed for teachers to identify and create differentiated resources, plan differentiated activities, and collaborate with other teachers.
5. Teachers desire professional development on meeting the needs of gifted and high ability learners through effective differentiated instruction.

Discussion and Implications in Light of the Theoretical Framework

The conceptual framework for this study was comprised of four theories. The first theory, Vygotsky's (1978) Constructivist Learning Theory, provided the foundation for differentiated instruction. The Progressive Education Theory (Dewey, 1938), the Theories of Multiple Intelligences (Gardner, 2011) and Learning Profiles (Tomlinson, 2009; 2012), and the Theory of Differentiated Instruction (Tomlinson, 1999a) join the Constructivist Learning Theory (Vygotsky, 1978) to complete the theoretical framework related to differentiation and gifted education and this study.

Constructivist Learning Theory

Vygotsky's (1978) work related to the Zone of Proximal Development, a part of his Sociocultural Theory within the broader Constructivist Learning Theory, stated that in order for instruction to be the most effective, it must be provided at a level just beyond the independent instructional level of the student and require the verbal scaffolding from an adult. Within the Zone of Proximal Development, the teacher assumed the role of purposeful instructor and mediator of activities and experiences at an individual level (Blanton, 1998; Riddle & Dabbagh, 1999).

This study supported the relationship between instruction and students' Zone of Proximal Development. Applying Vygotsky's theory to lesson design, instructional activities should be complex enough to extend students just above independent developmental levels, build upon prior knowledge, and empower students to move into areas of greater challenge (MacGillivray & Rueda, 2003; Riddle & Dabbagh, 1999). The participants in this study provided students with differentiated enrichment opportunities within flexible small groups. The activities provided, whether a part of the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum or teacher-located enrichment resources, were designed to be at a level of challenge that required the gifted and high ability learners to be unable to complete the tasks without working collaboratively with the other students within the small group. Participants reported using multiple data sources to determine the instructional levels of students when selecting tasks. Participants also reported changing student group placements in response to classroom performance. When students accomplished the assigned tasks easily, they were transitioned to a more complex group. Conversely, if a task was beyond the conceptual understanding of the students, they were transitioned to a lower-level task that would be more appropriate. This fluid

transition based on student's performance evidenced the participants' understanding that assigned tasks must be at the appropriate complexity level for students, which aligns with Vygotsky's (1978) theory.

Progressive Education Theory

Dewey's Progressive Education Theory (1938) stated that learning occurred best in situations where students were working authentically, connecting new knowledge to prior experiences. Dewey (1938) emphasized the need for instruction to provide opportunities for new learning to occur and to enable students to connect new information to prior knowledge. Inherit in Dewey's (1938) Progressive Education Theory was the exposure of students to novel information that could then be connected to prior knowledge. Reis, et al. (1993) found that gifted students already knew the vast majority of regular instructional content that is taught during the school day, indicating a great need for differentiated instruction to occur.

Consistent with Dewey's (1938) Progressive Education Theory, participants within this study were observed designing and implementing lessons that provided students with a connection to prior knowledge at the onset of the instruction. Vocabulary and pre-requisite skills were discussed prior to introducing new concepts, enabling students to build new information upon prior mathematical knowledge. Participants utilized information from multiple data sources to determine students' level of understanding prior to lesson delivery. This allowed participants to assign students into small groups based on instructional needs. Participants expressed concern that some students may not be sufficiently challenged through in-class differentiation. This revelation indicated that that, while participants were attempting to provide students with novel content instruction through differentiated instruction, some students would benefit from alternative educational opportunities.

Dewey (1929) also discussed the role of the teacher within the educational environment. Rather than standing at the front of the classroom, providing passive students with isolated pieces of information, Dewey (1929) advocated for the teacher to assume the role of facilitator. Data collected within this study showed that participants had assumed the role of facilitator for most mathematics instruction. Participant's instructional methodologies followed the Gradual Release Method (Pearson & Gallagher, 1983), transitioning students from whole-group direct instruction, to guided practice, followed by independent practice. Small group practice was often substituted for independent practice, allowing the students to support one another while the participants were assisting specific groups.

Theories of Multiple Intelligences and Learning Profiles

Howard Gardner's (2011) Multiple Intelligences Theory posited that intelligence was multi-faceted, as opposed to being a single, measurable item. According to Gardner (2011), intelligence could be broken down into nine facets and individuals possessed differing levels of each area. The nine intelligences Gardner (2011) identified were: (1) logical/mathematics; (2) interpersonal; (3) intrapersonal; (4) spatial; (5) verbal; (6) auditory; (7) naturalist; (8) musical; and (9) existential. Gardner (2011) asserted that students learn best when working within their strongest areas of intelligence. Gardner (2011) asserted that teachers should actively differentiate instructional methodologies to best match students' intelligence areas in order to provide the most effective learning experience for students.

Carol Ann Tomlinson's (2009; 2012) Learning Profiles Theory stated that students have a preferred modality or instructional style that best enables learning to occur and is related to how students take in and process information. Tomlinson (2012) explained that learning profiles were comprised of fluid aspects of learning that should be used by teachers to plan curriculum and

instruction to meet the needs of individual learners, including: (a) culture; (b) gender; (c) learning styles, and (d) intelligence preferences. According to Tomlinson (2010), individuals learn differently in varied contexts and thus the instruction and environment within a classroom should be differentiated to include a multitude of contexts in which learning can occur. Tomlinson (2012) asserted that an understanding of learning profiles resulted in teachers who incorporated multi-modal approaches to teaching and learning, provided student choice for processing and demonstrating mastery of content, and helped students to understand themselves as learners.

Participants within this study did not indicate any attempts to identify or differentiate for students based on multiple intelligences or learning profiles. The *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curricular resources were exclusively printed materials consisting of computation or word problems. Outside of the *Math in Focus* resources, participants indicated the use of surveys to identify students' learning styles and reported that students were either "an even mix between them all," or "mostly auditory or visual." Two participants noted the use of hands-on, tactile instructional methodologies for lower-level students. All participants indicated that gifted and high ability learners received differentiated materials consisting primarily of enrichment packets to be completed in small groups. The participants within this study acknowledged that students have different learning styles, but instructional modifications based on multiple intelligences or components of learning profiles were not evidenced within the collected data.

Theory of Differentiated Instruction

The Differentiated Instruction Theory (Tomlinson, 1999a) was derived from the general educational philosophy that all students have different educational strengths and weaknesses that

must be uniquely met in order for students' to have meaningful learning experiences (Loeser, 2008). Tomlinson's Differentiated Instruction Theory (1999a) explained that teachers must intentionally modify the learning content, process, product, or environment in response to students' readiness, interests, and learning profile in order for instruction to be the most effective.

Differentiated instruction required that teachers acknowledge the varied backgrounds, readiness levels, languages, interests, and learning profiles of students (Hall, 2002). The objective of differentiating instruction was to assist in the learning process, maximizing each student's growth and individual success by matching the educational experience to the individual level of each student (Hall, 2009). By differentiating the educational experience, students were offered opportunities to demonstrate skills through a myriad of assessment techniques while also having their personal, unique strengths valued by the educational process (Mulroy & Eddinger, 2003; Tomlinson, 2001; Tomlinson & Kalbfleisch, 1998; Tuttle, 2000).

This study supported the use of content differentiation to meet the individual needs of mathematics students. Participants within this study were observed differentiating mathematics instruction to meet the needs of students. Using content differentiation, participants provided students with instructional activities at varying levels of complexity to be completed within small groups. Students were assigned tasks based on data collected by participants across multiple sources. Participants were not observed utilizing differentiating the process or product for students, although both methodologies were mentioned as a part of how participants described differentiation.

Discussion and Implications in Light of Relevant Literature

The meaningful units and patterns presented in the previous chapter were synthesized into five overarching themes. These statements reflect a holistic understanding of the research questions and theoretical framework for this study. The statements identified were:

1. Flexible small groups, within safe and supportive classrooms, enable teachers to utilize content differentiation to respond to the individual needs of students.
2. Analyzing student data from multiple sources, including measures of general mathematics understanding and pre-assessments of content and readiness, is essential to planning for differentiated instruction, while responding to classroom performance is critical to implementing differentiated instruction.
3. A variety of instructional resources, including diverse enrichment and assessment materials, are needed to compliment *Math in Focus* resources in order for teachers to effectively differentiate instruction to meet the needs of gifted and high ability learners.
4. Time is needed for teachers to identify and create differentiated resources, plan differentiated activities, and collaborate with other teachers.
5. Teachers desire professional development on meeting the needs of gifted and high ability learners through effective differentiated instruction.

Theme 1

Flexible small groups, within safe and supportive classrooms, enable teachers to utilize content differentiation to respond to the individual needs of students. Based on questionnaires, interviews, observations, and document analysis, differentiation for gifted and high ability learners was an important facet of participants' mathematics instructional delivery. Van-Tassel-Baska's (2012a) and Dean and Wismer (2012) asserted the need for differentiated

instruction. Within this study, all participants evidenced intentionally differentiating the content of instructional activities in order to ensure students received instruction at the appropriate rigor level. The need for purposeful differentiation to challenge gifted and high-ability learners is consistent with the findings of Huebner (2010) and Shultz, Dayan, and Montague (1997). This study also validated the work of Johnson (2000), who asserted that mathematically gifted students required curriculum that was at a greater complexity level and pace than what was designed for other students.

The results of this study showed that the learning environment was an important facet to differentiated instruction. Participants were observed to have purposefully created safe and organized learning environments for students to feel supported when taking academic risks, which were presented in the form of content differentiation to be solved collaboratively in flexible small groups. This supported the work of Howard (2006), Jensen (2005), McGaugh, et al., (1993), Linn-Cohn and Hertzog (2007), and McQuarrie et al. (2008), who all reported on the correlation between the classroom environment and learning. This also supported Stepanek's (1999) finding that gifted students required tasks at an appropriate level of challenge in order to prevent decreased levels of engagement. Data from observations and interviews evidenced that participants were concerned about the potential decrease in student engagement and student achievement if students were not provided diverse enrichment offerings.

The results of this study supported the findings of Sowell et al. (1990), who found that mathematically gifted students were capable of doing mathematics typically accomplished by older students and engaged in qualitatively different mathematical thinking than their classmates or chronological peers. Analysis of document artifacts collected within this study found that the enrichment resources provided students within the observations were multi-step, complex word

problems and tasks that exceeded the rigor level of the resources utilized with the grade-level peers. Additionally, document artifacts evidenced students successfully completing iPad enrichment activities that were up to three grade levels above the current grade placement of the students. The near exclusive utilization of flexible small groups conflicted with the findings of Kanevsky (2011), who found that gifted learners wanted to work with others only part of the time. Data collected within this study showed gifted and high ability learners collaboratively engaged in small group activities in order to develop individual understanding of concepts.

Theme 2

Analyzing student data from multiple sources, including measures of general mathematics understanding and pre-assessments of content and readiness, is essential to planning for differentiated instruction, while responding to classroom performance is critical to implementing differentiated instruction. Tomlinson (1999a) and Winebrenner and Brulles (2012) both asserted that curricular modifications should be guided by student information to make the educational process more individualized and meanings for students. This study found that thorough analysis of multiple types of student data was important in the planning and implementation stages of differentiated instruction. The detailed data analysis allowed participants to develop a holistic understanding of the mathematical understanding and readiness of students. Participants used their knowledge of individual students to plan and prepare for differentiated instruction. This supported Olenchak (2001) and Reis (1998), who found that the individualization of instruction for students through differentiation required teachers to have an extensive knowledge of both the instructional content and the students who would receive the instruction.

Theme 3

A variety of instructional resources, including diverse enrichment and assessment materials, are needed to compliment Math in Focus resources in order for teachers to effectively differentiate instruction to meet the needs of gifted and high ability learners. This study identified a great need for ancillary instructional resources in order for participants to effectively meet the needs of gifted and high ability learners through the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum. This directly supported the finding of Deal and Wismer (2010), who reported that the enrichment activities for advanced learners provided by textbooks rarely involve the rigor necessary to meet the needs of mathematically gifted learners. The need for ancillary enrichment resources was also consistent with VanTassel-Baska's (2012a) assertion that gifted students must be provided differentiated instructional opportunities that include multiple pathways for meeting the standards, thinking applications, and real-world problem solving experiences. All participants of this study recognized the importance for these instructional opportunities, finding the available *Math in Focus* curricular materials to be insufficient in meeting the needs of gifted and high ability learners. This study further supported research that suggested textbook-based curriculum units designed for gifted learners lacked the necessary variety, depth, and complexity, to be an effective differentiation methodology (Erikson, 1998; Flanders, 1987; Lawrence-Brown, 2004; Renzulli, 1994; Rock et al., 2008; Tieso, 2005).

This study did not strongly support the findings of Gardner (1995), Johnson (2000), and Nehring (1992), who emphasized the importance of designing differentiated instructional materials to meet the needs of students' interests, learning profiles, and ability levels. Although the use of student learning style and interest surveys were documented within the collected data,

no evidence was found to demonstrate participants' consideration of students' learning styles, interests, or learning profiles when planning and implementing differentiated instruction.

Participants in this study provided content differentiation to students that were similar in design, but at a greater complexity level, which directly conflicted with the recommendation of Hess (1999). Hess (1999) asserted that students in a mixed-ability classroom required opportunities to work on different, unique tasks, rather than completing the same tasks as classmates but at a different level of complexity. While data collected in this study did not demonstrate implementation of differentiated instruction in the manner described by Hess, the tasks provided to students were consistent with the programmatic resources and implementation guide provided within the *Math in Focus* curriculum and participants were actively seeking greater diversity of enrichment resources.

Theme 4

Time is needed for teachers to identify and create differentiated resources, plan differentiated activities, and collaborate with other teachers. The task of planning and implementing differentiated learning opportunities was described as challenging but critical to effectively meeting the individual needs of students. This study found that participants provided fewer differentiated activities to students as a result of the time invested in other initiatives. Research indicated that when teachers were concerned about the impact of high stakes testing stemming from NCLB (2001), they responded by narrowing the curriculum, teaching to the middle third of the students, and focusing on test-taking strategies at the expense of teaching problem-solving strategies and utilizing performance-based assessments, which was consistent with the findings of this study (Amrein & Berliner, 2002; Hamilton et al., 2007; Hopson-Lamar, 2009; Kohn, 2000; Matthews, 2006). Participants within this study recognized that they needed

time to create and plan for differentiated instruction for gifted and high ability learners. This was consistent with Johnson (2000), who asserted that classroom teachers and school districts needed to share in the responsibility of addressing the needs of gifted students.

This study also revealed the need for participants to collaborate together to discuss instructional methodologies. This supported the findings of Park and Oliver (2009), who reported that teachers who work collaboratively to develop instructional units for use with gifted learners gain insights into methodologies to better meet the needs of all students. This also supported Minott's (2009) finding that teachers who were intentional and purposeful with curricular planning and reflection were more likely to be able to meet the individual needs of students through differentiated instruction.

Theme 5

Teachers desire professional development on meeting the needs of gifted and high ability learners through effective differentiated instruction. Findings in this study indicated a need for professional development related to the instructional needs of gifted leaners and strategies for providing differentiated instruction. This was consistent with Deal and Wismer (2010), who reported that few teachers recognized true mathematical talent or knew how to make necessary curricular accommodations for mathematically gifted students. Rotigel and Fello (2004) found that educators needed to be aware and sensitive of the unique characteristics of gifted learners in order to effectively provide students with opportunities to develop mathematical reasoning and problem solving skills. This study also supported the findings of Johnsen (2012), who found that teachers required specialized knowledge about gifted students' characteristics, methods to identify strengths and weaknesses, and how to implement appropriate instructional strategies, to effectively meet their unique instructional needs.

Participants in this study reported little to no specialized training in meeting the needs of gifted students or mathematically gifted students in either pre-service training or through professional development since beginning their teaching career. This was consistent with Deal and Wismer's (2010) findings that very few teachers had been trained on how mathematically gifted learners approach and develop understanding of skills and problems.

Implications

Although differentiated instruction is expected of teachers, many are not prepared to provide it. The majority of general classroom teachers have received no professional development on how to best meet the needs of academically advanced students (Farkas and Duffet, 2008). Understanding the forms of instruction that are the most effective for teaching mathematics to gifted and high ability learners is crucial so that students are able to remain competitive in the global world (National Council of Teachers of Mathematics, 2009).

The most interesting finding of this study was the manner in which the participants implemented differentiated instruction. Collected data indicated a strong emphasis on content differentiation, primarily in the form of worksheets of multi-step word problems at a greater level of complexity than those provided to the other students. Participants demonstrated a strong ideological understanding of other forms of differentiation, but the concepts were only minimally put into practice.

This study identified a clear need for broader variety in enrichment resources, but most participants described needing enrichment options of greater complexity and emphasizing different modalities, rather than different activities all together. Hess (1999) asserted that students in a mixed-ability classroom required opportunities to work on different, unique tasks, rather than completing the same tasks as classmates but at a different level of complexity. The

data collected in this study did not demonstrate implementation of differentiated instruction in the manner described by Hess, however the tasks provided to students were consistent with the programmatic resources and suggested implementation strategies provided within the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum.

While the participants in this study were all actively differentiating instruction, they were not providing differentiated opportunities. In other words, they were not differentiating their differentiation. A self-reflection tool for teachers that clearly delineates the characteristics of each general method of differentiation may prompt greater diversity in implementation strategies.

The findings from this study suggest teachers believe differentiation for gifted and high ability learners is important and worth the time it requires, but they are in need of professional development and time in order to become more effective. Providing teachers with professional development about content, process, and product differentiation, including concrete, realistic examples of each, may lead to more diverse implementation of differentiated instruction techniques. Providing time for mathematics teachers to collaborate and plan with peers may also impact how differentiation is implemented. The time provided may allow teachers to collectively learn and develop additional differentiation techniques, implementation strategies, and differentiated classroom management styles. This could impact the teachers' ability to reflect on current practices, improve classroom implementation, and reduce the amount of planning time required for effective differentiation.

This study also supported the need for ancillary resources beyond those available within the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum. During future mathematics textbook adoptions, textbook resources could be critically analyzed to determine the

strength of the available enrichment materials. Identified deficiencies could be addressed with supplemental materials prior to beginning with the text, eliminating the need for teachers to have to research and identify extension resources to use. This process could be collaborative and include a diverse representation of extension opportunities in order to facilitate meeting the needs of gifted and high ability learners across learning profiles.

Another implication of this study is that teachers need professional development on gifted learners and effective differentiation techniques, but the most effective training may not be grounded in mathematics. Both representative participants identified the specialized training in other subject areas as having the greatest influence upon the differentiation methodologies utilized within their mathematics classes. Both identified trainings were in-depth, included modeling and guided practice, and contained specific methodological and organizational expectations. These skills were then transferred and applied to the participants' understanding of the Gradual Release Method (Pearson & Gallagher, 1983) and teaching mathematics. Differentiated instruction professional development for mathematics teachers could combine the programmatic recommendations of the district or text, with broader methodological and organizational expectations that may be applied to teaching mathematics. Modeling of implementation strategies could be a component of the professional development and on-going connections between the expectations identified in training and classroom practice could be provided to ensure the necessary transfer of skills occurs.

Finally, this study demonstrated the vast amount of student data that is analyzed by mathematics teacher while they plan and implement differentiated instruction. Participants were observed considering data from up to 12 sources when preparing for a single lesson. The data was a mixture between electronic and print information and was cumbersome for the participants

to manipulate. An electronic data warehouse tool could significantly reduce the amount of time required to analyze student data when differentiating instruction. This study revealed a need for a tool that would automatically populate with student data that was collected at the building level or higher, such as standardized test scores, and also able to organize classroom level data imported by the teacher, including classroom assessments and learning profile information. A more streamlined process for data analysis may improve teachers' ability to differentiate instruction to respond to the individual needs of students.

Limitations

Limitations are a natural aspect of qualitative research (Creswell, 2013). Several limitations were present within this study, which were addressed through trustworthiness measures.

The first limitations to this study were the size of sample and the demographics of the setting. The sample size of this study was only six participants. While this sample size is appropriate for a phenomenological study, the results may not be generalizable to other populations of teachers or schools. The participants in this study were limited to fifth grade teachers at a suburban school district in Ohio. Teachers in other grade levels, school districts typologies, or states may have provided different experiences with the phenomenon studied.

Subjectivity, an inherent aspect of qualitative research, may lead to bias and is a limitation to this study. As a former general classroom teacher and Gifted Intervention Specialist, I acknowledged my own bias regarding differentiating instruction for gifted and high ability learners. I used bracketing and a reflective journal to set aside my personal experiences and opinions with the phenomenon being studied. Considering the phenomenon through different

lenses and from alternate perspectives while analyzing the collected data also served to mitigate subjectivity within the study.

Trustworthiness was addressed through consideration of credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Member checking and peer debriefing were used to ensure validity of transcriptions, themes, and findings. Four data collection procedures were utilized within this study, exceeding the requirements of triangulation. Thick, rich detail regarding the setting, participants, methodology, processes, sampling, and data analysis were provided and a detailed audit trail was maintained to document the decisions made during the study.

Recommendations for Future Research

Based on the results of this study, several areas of future research should be explored. Similar methodology should be utilized to determine how the experiences with the phenomenon of differentiated instruction are impacted when other math programs are being utilized to identify programmatic characteristics with differentiated instruction. The current study should also be replicated with different grade levels, in school districts of different typology, within schools and districts with demographics, and in varied geographic locations. These studies would provide new perspectives and lead to the development of a more accurate representation of the phenomenon.

This study focused on general classroom teachers providing instruction to gifted and high ability learners within heterogeneously mixed general classrooms. Future research should be conducted on how differentiation is implemented within homogeneously mixed classrooms taught by general classroom teachers and also within classes taught by Gifted Intervention

Specialists to identify the potential impact teacher certification training has on differentiating instruction.

This study identified the need for ancillary resources in order to improve differentiation. Future studies should thoroughly examine all available *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) resources, particularly in new editions of the program, to determine Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010a) alignment and what resources teachers may still be supplementing. Additional research should also be conducted to identify sources of mathematics enrichment activities for gifted and high ability learners beyond multi-step word problems.

Professional development provided to general classroom teachers is also an area needing future study. This study identified a need for professional development in meeting the needs of gifted learners through differentiated instruction. Future research should be conducted to correlate the impact professional development about gifted learners has on the type and frequency of differentiation implemented. Results of this study also identify the need for research to be conducted to determine teachers' understanding and implementation of multiple intelligences, learning profiles, and differentiating the instructional process and product.

Future research should investigate the relationship between student growth and achievement with differentiated instructional practices. Participants within this study reported limiting the amount of differentiation that occurred while preparing students for high-stakes assessments. Research should be conducted to investigate how differentiated instruction impacts student performance on assessments.

Finally, additional research regarding differentiation from the perspective of students, parents, and administrators is needed for all subject areas and grade levels. The resulting data would provide context and additional perspectives regarding differentiation and would deepen the collective understanding of the phenomenon.

Summary

Grounded in Vygotsky's (1978) Constructivist Learning Theory, Dewey's (1938) Progressive Education Theory, Gardner's (2011) Multiple Intelligences and Tomlinson's (2009, 2012) Learning Profiles Theories, and Tomlinson's (1999a) Differentiated Instruction Theory, this study sought to discover the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) Singapore Mathematics program. Through anonymous questionnaires, semi-structured interviews, observations, and document artifacts, an analysis of collected data revealed several significant findings.

Findings from this study revealed that flexible small groups are utilized to provide content differentiation within safe, supportive classrooms. Teachers established an atmosphere of trust and support, encouraging students to take risks and attempt challenging tasks. Students were responsible for reflecting about their work and seeking assistance if they were unsure of how to proceed. Teachers were most responsive to the needs of individual students during independent/small group practice. The use of flexible groups allowed teachers to provide content at varying complexity levels and differing levels of teacher support.

This study also revealed the need for multiple types of student data in order for teachers to plan and implement differentiated instruction. Broad mathematical information provided foundational knowledge, while content and readiness specific pre-assessments enabled teachers

to more accurately identify specific student needs. Observations of student performance during instruction allowed teachers to smoothly transition students to assignments of different complexity levels in response to students' needs during lessons.

In order to meet the diverse instructional needs of gifted and high ability learners, this study revealed a need for greater diversity in available enrichment and assessment resources that accompany the *Math in Focus* (Great Source/Houghton Mifflin Harcourt, 2009) curriculum. Teachers need time to identify and create differentiated instructional resources and time to plan for how to incorporate them into their instructional methodology. Collaboration with other teachers may also improve the quality and diversity of differentiated instruction implementation.

Finally, this study revealed a need for professional development for teachers. Understanding the needs of gifted and high ability learners, the various ways to differentiate, and the instructional methodologies that facilitate individualized instruction were all identified as areas of need by teachers. Providing high quality, on-going professional development, including opportunities for modeling and observation, may also lead to improved quality and diversity of differentiated instruction implementation.

Through data collection and analysis procedures, I gained a greater understanding of the unique struggles teachers experience when differentiating instruction for gifted and high ability learners. Despite large class sizes, few resource options for enrichment materials, and pressures to successfully implement other time-consuming initiatives, teachers are diligently working to meet the needs of the gifted and high ability learners in their classrooms. Using a variety of types of student data to identify needs, teachers are able to differentiate mathematics content to provide opportunities for students to work in flexible small groups and complete tasks at different levels of complexity. Providing additional forms of assessment, diverse enrichment resources, time for

planning and collaboration, as well as, professional development related to gifted learners and differentiated instruction, will all impact teachers' ability to effectively and efficiently meet the individual needs of students.

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APPENDIX A

IRB Approval Letter

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

March 10, 2015

Elizabeth Ann Keithley Sizemore
IRB Approval 2127.031015: A Phenomenological Study of Differentiated Instructional Techniques Utilized for Fifth-Grade, Gifted, and High-Achieving Students Receiving Singapore Math Instruction through the Math in Focus Program within a Regular Classroom Setting

Dear Beth,

We are pleased to inform you that your above study has been approved by the Liberty IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

[redacted]
Professor, IRB Chair
Counseling
[redacted]

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APPENDIX B

IRB Change in Protocol

IRB Change in Protocol Approval: IRB Approval 2127.031015: A Phenomenological Study of Differentiated Instructional Techniques Utilized for Fifth-Grade, Gifted, and High-Achieving Students Receiving Singapore Math Instruction through the Math in Focus Pro

IRB, IRB <IRB@liberty.edu>
Mon 4/27/2015 8:34 PM
Inbox

To: Sizemore, Elizabeth;
Cc: Woodbridge, Jerry L (School of Education); IRB, IRB; Garzon, Fernando (Ctr for Counseling & Family Studies);

Good Evening Beth,

This email is to inform you that your request to conduct your study within the six elementary schools of [redacted] is opposed to utilizing [redacted] Schools becaus[redacted] longer using the Math in Focus curriculum program has been approved. Thank you for submitting documentation of permission from the superintendent [redacted] for our review and documentation.

Thank you for complying with the IRB's requirements for making changes to your approved study. Please do not hesitate to contact us with any questions.

We wish you well as you continue with your research.

Best,

[redacted]
Institutional Review Board Coordinator
The Graduate School

[redacted]

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APPENDIX C

Superintendent Permission Letter for Research and Accompanying Documentation

I. Research Background

Title of the Study: A Phenomenological Study of Differentiated For Fifth Grade Gifted and High Ability Learners Through *Math In Focus*

Name of Researcher: Elizabeth Ann Keithley Sizemore Organization: Liberty University

Street address: [redacted] City: [redacted] State: Ohio Zip: [redacted]

E-mail: [redacted] Phone: [redacted]

II. Description of Research Proposal

Abstract:

Although differentiated instruction is expected of teachers, many are not prepared to make the necessary modification to meet the needs of gifted and high ability learners. This phenomenological study investigates the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the *Math in Focus* Singapore Mathematics program in a suburban, middle-class school district. In order for this study to provide an understanding of the differentiation process currently being implemented by teachers, a maximum variance sampling of eligible teacher-participants will complete an open-ended questionnaire. In addition, 5-7 representative general *Math in Focus* classroom teachers will be interviewed, observed, and asked to provide artifacts for analysis in the study. The use of phenomenological reduction will enable the essence of the differentiation process for gifted and high ability fifth grade mathematics learners with a general *Math in Focus* classroom to be identified.

Timeline:

March: All 5th grade mathematics teachers will be asked to participate in the study. Consenting teachers will be asked to complete a questionnaire about their instructional practices.

April-May: 5-7 representative teachers will each participate in one individual interview (approximately 45 minutes in length), three observations of math lessons (between 50-75 minutes in length), and to provide the researcher with documents related to the interview and observation (including such items and lesson plans and instructional documents).

June-August: Data will be analyzed and the study will be completed.

III. Agreement (to be completed by superintendent)

I, [redacted], Superintendent of [redacted] understand

- the study and what it requires of the staff, students, and/or parents in my school,
- that the privacy and confidentiality of any staff or student will be protected,
- that I have the right to allow or reject this research study to take place in my school,
- that I have the right to terminate the research study at any time,
- that I have the right to review all consent forms and research documents at any time during the study and up to three years after the completion of the study.

☑ I grant permission to the researcher to conduct the above named research in my school district as described in the proposal.

☐ I DO NOT grant permission to the researcher to conduct the above named research in my school district as described in the proposal.

[redacted]_____
Signature of Superintendent

APPENDIX D

Recruitment Message

Good evening,

My name is Beth Sizemore and I am a doctoral student at Liberty University. I am conducting a qualitative research study to investigate the differentiation techniques implemented for gifted and high ability learners by fifth grade general classroom mathematics instructors utilizing the "Math in Focus" mathematics program. From this study, I hope to gain an understanding of how classroom teachers differentiate mathematics instruction to meet the needs of gifted and high ability learners.

Three forms of data collection will be used within this study. First, data will be collected from an anonymous questionnaire. I will then ask 5-7 representative teachers to allow me to interview them one time and observe their mathematics class three times prior to the end of the school year. I will audio-record the interview but will not record the observation. To gather additional information, I will also collect copies of documents related to differentiation, such as lesson plans or instructional activities.

To ensure confidentiality, I will not disclose any personal identification information in the final transcripts from this study, no data collected will be used for evaluative purposes, and your participation will have no impact your position with [redacted]. You may choose to participate or you may opt out of participation. You may participate in the anonymous questionnaire and choose not to be one of the representative participants who are interviewed and observed.

If you would like to participate, please complete the informed consent form that is included in this message and return it to the main office of your school.

If you have any questions, please contact me at [redacted] or by phone at [redacted].

Thank you for your consideration,

Beth Sizemore

APPENDIX E

Participant Consent Form

A Phenomenological Study of Differentiated Instruction For Fifth Grade Gifted and High Ability Learners Through *Math In Focus*

Principal Investigator: Elizabeth Ann Keithley Sizemore
Liberty University
Graduate School of Education

You are being asked to take part in a research study on how classroom teachers differentiate to meet the needs of gifted and high ability learners within the *Math in Focus* classroom. You are being asked to participate in this study because you are a fifth grade mathematics teacher with gifted and high ability students in your classroom. Elizabeth Ann Keithley Sizemore, a doctoral candidate in the Graduate School of Education at Liberty University is conducting this study. Please read the form carefully and ask any questions that you may have.

Background Information:

The purpose of this study is to discover the essence of the differentiation process for gifted and high ability learners within general fifth grade *Math in Focus* classrooms.

Procedures:

You will be asked to complete an anonymous questionnaire about your classroom instructional techniques. This questionnaire will take approximately 25 minutes to complete.

You may also be asked to participate in an interview, observation, and provide document artifacts, such as lesson plans and instructional resources. The interview will last approximately 45 minutes to complete and will be audio recorded to enable the researcher to transcribe the content. Following the interview, you will be observed teaching a math class three different times during a period of nine weeks to gain an understanding of the differentiation techniques present in your classroom. As a part of the interview and observation process, you will be asked to provide the researcher with copies of the materials utilized within your lessons.

Risks and Benefits of being in the Study:

I do not anticipate any risks to your participating in this study other than those regularly encountered in daily teaching. By participating in the study you will gain insight into the differentiation strategies and methodologies utilized within your classroom.

Compensation:

You will not be compensated for your participation in the study.

Confidentiality:

Your responses on the survey will be anonymous and responses related to the interview, classroom observations, and collected documents will be kept confidential. Your responses will

not be used for district evaluative purposes in any way. The reporting of the results of the study will be presented in a way as to not identify you or any of your students. In any sort of report I might publish, I will not include any information that will make it possible to identify a participant in the study. The recorded interview and all research records will be stored in a secure location that only the researcher will have access to.

Voluntary Nature of the Study:

You are not obligated to participate in this study. You may participate in the questionnaire and select to not participate in the interview, observation, and document collection. You may skip any questionnaire or interview questions you do not want to answer. Failure to participate in this study will not affect your current or future teaching positions in any way.

How to Withdraw from the Study:

If, at any time, you wish to withdraw from participation in the study, please contact the researcher and request to be removed from the study. Responses to interview questions, including audio recordings, observation notes, and document artifacts provided to the researcher will be destroyed and will not be included in the analysis or findings of the study. Questionnaire responses, because they are anonymous, will not be removed from the study.

Contacts and Questions:

The researcher conducting this study is Elizabeth Ann Keithley Sizemore. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at [redacted] or [redacted] You may also contact her advisor, Dr. Woodbridge-Cornell, at [redacted]

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the Institutional Review Board, 1971 University Blvd, Suite 1837, Lynchburg, VA 24515 or email at irb@liberty.edu.

Please notify the researcher if you would like a copy of this information for your records.

Statement of Consent:

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

__The researcher has my permission to audio-record me as a part of my participating in this study.

By signing below, I agree to participate in this research study and consent to having the interview audio-recorded.

Signature: _____ Date: _____

Signature of Investigator: _____ Date: _____

APPENDIX F

Questionnaire

1. Where do you teach?
2. How many years have you been teaching?
3. Please describe your comfort level with the *Math in Focus* curriculum.
4. How many years have you been teaching in your current grade level?
5. Please describe your current class' ability demographic.
6. How many students are in your current class?
7. How many of your current students are identified as gifted?
8. How many of your current students would you classify as having high math ability, but are not formally identified as gifted?
9. What did you use to determine the students you listed in response to question 8?
10. What do you think it means to "differentiate instruction?"
11. Do you believe you differentiate your instruction? Please explain.
12. Do you believe you differentiate your mathematics instruction? Please explain.
13. Do you believe you differentiate your mathematics instruction for the gifted and high ability students in your class? Please explain.
14. In what ways do you differentiate your mathematics instruction (content, process, product, other)? Please be as detailed as possible.
15. If you teach subjects other than mathematics, in what ways do you differentiate that instruction (content, process, product, other)? Please be as detailed as possible.
16. What obstacles are preventing additional or more effective differentiation from occurring within your math class?

17. What resources do you need in order to do additional or more effective differentiating within your math class?
18. What additional information would you like to share regarding differentiation?

APPENDIX G

Semi-Structured Interview Questions

1. What is your teaching philosophy?
2. Please tell me about the students in your classroom.
3. Describe your teaching methodologies.
4. Explain your pre-service training related to teaching methodologies.
5. What professional development or mentoring you have received since becoming a teacher that you perceive has impacted your teaching methodologies?
6. Describe the students in your class in terms of readiness, interests, and learning profiles.
7. How do you differentiate for specific student groups within your mathematics class (emphasis on implementation)?
8. Describe what differentiation techniques you utilize to differentiate for specific student groups within your mathematics class (emphasis on strategies).
9. Do you believe the *Math in Focus* curriculum impacts your ability to meet the needs of the gifted and high ability learners in your classroom?
10. What obstacles are preventing additional or more effective differentiation from occurring within your classroom?
11. What resources are necessary for additional or more effective differentiation to occur within your classroom?
12. What else would you like to tell me about teaching methods, differentiation, or *Math in Focus* that I may not have asked about?

APPENDIX H

Permission to Use the COS-R

From: Vantassel-Baska, Joyce <jlvant@wm.edu>
To: Sizemore, Elizabeth

Dear Elizabeth-
I would be pleased to see you use the COS-R for the purpose you describe. Good luck with your study!

joyce vantassel-baska

Dr. Joyce Van Tassel-Baska, EdD.
Smith Professor Emerita
College of William and Mary

From: Sizemore, Elizabeth
To: Vantassel-Baska, Joyce

Good evening, Dr. Van Tassel-Baska.
I am nearing the completion of my data collection, which has included the use of the COS-R. I would like permission to include the applicable portions of the tool used in my study within my dissertation, which will be published and distributed. If you do not wish for me to include this as an appendix in my dissertation, I will still include the citation and reference to the tool within the document, so it is evident that your resource was utilized. I have attached what I would include as an appendix within my dissertation to this message, for your consideration.

Thank you for your time,
Beth Sizemore

From: Vantassel-Baska, Joyce
To: Sizemore, Elizabeth

I give permission for you to cite the COS-R as noted in the attachment.

Joyce VanTassel-Baska

From: Sizemore, Elizabeth
To: Vantassel-Baska, Joyce

My apologies, but I must clarify: You have granted permission to cite the COS-R, but not to include it in the appendix. Is that correct? Or may I also include it in the appendix in the format shown in the attachment? Thank you for clarifying - it is a necessary requirement of my dissertation process to ensure that I have permission to include it in the appendix.

Sincerely,
Beth Sizemore

From: Vantassel-Baska, Joyce <jlvant@wm.edu>
To: Sizemore, Elizabeth

You may include it in the appendix.

Joyce

APPENDIX I

The William and Mary Classroom Observation Scales, Revised
(applicable portions)

The William and Mary Classroom Observation Scales, Revised

Joyce VanTassel-Baska, Ed.D *Linda Avery, Ph.D.* *Jeanne Struck, Ph.D.* *Annie Feng, Ed.D.*

Bruce Bracken, Ph.D. *Dianne Drummond, M.Ed.* *Tamra Stambaugh, M.Ed.*

Observer _____ **Date** _____ **Minutes Observed** _____

School _____ **Grade** _____

Teacher _____ **Course/lesson Observed** _____

Student Information: Total _____

Observed Gender: Boys _____ #Girls _____

Observed Ethnicity: White _____ #African American _____
#Hispanic _____ Asian American _____
Other _____

Gifted: Identified Gifted _____ Mathematically Gifted _____

Classroom Desk Arrangement: Desks in rows and columns ____ Desks in groups ____
Desks in circle ____ Other (specify) _____

Please outline what you have observed in the classroom with respect to curriculum and instruction-related activities. Describe the specific lesson, its organization, instructional methods used, characteristics of the learning experience and environment, texts and materials used, questions asked by the teacher, and any other relevant observations and impressions that may influence your completion of the attached checklist.

Lesson Outline: (attach)

Texts and Materials: (list any materials used by students and/or the teacher)

Teacher Interview Questions: (see final page of COS-R)

Directions: Please employ the following scale as you rate each of the checklist items. Rate each item according to how well the teacher characteristic or behavior was demonstrated during the observed instructional activity. Each item is judged on an individual, self-contained basis, regardless of its relationship to an overall set of behaviors relevant to the cluster heading.

3=Effective	2=Somewhat Effective	1=Ineffective	N/O = Not Observed
The teacher evidenced careful planning and classroom flexibility in implementation of the behavior, eliciting many appropriate student responses. The teacher was clear, and sustained focus on the purposes of learning.	The teacher evidenced some planning and/or classroom flexibility in implementation of the behavior, eliciting some appropriate student responses. The teacher was sometimes clear and focused on the purposes of learning.	The teacher evidenced little or no planning and/or classroom flexibility in implementation of the behavior, eliciting minimal appropriate student responses. The teacher was unclear and unfocused regarding the purpose of learning.	The listed behavior was not demonstrated during the time of the observation. (NOTE: There must be an obvious attempt made for the certain behavior to be rated "ineffective" instead of "not observed".)

General Teaching

Curriculum Planning and Delivery	**3**	**2**	**1**	**N/O**
The teacher…				
1. set high expectations for student performance.				
2. incorporated activities for students to apply new knowledge.				
3. engaged students in planning, monitoring or assessing their learning.				
4. encouraged students to express their thoughts.				
5. had students reflect on what they had learned.				
Comments:				

Differentiated Teaching Behaviors

Accommodations for Individual Differences	**3**	**2**	**1**	**N/O**
The teacher…				
6. provided opportunities for independent or group learning to promote depth in understanding content.				
7. accommodated individual or subgroup differences (e.g., through individual conferencing, student or teacher choice in material selection and task assignments.)				
8. encouraged multiple interpretations of events and situations.				
9. allowed students to discover key ideas individually through structured activities and/or questions.				
Comments:				

Problem Solving	**3**	**2**	**1**	**N/O**
The teacher…				
10. employed brainstorming techniques.				
11. engaged students in problem identification and definition				
12. engaged students in solution-finding activities and comprehensive solution articulation.				
Comments:				

Critical Thinking Strategies	**3**	**2**	**1**	**N/O**
The teacher…				
13. encouraged students to judge or evaluate situations, problems, or issues				
14. engaged students in comparing and contrasting ideas (e.g., analyze generated ideas)				
15. provided opportunities for students to generalize from concrete data or information to the abstract.				
16. encouraged student synthesis or summary of information within or across disciplines.				
Comments:				
Creative Thinking Strategies	**3**	**2**	**1**	**N/O**
The teacher…				
17. solicited many diverse thoughts about issues or ideas.				
18. engaged students in the exploration of diverse points of view to reframe ideas.				
19. encouraged students to demonstrate open-mindedness and tolerance of imaginative, sometimes playful solutions to problems.				
20. provided opportunities for students to develop and elaborate on their ideas.				
Comments:				
Research Strategies	**3**	**2**	**1**	**N/O**
(It is atypical for these to be observed in one session. Some teachers, however, may use Items #21-25 within a single period to illustrate the full research process to students. Please note those observations in the comments section.)				
The teacher…				
21. required students to gather evidence from multiple sources through research-based techniques (e.g., print, non-print, internet, self- investigation via surveys, interviews, etc.).				
22. provided opportunities for students to analyze data and represent it in appropriate charts, graphs, or tables.				
23. asked questions to assist students in making inferences from data and drawing conclusions.				
24. encouraged students to determine implications and consequences of findings.				
25. provided time for students to communicate research study findings to relevant audiences in a formal report and/or presentation.				
Comments:				

Student Responses to General Classroom Teacher Behaviors

Engaged in General Classroom Behaviors **Students:**	**Most** >75%	**Many** 50-75%	**Some** 25-50%	**Few** <25%	**None**	**N/A**
1. demonstrated a high level of performance.						
2. applied new learning.						
3. demonstrated planful, monitoring, or evaluating behavior.						
4. articulated thinking process (e.g., verbal mediation).						
5. reflected on learning						
Comments:						

Student Responses to Differentiated Teaching Behaviors

Engaged in Diverse Self-selected or Self-paced Activities **Students:**	**Most** >75%	**Many** 50-75%	**Some** 25-50%	**Few** <25%	**None**	**N/A**
6. worked on projects individually or in pairs/groups.						
7. worked on tiered assignments or tasks of choice.						
8. explored multiple interpretations.						
9. discovered central ideas through structured activities and/or questions asked.						
Comments:						
Engaged in Problem-solving Strategies **Students:**	**Most** >75%	**Many** 50-75%	**Some** 25-50%	**Few** <25%	**None**	**N/A**
10. brainstormed ideas or alternative possibilities.						
11. defined problems.						
12. identified and implemented solutions to problems.						
Comments:						
Engaged in Critical Thinking Strategies **Students:**	**Most** >75%	**Many** 50-75%	**Some** 25-50%	**Few** <25%	**None**	**N/A**
13. made judgments about or evaluated situations, problems, or issues.						
14. compared and contrasted ideas and concepts.						
15. generalized from specific to abstract data or information.						
16. synthesized or summarized information within or across disciplines.						
Comments:						
Engaged in Creative Thinking Strategies **Students:**	**Most** >75%	**Many** 50-75%	**Some** 25-50%	**Few** <25%	**None**	**N/A**
17. demonstrated ideational fluency.						
18. explored diverse ways to think about a situation/object/event.						
19. offered imaginative, sometimes playful, suggestions as solutions to problems.						
20. provided examples and illustrations of ideas.						
Comments:						
Engaged in Research Strategies **Students:**	**Most** >75%	**Many** 50-75%	**Some** 25-50%	**Few** <25%	**None**	**N/A**
21. gathered evidence through research techniques (e.g., surveys, interviews, analysis of primary and secondary source documents).						
22. manipulated and transformed data to be interpreted.						
23. made inferences from data and drew conclusions.						
24. determined the implications and consequences of situations.						
25. communicated findings (e.g., report, oral presentation).						
Comments:						

Teacher Interview Form

Questions	**Teacher Responses**
Did you have a written lesson plan for this lesson?	_____yes _____no
How would you characterize the purpose of the lesson?	
What were your instructional objectives for the previous lesson with this class?	
What content will you cover in your subsequent lesson?	
What plans do you have to address homework or extensions of this lesson?	
How do you intend to assess the outcomes for this lesson? Final outcomes for the unit?	
Are there any aspects of the lesson you would like to clarify before this observation is finalized?	