THE VOICE OF SPECIAL EDUCATION MATH STUDENTS AND THEIR TEACHERS: A COLLABORATIVE APPROACH TO SPECIALLY DESIGNED INSTRUCTION

By

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To the Faculty of Washington State University:

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Abstract

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The perception of high school special education math students and their teachers regarding the collaboration and provision of specially designed instruction was explored in this qualitative study. The theoretical framework proposed that a balance between constructivism and direct instruction within a student-centered classroom would encourage student voice and provide immediate feedback to teachers in their selection and use of instructional strategies. The literature suggests that students offer a unique perspective on learning and that when listened to could have a positive impact. According to fifteen student participants and three special education teachers, collaboration between students and teachers did not exist, yet suggestions for encouraging this two-way dialogue emerged. Additionally, the instructional strategies that were identified as having a positive impact on learning surfaced within the context of three qualities of an effective teacher: student connectedness, differentiated instruction, and subject competence. Recommendations invite school districts to consider subject knowledge in teacher assignment and for policy leaders to include student voice as a component of teacher evaluation systems in an effort to improve math instruction and have a greater impact on student learning.

Keywords: student voice, differentiated instruction, SDI

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Dedication

This dissertation is dedicated to all the special education teachers who work tirelessly and often without thanks to help every child reach their full potential. It is further dedicated to every special education student and their parents—may your voice be heard as you continue to break down the barriers that impede your right to equal access and educational opportunity.

CHAPTER ONE

INTRODUCTION

The purpose of this qualitative study was to better understand from the perspective of high school special education math students and their teachers how student-teacher collaboration could be used in the provision of specially designed instruction. Specially designed instruction (SDI), a term widely used in special education, is the design and selection of specific instructional strategies or methods teachers use to positively impact student learning. King County Superior Court Judge Erlick in his ruling on the state's funding of basic education stated, "Education plays a critical role in building and maintaining a strong economy, e.g., builds the well educated workforce necessary to attract more stable and higher wage jobs " (*McCleary v. State of Washington*, 2009, para. 132). "A well-educated population is the foundation of our democracy, our economy, and the American dream" (para. 137). Yet, when you examine student learning and the performance of U.S. students, especially compared to those in other countries, it's clear that the efforts to improve education have not met national expectations (e.g., Perie, Moran, & Lutkis, 2005; Planty et al., 2009; Rampey, Dion, & Donahue, 2008).

The No Child Left Behind (NCLB) Act of 2001 requires that by 2014, regardless of disability or situational limitations, students meet standard in reading, writing, and math. Aligned with challenging academic standards, the purpose of the NCLB is to ensure that all students are given the same opportunity to achieve at a high standard by improving teacher quality and providing scientifically based instruction to all students. Building upon the accountability provisions in the Improving America's Schools Act of 1994, NCLB uses a system of Adequate Yearly Progress (AYP) to measure student growth in core academic areas in grades 3 through 10. Schools that fail to demonstrate sufficient progress via state standardized

assessments are publicly identified and subject to a series of interventions and escalating sanctions ("*No Child,"* 2001).

Efforts to improve teacher quality and scientifically based instruction have been exhausted via school reform efforts as states establish rigorous certification standards for new teachers ("*IDEA*," 2004) and provide challenging academic curriculum aligned with common core state standards (e.g., Engelmann, 2007; Kuder, 1990; National Mathematics Advisory Panel, 2008). Additionally, the factors that impact student learning and the challenges teachers experience when teaching math (Elfers, Plecki, Knapp, Yeo, & McGowan, 2007) have been examined in an attempt to improve student learning and teacher effectiveness (e.g., Chiodo & Byford, 2004; Fraser, Walberg, Welch, & Hattie, 1987; Fullan, 2003; Glickman, Gordon, & Ross-Gordon, 2007; Marzano, Pickering, & Pollock, 2001; Marzano, Waters, & McNulty, 2005). Despite these efforts and the attempts to disseminate findings about how educators can improve student learning, some schools continue to struggle with how to best meet the instructional needs of their students. U.S. Secretary of Education, Arne Duncan, in a recent speech to the National Education Association recommended that schools "wake-up" to the reality that our students are falling behind, urging educators to "think differently" in the understanding and use of data to inform instruction in order to help raise student achievement (Duncan, 2009, p. 2). This study supported Duncan's call for a renewed focus on student learning based on a perspective of the data that is different. By consciously making the decision to include the voices of special education math students and their teachers, this study illustrated the unique role students could play in learning how math instruction could be provided in a manner that improves the learning for students diagnosed with a Mathematical Learning Disability.

Statement of the Problem

Since 1969, the National Assessment for Educational Progress (NAEP) has been administering assessments in reading, mathematics, and science. In an effort to inform the U.S. Department of Education of our schools' academic progress, the NAEP has reported these results at the national, state, and local levels. According to a recent report on the long-term trends in mathematics' assessments, average scores in math among high school students have not changed since 2004, with no significant increase since 1973 (Rampey et al., 2009), and math scores of 15 year-olds are now below thirty-one other countries (Planty et al., 2009). Additionally, the vast majority of minorities attending public schools have tested deficient in basic literacy and math skills (James, Jurich, & Estes, 2001) and for special education students that number has been as high as 69% (Perie et al., 2005). Unable to cope with continued school failure, 27% of high school age students have dropped out (Planty et al., 2009). With over 90% of the fastest-growing jobs requiring a post high school education, and less than half of our students ready for college level math (Spellings, 2006, para. 14) our students are and will continue to be ill-prepared to meet the growing demands of a global economy if we continue doing what we have always done.

Special education. According to the *29th Annual Report to Congress on the Implementation of the Individuals with Disabilities Act* (2007), over 10% of the student population ages 3 through 21 have been diagnosed with a disability and in need of specially designed instruction. The largest proportion served in the 12 to 17 year-old range (44.3%) are students who receive a special education service as a student with a Specific Learning Disability (SLD) and an estimated 35-50% qualify in the area of math (Mazzocco & Myers, 2003). A SLD,

a disorder involved in understanding or in using language that significantly impacts a student's ability to listen, think, speak, read, write, and/or do mathematical calculations, can be exacerbated by other disabilities or environmental disadvantages, e.g., poverty (Heward, 2009). Even though students with a SLD generally have average or above average intelligence, they often do not achieve at the same academic level as non-disabled students. Moreover, special education students who experience learning problems often have trouble with low self-esteem, poor motivation, and exhibit the tendency to give up much more easily in the classroom (Lebedina-Manzoni, 2004) making it more difficult for students to connect with and build a relationship with their teachers.

Students with a SLD vary greatly in their instructional needs and backgrounds—differing in ability, learning style, and the need for SDI and related services, e.g., speech language therapy. Additionally, particular subtypes of SLD manifest themselves differently. For example, in reading students exhibit limited acquisition of verbal skills and reading comprehension; whereas, in writing, students may demonstrate difficulty with forming letters and organizing words into meaningful thoughts. Students with a Mathematical Learning Disability (MLD), the focus of this study, experience deficits in their ability to memorize and recall math facts, understand pictorial representations of quantitative concepts, and do not demonstrate correct sequencing of complex operations (Garnett, 1998; Geary, 2004). These inefficiencies make it difficult for students to comprehend the math curriculum and achieve at higher academic levels. Theoretically, with changes to instruction, e.g., visual representations of vocabulary; and the manner in which the student is evaluated, e.g., oral responses, special education students should be able to access the curriculum and perform commensurate with their non-disabled peers.

These changes, better known as SDI, are intended to mitigate the effects of the disability (Hitchcock, Meyer, Rose, & Jackson, 2002). Unfortunately, the typical curriculum and the manner in which it is taught are not specially designed but intended for students with similar instructional needs (Rose, Meyer, & Hitchcock, 2005).

The U. S. Department of Education reports that 40% of secondary age students receiving special education services spend up to 60% of their school day in a special education setting in which core subject areas are taught within a specially designed instructional framework (Adams & Engelmann, 1996; Carnine et al., 2004; Swanson, Hoskyn, & Lee, 1999). This instruction outlined in the special education student's Individualized Education Program (IEP) is based on the student's unique learning needs, present levels of performance, and the accommodations necessary for accessing the core curriculum. Traditionally developed by parents and educators, the IEP includes measurable and observable goals for academic improvement in each area of educational need describing the specific skills necessary to reach each goal. This design is intended to put the burden on teachers to create modified materials personalized to the needs of each student, rather than expecting learners to adapt to inflexible curriculum and strategies that do not work. The real challenge, however, has been to provide learning opportunities using the general-education curriculum that are inclusive and effective for all students. However, across the nation and here in Washington State there exists long-standing disparities in educational performances between special education students and their non-disabled peers, especially in mathematics (Kirsch, Yamamoto, & Sum, 2007; Rampey et al., 2009) suggesting that schools may not understand how to effectively meet student needs.

Highly qualified teachers. According to Title IIA under No Child Left Behind Act (2001) all students must be taught in each of the core subject areas by a teacher who is considered *highly qualified*. The term highly qualified with respect to a secondary teacher is defined as obtaining full State certification as a teacher. In Washington, according to the Office of Superintendent of Public Instruction, this means that a teacher must hold at a minimum a bachelor's degree. Additionally, for each of the academic areas taught, the teacher must demonstrate a high level of competency by either passing a standardized subject examination, e.g., Praxis, or demonstrate competency based on a highly objective uniform state standard of evaluation (HOUSSE). The HOUSSE option, developed in consultation with principals and other school staff, must consider subject knowledge and pedagogy aligned with state academic content.

According to the American Council on Education (1999), a "thorough grounding in college-level subject matter and professional competence in professional practice are necessary for good teaching . . . Students learn more mathematics when their teachers report having taken more mathematics" (p. 6). Given this premise, certification using the HOUSSE method seems reasonable for special education math teachers who have a background in teaching as well as an adequate degree of math knowledge. This latter criteria has been partially addressed in section 300.18(c)(2) of the IDEA (2004). It requires teachers to possess subject matter competency *appropriate to the level of instruction being provided* (U.S. Department of Education, 2004). While this may be easier to measure at the elementary level, the degree of subject knowledge for secondary special education math teachers becomes more difficult as standards become increasingly complex (Fennema & Franke, 1992). Although, the intent of this exception clause

was to allow for certification for experienced special education teachers while taking into consideration the level of subject knowledge needed, the ambiguity and subjective nature of the HOUSSE method gave school districts a loophole. For example, at a time where both rural and urban schools have found it difficult to recruit teachers (Ingersoll, 2003), HQ in math and in special education (Brackett & Brackett, 2005), school districts have used the HOUSSE method to hire and then evaluate high school special education math teachers as HQ (Ingersoll, 2003). As a result, high school special education students are often provided math instruction by special education teachers who lack the appropriate level of subject knowledge in combination with pedagogical skill (Rosas & Campbell, 2010).

This issue of subject competency became even more confusing when an exception clause was added in the reauthorization of the Individuals with Disabilities Education Act (IDEA) (2006) allowing secondary special education teachers to meet HQ standards consistent with elementary level teaching. Section 602(10)(C)(ii) of the Act allowed special education teachers teaching exclusively to children who are *assessed against alternate achievement standards* to meet this lower threshold. What this means is that a high school math student whose IEP team has determined that the student is performing at the 5^{th} grade and assessed using alternate achievement standards may only require that instruction be provided by a teacher with subject matter competency at that 5^{th} grade level. Unfortunately, what IDEA does not address is that most special education math students are first assessed using a standard achievement assessment in which high school common core standards are measured, e.g., Washington utilizes the math assessment titled the End of Course (EOC) exam. It is only after students first attempt and then fail this high school level assessment are high school special education math students given an

opportunity to meet standard using an alternate assessment tool. Exceptions are made for eleventh grade special education students who for some reason were absent during the EOC in tenth grade, but schools are penalized for this absence receiving a score of zero for AYP purposes.

With graduation directly linked to the passing of a high school level competency exam (Revised Code of Washington 28A.655.061), I would argue that all high school students need a teacher competent in high school level math. Without it, high school special education students will continue to fall farther behind their peers, threatening the academic progress of millions of special education students nationwide (Berch & Mazzocco, 2007).

Student learning. In 1983 a report written by a commission appointed by the U.S. Secretary of Education entitled, *A Nation at Risk*, criticized America's public school system. Prior to this report, attempts were made to change and thus strengthen the mathematics' curriculum taught in the public schools, especially after U.S.S.R. launched the *Sputnik* satellite in 1957. Unfortunately, mathematicians and teachers were unable to strike a balance between the teaching of basic skills and abstract mathematical concepts. Eventually, the demands placed on math teachers to learn the more advanced material, e.g. Algebra, the seeming irrelevance to the industrial age, and the complaints from parents regarding the inability to help their child, soon dominated, shifting the pendulum back to a more progressive idea of teaching in which basic skills were primarily taught (Ravitch, 2000). Opponents objected stating that despite good intentions, schools were not meeting the educational needs of the poor and minorities. Many families simply did not possess the education, background knowledge, and financial resources in which to supplement their child's basic education (Delpit, 1988).

Plummeting test scores in the 1970s and early 80s alarmed the public forcing educators to once again examine the issue citing *A Nation at Risk* (1983) as proof that "the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future" (para. 1). Quick to object and defend our schools and students, teachers blamed the ever-changing and increasing student population as the reason for the stagnation in our test scores and a decline in industrial productivity. With increases in poverty (James, Jurich, & Estes, 2001), special education (Kerachsky, 2009), and students learning English as their second language (Rampey et al., 2009), teachers pointed to these as mitigating factors as a legitimate excuse for public school's inability to meet the needs of today's all inclusive classrooms. Researchers, unwilling to accept the tenets of *A Nation at Risk* (1983), examined the factors associated with student learning. These studies were later synthesized in a meta-analysis by Marzano, Pickering, and Pollock (2001). Student learning based on this review of thousands of educational studies, indicated instructional strategies to be the significant factor in positively impacting student learning. Other studies have shown that a positive school climate (e.g., Haynes, Emmons, & Comer, 1993; Kuperminc et al., 2001) and instructional leadership (e.g., Ervay, 2006; Helgesen, 1995; Mulford & Moreno, 2006) were keys to improving student learning. But only factors related to effective instruction, when demonstrated over a series of several school years, were shown to completely close the achievement gap for lower income students (Haycock, 1998; The Education Trust, 2005).

Armed with the belief that school-based factors were the antidote to educational reform, school districts spent thousands of dollars on professional development for teachers to learn how to better implement these instructional strategies, e.g., reinforcing effort and providing

recognition (Gagnon & Bottge, 2006); thinking and communication skills (Wiebe-Berry & Kim, 2008); and developing questions and advance organizers (Brewer & Treyens, 1981). Unfortunately, these efforts have not worked because as the findings of this study suggest, these strategies maybe important but are not sufficient.

Instructional framework. A teacher's instructional framework represents a belief in how students learn (Kemp, Morrison, & Ross, 1996). This framework comprised of specific teaching strategies, skills, and student activities, change based on the individual needs of students. Given the limited opportunities for individualization and huge ranges in student performance levels within a special education classroom (Gersten, Keating, Yovanoff, & Harniss, 2001), school districts have looked for alternative ways to build in more time for teachers to address the needs of their students. One such way has been to adopt curriculum embedded within an instructional framework that requires little teacher preparation and limited subject knowledge (Adams & Engelmann, 1996). Direct instruction (DI), with its scripted, well-sequenced, and highly focused method of teaching (Adams & Engelmann, 1996), has become very popular over the last twenty years among special education math teachers (Jones & Southern, 2003). Its ease in administration and demonstrated effectiveness with special education students have been cited as strengths (Adams & Engelmann, 1996; Kuder, 1990; Engelmann, 2007). However, critics claim that its effectiveness has primarily been observed in its measure of lower level thinking skills, such as, the recall of basic math facts and performing simple calculations (Grossen, 1996; Stebbins, Pierre, Proper, Anderson, & Cerva, 1977), rather than the common core standards assessed at the high school level.

Constructivism, another instructional framework, uses strategies that engage students in these higher standards (Anderson & Hidi, 1988). Although it has shown success with students learning how to solve complex story problems (Bracey, 2007), constructivism, unlike DI, requires a higher degree of teacher preparation time and subject knowledge (Richardson, 1997). Nonetheless, the assumptions of state and national standards are that all students be able to engage in higher level thinking (Goodnough & Cashion, 2006), demonstrate the ability to reason mathematically and use well-developed representations when communicating their interpretations of algebraic and geometric concepts (Lemke et al., 2004).

With many special education math teachers struggling to provide effective math instruction (Ball, Lubienski, & Mewborn, 2001) and the retention rate due to burdensome paperwork loads and extensive time spent in meetings, e.g., (Gersten et al., 2001) school districts' attempts to alleviate this issue have not been enough suggesting that there may be additional factors that could assist teachers in understanding how to better meet the learning needs of special education math students.

Student voice. Research on student voice has primarily focused on students having an opinion or a vote on matters that involve school activities, such as, assemblies and dances (Chiodo & Byford, 2004). Citing reasons, such as, leadership skills and increased engagement (Johnson & Golombek, 2002), schools believed that student participation through meaningful involvement would encourage civic engagement (Billig, 2000) within the students' communities (Lesko & Tsouronis, 1998). But it was not until about ten years ago that the research on student voice began to also consider instructional matters, such as student learning, as a meaningful activity for which students would elect to be involved. Now with studies by leading researchers

in matters of educational reform, (e.g., Cook-Sather, A., Fletcher, A., Gentilucci, J., and Mitra, D.) student voice on instruction has become more prominent, suggesting that involving students clarifies purpose, improves instructional programs, and better meets students' needs (Zeldin, Kusgen-McDaniel, Topitzes, & Calvert, 2000). What has not been demonstrated in the literature is the advantage of including the voice of high school special education students with a MLD concerning their perspectives on how student-teacher collaboration could aid in the selection and use of specific instructional strategies or methods.

This study did not address how school districts might meet the highly qualified teaching requirements amid an era of teacher shortage or how to avoid the built-in penalties for schools when special education students are unable to first access the alternate achievement standards. However, this study did address the concern that the delivery of math instruction and the manner in which SDI has been provided over the last several decades has not produced the desired results. The research on instructional effectiveness is incomplete because it has largely ignored the voice of students in matters related to student learning. Therefore, this study suggested that spending time listening to special education math students and their teachers could give us a better understanding of how to better improve student learning. This study also affirmed how subject competence in math is a significant factor in the limited achievement of all students (Bailey, 2010; Evans, 2011; Merrill, Devine, Brown, & Brown, 2010).

Purpose

The purpose of this qualitative study was to better understand from the perspective of high school special education math students and their teachers how student-teacher collaboration could be used in the provision of SDI. It further explored the specific instructional strategies or

methods teachers could use to positively impact student learning. Despite the research demonstrating students' expressed interest in learning and the roles students have played in enriching the educational process (Chiodo & Byford, 2004; Gentilucci, 2004; Lebedina-Manzoni, 2004; Mitra, 2003; Robinson & Taylor, 2007; Shultz & Cook-Sather, 2001), this study proposed that the body of literature on instructional effectiveness has ignored student voice as a trustworthy source. Seeking student input and placing their perception at the center of this issue provided the leading influence in how instruction could be provided that better meets the needs of special education math students.

Research Questions

1. How could special education math students collaboratively engage with their math teacher in the identification and use of the instructional strategies or methods teachers use to improve student learning?
    a. What are the shared understandings and perceived differences between special education math students and their teachers regarding this collaborative experience?
2. What are the instructional strategies or methods special education math teachers use to improve student learning?
    a. What are the shared understandings and perceived differences between special education math students and their teachers regarding the perceptions of how to improve student learning?

Significance

The research on academic achievement suggests that several school-based factors play a role in enhancing student learning. Students when engaged in a positive atmosphere (Chiodo & Byford, 2004) by teachers who effectively use instructional strategies (Gentilucci, 2004) and under the leadership of principals who are visible and approachable (Glickman et al., 2007) are more likely to remain motivated and involved in learning. However, when student interest is lost, student engagement begins to fade, diminishing its positive influence on learning (Hidi & Renninger, 2006). Student interest, a powerful effect on learner motivation (Alexander, Jetton, & Kulikowich, 1995), can be enhanced when students find the instruction meaningful and of particular interest (Bellig, 2000). Engaging special education math students in a dialogue about the provision of SDI and the manner in which math teachers could connect with students could reveal a different understanding about what facilitates student learning. Not only could the findings from the study potentially alter the look of SDI to become more of a teacher and student interactive process; but, it could also change the way in which student voice is perceived in this high school. For example, student voice could be seen as a cooperative exchange of ideas between teachers and students that offers benefits to both teachers' instruction and students' learning. Additionally, this high school, with their focus on collaborative teaching and differentiated instruction, may want to incorporate the findings from this study into a broader discussion about how we can begin to successfully close the achievement gap in math, making academic gains toward successful high school graduation with special education math students.

Theoretical Framework

The theoretical framework for the study situates student voice within the progressive movement and offers assumptions of what constitutes learning. The role of the democratic leader, constructivist learning principles, and student voice are the lens in which this study is viewed. As educational leaders, it has been our responsibility to ensure that the instruction provided in the classroom acknowledges individual student needs and that teachers respond accordingly. At the same time, it is not merely recognition of those differences, but a response to how those differences might embrace a philosophy of education that views schools as an experientially-based training ground for cultivating a civic minded population aligned with the current perceived needs of a global society. In other words, what defines an educated person today may not have been true forty years ago, because the knowledge and skills necessary for post high school employment have increased

This mindset of education being experientially-grounded, emanated from a period of reform in American education during the late 19th century, and is generally referred to as the progressive movement (Engel & Martin, 2005). The sources of this movement lie in the works of philosopher Jean-Jacques Rousseau (1712-1778), educational reformer Johann Pestalozzi (1746-1827), and educator Friedrich Froebel (1782-1852). Minimizing the importance of book learning, proponents of progressive education believed in the social experience of learning, relying less on teacher directed activities, and encouraging student expression within a cooperative group setting. Allowing for these individual differences and student-centered classrooms were considered radical reforms. Often met with criticism, opponents felt a more systematic, standardized, and sequential approach to learning was more appropriate. But

progressive educators opposed formalized procedures in student learning, maintaining that learning occurs when it is individualized and when students are allowed to engage in free expression and learn through authentic experiences. It is within this philosophical orientation to learning that we see the seeds of student voice taking root.

Efforts to reorganize schools based on this progressive ideology began to emerge as proponents, such as leading educational theorist John Dewey (1859-1952), spoke of his belief that schools should reflect the society they are embedded and that as society changes, schools should adapt as well (Dewey, 1916). Rather than teaching to a predetermined set of skills and a fixed ideology, Dewey saw school as a place where students could learn how to live in a democratic society and be able to use their skills for the greater good. In order for students to have their "full and ready use of all his (sic) capacities," Dewey (1899) wrote that schools need "to give him (sic) command of himself" and to share in the "social consciousness" with others (p. 6). Education, according to Dewey, is a vehicle for creating social change and reform in response to an increasingly diverse population and a technologically advancing world. Based on Dewey's Laboratory School in Chicago, schools across America instituted Deweyian ideas, e.g., Gary, Indiana; Dalton, Massachusetts; and Winnetka, Illinois (Engel & Martin, 2005). In an effort to demonstrate that student learning was based on a practical sense of the present industrial needs, these schools were grounded in a cooperative, experientially-based approach. Yet these reforms met opposition. For example, Dewey's ideas continued to encounter objections as colleges of education and school administrators adopted a school of thought that adhered to a top-down, traditionalist approach to education that embraced a more fixed knowledge. This approach, with predetermined goals based on an obsession with standardization, ignored the

individual needs of special education students and the fluidity of learning. Arguably any student who did not fit the normative definition of a White, middle-class male student, may not fit have well into this very rigid structure.

This study suggested that espousing a more progressive theory in educational reform could provide educators a lens through which to view specific instructional strategies or methods. Valuing the experiences and voices of special education math students within a constructivist approach to learning could offer ideas to special education math teachers for use in student learning. A logical extension of progressivism, democratic leadership creates an environment that fosters the development and support of a constructivist classroom with a specific interest in student voice.

Democratic leadership. According to Fullan (2003) educational leadership is to this decade what standards were to the 1990s. Yet for some school administrators, adjusting their priorities and broadening their focus in examining school change efforts has been too difficult to achieve. Those struggling seem to lack the cultural awareness of their ever changing student population (Albert, 1996; Hallinger & Heck, 1996) and continue to make decisions based solely on standards and tests without taking into consideration the unique needs of those being educated (Bracey, 2007). These leaders, deficient in their ability to forge democratic relationships with staff, parents, and students (Hofstede, 1980), have been unable to strengthen vitality and encourage sustainable academic growth in schools (Helgesen, 1995; Mulford & Moreno, 2006; Waters et al., 2004).

Many public school systems have not been led in ways that enabled them to respond to the increasing demands of today's educational reform because most leadership styles disregard

or overlook the value of a collective and democratic view of change. Under a democratic leader, all persons impacted by the proposed changes have a participatory role in the decision-making process. First described in 1939 by Lewin, Lippitt, and White, a democratic leader in the context of a school would give teachers, students, parents, and community members an opportunity to share their insights and ideas. Feeling more involved and empowered in the decision-making process, participants would be more likely to establish a power-sharing model leading to a more productive and higher quality learning environment (Acker-Hocevar, Cruz-Janzen, & Wilson, 2011; Wallin,2003; Yonezawa & Jones, 2007). Students, seen as capable and valued members of this group, would be especially appreciated in their roles as active participants in improving their learning and identifying factors that inhibited or prevented academic progress (Mitra, 2007). School administrators have found that engaging students in a youth-adult partnership within a democratic framework has helped bridge communication between parents and schools (Mitra, 2007), improving the overall school experience (Gerstl-Pepin & Aiken, 2009), and facilitating student achievement (O'Donnell & White, 2005). Broadening this approach to a special education math classroom, this study sought to examine how a democratic approach to learning could give special education math teachers a better understanding of how to collaborate with students in the provision of SDI and improve student learning.

Constructivism. Rooted in Vygotsky's (1896-1934) research and assumptions known as Social Development Theory and Dewey's belief that a teacher's role is not to drill the basics, but to encourage student self-expression through social experience, the constructivist model of teaching acknowledges that each student learns differently. In order for students to maximize their learning potential, teachers implement a variety of styles and strategies. With the provision

of appropriate materials and discussions using probing questions, students are encouraged to develop their own learning (Anderson & Hidi, 1988). At the secondary level when adolescents are better able to think and reason abstractly (Piaget, 1973), a constructivist classroom engages the student in their quest to solve theoretical problems, and answer hypothetical questions. Through the use of higher order questioning, students then become co-constructors of their knowledge (Anderson & Hoffmeister, 2007; Chung, 2004).

Researchers have found that students view this pedagogical approach, or instructional framework, as engaging, enjoyable, and motivating (Gagnon & Bottge, 2006; Goodnough & Cashion, 2006), particularly when teachers collaborate with their students emphasizing culture, social learning, and language development (Bottge et al., 2007; Mevarech, 1999; Song, Grabowski, Koszalka, & Harkness, 2006). This constructivist approach to learning has relied heavily on the voice of students and without it cannot exist.

Student voice. Concerned with influencing the quality of teaching and student learning outcomes, learning-centered instruction (Hoy & Hoy, 2003) or personalized learning (Hargreaves & Fink, 2004), have used a democratic approach in which students participate in the learning process by developing and choosing instructional strategies, and then evaluating their own learning success with these strategies. This degree of involvement by students is what Britzman (1989) has defined as student voice. In this context, student voice has not merely been an opinion or a vote, but an opportunity to make decisions regarding the planning, implementation, and evaluation of their learning experiences (Rogers, 2005). This study then adopted the principle that students have a unique perspective on learning and that when listened to can positively impact their education (Cook-Sather, 2006).

Student voice has provided a compelling argument for how schools, steeped in constructivist and progressive grounding, can accomplish this shift in thinking. Being able to look beyond the scores and listen to students as co-constructors of learning have been what leaders in the field of student voice advocate, and was an important lens to this study (e.g., Cook-Sather, 2006; Mitra, 2003). Historically, studies in educational reform have traditionally ignored the voices of students, often relying on thousands of teacher-centered studies (e.g., in Jones & Southern, 2003; Marzano et al., 2001). This study places special education students at the center with their perceptions of SDI as the leading influence in determining the most effective set of instructional strategies to use.

Limitations

Several characteristics of this study's design limit its ability to interpret and generalize the findings from the sample group to a larger student and teacher population.

- The small student and teacher sample size.
- One high school's special education math department.
- The time frame of the study giving some students little opportunity to review the data prior to the end of the school year.
- The recall of the teachers to remember what instructional strategies were used.
- The comorbidity of learning disabilities and their impact on a student's ability to learn math.
- The withdrawal of two teacher participants.

Delimitations

Due to the scope of this study, several delimitations narrow the study's implications and suggestions for further research.

- The perspective of special education students may be different than students without disabilities.
- A student's culture or ethnic background was not explored.
- Students with multiple disabilities may present a different perspective on how instruction could positively impact student learning.
- General education math teachers or students' perceptions of effective instructional strategies was not explored.

Definition of Terms

For the purpose of this study, the following definitions were used in the understanding of certain terms.

Specially designed instruction, a term defined in the Individuals with Disabilities Act (2006), means adapting, as appropriate to the needs of the student, the content, methodology, or delivery of instruction to ensure access to the general core curriculum, so that the student can meet the educational standards that apply to all students. For this study, I was particularly interested in the specific use of instructional strategies or methods teachers use.

Instructional strategy is a term used in Marzano et al's., (2001) book *Classroom Instruction that Works.* It is defined as any method or way of teaching designed to have an effect on increasing student achievement.

Core curriculum, a term defined in the Elementary and Secondary Education Act (1965), means the set of courses and their content provided to non-disabled students. Core curriculum is

often based on grade level academic standards and measured by local, state and national standardized assessments.

Student voice, according to Britzman (1989), is a concept interpreted literally, metaphorically, and politically. It is a perspective, a representation of the speaker's words, and a call for action. Although the purpose of this study was to seek the perspective of special education math students, I believe that one cannot engage in a "call for action" until a perspective is first obtained. Therefore, the theoretical perspective of this study embraces the concept of student voice as defined by Britzman (1989), but the study only addressed the initial step—the perspective of special education students. However, recommendations and suggestions for further research in the last Chapter attempt to engage the reader in a call for action in order to have a greater impact on student achievement.

Mathematical Learning Disability (MLD), according to current research (e.g., Fuchs et al., 2005; Greary, 2004) and based on Kosc's (1974) research of more than 30 years ago, is defined as a biologically based disorder impacting a person's ability to understand and process visual and spatial information as it relates to mathematical concepts. A student with a MLD performs significantly below grade level; yet, their cognitive abilities are typically within the normal range of functioning. A MLD is a subtype of the broad category of Specific Learning Disability used in the qualification and provision of special education services for school-age students as outlined in the Individuals with Disabilities Education Act.

Organization of Dissertation

This qualitative study begins with a review of the literature in Chapter Two examining issues related to student learning and the factors impacting it. In Chapter Three, the design of the

study is presented followed by the themes in Chapter Four. This study concludes in Chapter Five with findings, recommendations and suggestions for further research in an effort to better understand how students and teachers could collaborate in the provision of SDI and positively impact student learning.

CHAPTER TWO

LITERATURE REVIEW

Improving the quality of education in America's schools has been a primary focus of educational reform since the National Commission on Excellence in Education presented the report, *A Nation at Risk* (1983). Citing issues aligned with poor teaching, the report called for increased accountability to improve student learning. Today, accountability has been defined via No Child Left Behind (NCLB) (2001), a recent reauthorization of the Elementary and Secondary Education Act (1965), with scores of student learning measured in the form of state and nationwide standardized assessments (e.g., Washington's High School Proficiency Exam and the National Assessment of Educational Progress). In Washington, students in grades 3 through 10 are tested annually in core subject areas such as reading, math, and science—their progress tracked using a system of Adequate Yearly Progress (AYP). Schools that fail to demonstrate AYP in all subgroups, (e.g., socioeconomic, ethnic, and special education) are considered schools in need of improvement and face a series of escalating sanctions. Additionally, high school students who fall short of a passing score are at risk of not graduating on time or not graduating at all if they are unable to obtain a satisfactory score on one of several alternate assessment options, e.g., Scholastic Aptitude Test. For most special education students, an opportunity to be assessed against alternate achievement standards, e.g., the Developmentally Appropriate Proficiency Exam, is provided. However, special education students are only eligible to take the alternate measure in goal areas as defined in their IEP. What this means is that students who qualify in the area of reading can only be assessed against an alternate achievement standard in reading, ignoring the comorbid effects reading has on the understanding of mathematical concepts presented on a high school level math exam. Additionally, students

assessed against this alternate achievement standard must achieve at a proficient level, rather than basic, in order to meet standard in each of the tested areas. Despite the efforts to highly define and legislate a system of accountability, in which *no student is left behind*, the NCLB has created a system of negative consequences and an unfair advantage to special education students requiring more, not less, accommodations. This review of the literature examines how factors, such as, instructional leadership and school climate have not provided sufficient answers in how to effectively design instruction that meets the needs of all students.

Effective Instruction

A 1966 report titled *Equality of Educational Opportunity* (Coleman et al.) claimed that after analyzing data from 4,000 schools, researchers concluded that only about 10% of student achievement could be attributed to school based factors, such as, school climate, principal leadership, or teacher effectiveness. However, factors such as student aptitude and a family's socioeconomic status accounted for the remaining 90%. Teachers, administrators, and colleges of education believing that school factors accounted for more than 10% of a student's learning responded to this report over the next several decades with thousands of studies (in Marzano, Pickering, & Pollock, 2001). These studies when examining the factors impacting student learning, found that schools have a greater impact on student learning than once previously thought (e.g., Brophy & Good, 1986). Studies indicated that when students and teachers engaged in quality interaction, a climate that supports student learning was created (Haynes et al., 1993; Kuperminc et al., 2001). Additionally, principals and other school administrators played a key role in educational reform and student improvement when perceived by students as by being visible and approachable (Helgesen, 1995; Mulford & Moreno, 2006; Waters et al.,

2004). But according to a study of state assessment results (Haycock, 1998), it is having an effective teacher that has had the greatest impact on student learning and it is the one factor that is most likely to close the achievement gap for low-income students (The Education Trust, 2005).

An effective teacher, based on Marzano, Pickering, and Pollock's (2001) meta-analysis of thousands of educational studies conducted over two decades, revealed that there are nine types of instructional strategies teachers should use to increase student achievement. These strategies: identifying similarities and differences (Goodnough & Cashion, 2006); summarizing and note taking (Wiebe-Berry & Kim, 2008); generating and testing hypotheses (Anderson & Hoffmeister, 2007; Chung, 2004); representing knowledge (Anderson & Hidi, 1988); creating and sustaining learning groups (Mevarech, 1999; Song et al, 2006); developing cues, questions, and advance organizers (Anderson & Hidi, 1988); providing homework and practice (Engelmann & Carnine, 1982); reinforcing effort and providing recognition (Gagnon & Bottge, 2006; Shippen, Houchins, Calhoon, Farlow, & Sartor, 2006); and setting objectives and providing feedback (Chung, 2004) have become the "science" of teaching, and a relatively new phenomenon according to Marzano et al.

However, despite over two decades of research on the science of teaching, factors contributing to student learning and student achievement have not significantly impacted the achievement gap since 1973 (Rampey et al., 2009), with no measurable changes since 2003 (Darling-Hammond, 2010). Additionally this gap between the highest performing students and the lowest performing students, e.g., special education, has widened dramatically over the last ten years (Kirsch et al., 2007). As a result, a shift in how educators perceived the problem began

to occur viewing instructional leadership and a school's climate as contributing factors to student learning.

Instructional leadership. Efforts to bridge the gap between general and special education students have been exhausted via school reform efforts as researchers have examined academic progress and the impact of instructional leadership on student learning (Fullan, 2003; Glickman et al., 2007; Marzano, Waters, & McNulty, 2005). In a study by O'Donnell and White (2005), the relationship between a principal's instructional leadership and student achievement was explored. Researchers randomly selected 250 8th grade English and Math teachers along with 75 principals from Pennsylvania public middle schools. Using data from Pennsylvania's most recent standardized measure of reading and math as the measure for academic achievement, teacher and principal participants were asked to complete Hallinger's (1987) Principal Instructional Management Rating Scale (PIMRS). Assessing three dimensions of a principal's instructional leadership 1) defining the school mission, 2) managing the instructional program, and 3) promoting the school learning climate, the PIMRS required respondents to identify the frequency with which the principal performed fifty specific instructional leadership behaviors, e.g., limit interruptions of instructional time, discuss school issues with students and staff, compliment teachers, and publicly honor students for academic accomplishments. O'Donnell and White found a positive relationship between a teacher's perception of a principal's instructional behaviors and increased student achievement when comparing achievement data across the middle schools. However, it was the principal's behaviors related to promoting a positive school climate that seemed to be the strongest factor on predicting math and reading achievement.

School climate. The connection between school climate and a school's overall academic achievement has been well documented (e.g., Chiodo & Byford, 2004; Freiberg, 1998; Harris & Rudduck, 1993; and Johnson, Johnson, & Zimmerman, 1996). A multifaceted concept, school climate comprises several factors that can impact student learning, e.g., the quality and quantity of interaction between staff and students (Haynes et al., 1993; Kuperminc, Leadbeater, & Blatt, 2001); having a school-wide system of shared values and a feeling of safety, trust, and respect (Freiberg, 1998; Johnson, Johnson, & Zimmerman, 1996; Kottcamp, 1984); and a positive and supportive environment (Urban, 1999) within a system that clearly defines discipline and involves parents (Haynes et al., 1993). Schools that do not embody such a climate face increased discipline referrals and a decline in academic performance (Marshall, 2005).

Faced with 600 discipline referrals resulting in 50 expulsions and 798 out-of-school suspensions, this alternative high school of 172 students located in Southeastern Washington struggled with their focus on student learning and the daunting challenge of how to deal with the high number of discipline problems (Stevens, 2012). A veteran principal of 25 years and a reputation with how to positively connect with students and staff, this high school principal set out to change the school's culture. In collaboration with the co-founder of the Children's Resilience Initiative (Barila, 2010), they teamed up to educate staff on the effects of stress and its connection to childhood trauma both of which have shown to have a significant impact on student learning according to the National Education Policy Center (Losen, 2011). Receiving a First Fruits grant from the Blue Mountain Community Foundation, professional development was provided to the high school's 17 teachers on trauma and its impact on physical health and

related factors associated with academic achievement. Additionally, staff engaged in a book study of *Brain Rules* (Medina, 2008).

With poverty 20% higher than the other local high school and a doubled special education rate (21.7%), staff already knew their students faced challenges. What they did not realize, however, was the positive impact they would have when staff approached discipline issues differently. Starting with changes in the classroom, teachers rather than thinking about consequences began building connections with kids in an attempt to learn more about what led up to the behavior. Through educating staff about the effects of childhood trauma and responding to behavior problems differently, this high school experienced an 85% drop in discipline referrals and a significant decline in the number of expulsions and out-of-school suspensions. More remarkable was the change evidenced in academic achievement. Although still below the national and state average in math scores and extended graduation rate, this alternative high school took a step closer to closing the achievement gap when it experienced a 10 percentage point increase in math scores and a decrease in the overall student dropout rate (*Washington School Report Card*, 2011).

In short, instructional or teacher effectiveness, up until recently, has been largely measured based on surveys of teachers and other educational staff. Few studies have gone straight to those benefitting the most from that instruction--students--and then asked them what they deem to be most effective in the classroom. Even less has been the research with special education students and their perception of the instruction intended to mitigate the effects of a learning disability.

Student Voice

The presence of student voice was first written about in 1916 by John Dewey, advocating for the inclusion of student voice through student engagement in the school's curriculum. Later student voice evolved into a concept of student councils (Johnson, 1991) and more recently to students being viewed as critical members at the table when discussing curriculum design and instructional methods (Mitra, 2003). Student voice via student government, fundraising events, social activities, and school clubs; although important to enhancing a school's positive climate (Chiodo & Byford, 2004; Harris & Rudduck, 1993), has not been the example put forth in today's research by student voice advocates (Fielding, 2004). Rather, the research on student voice within the last ten years has primarily emphasized students as necessary change agents within educational reform and on matters that relate directly to their learning (Chiodo & Byford, 2004; Cook-Sather, 2002; Gentilucci; 2004; Lebedina-Manzoni, 2004; McCall, 2000; Mitra, 2003; Robinson & Taylor, 2007).

Adopting Dewey's (1916) philosophy that shared decision making is a necessary component of a society's democracy, the definition of student voice in educational reform has become more than just an opinion or a vote, but a call for action based on the perspectives of students within the context of learning. Student voice can positively influence instruction (Cook-Sather, 2002; Lodge, 2005; Mitra, 2003), shape curriculum and design (Fielding, 2001; Mitra, 2003; Robinson & Taylor, 2007; Rudduck & Flutter, 2000), and strengthen teacher evaluation systems (Cook-Sather, 2006; Gentilucci, 2004; Gentilucci & Mutto, 2007). Emphasizing the value of students' unique perspective on learning, advocates of student voice argue that when

listened to, students can and will positively engage in their own education and effectively impact their learning outcomes (Cook-Sather, 2006).

Testing an assumption that students don't care about learning, perceiving school as primarily a place to socialize; and that student failure is the result of factors outside the school system, Gentilucci (2004) conducted a secondary analysis of a 1978 study (as cited in Corsaro, 1985). The researcher gathered data consisting of participant observation and respondent-driven interviews of 54 general education 6th grade students on their thoughts and feelings about learning and the importance of specific instructional practices. To test the stability of these findings, Gentilucci (2004) collected new data using a focus group of 12 same grade students asking them whether or not the perspectives of the original participant sample reflected the views of today's elementary students. Subjected to an identical process of analysis, the findings suggested that the initial perspectives had remained stable over time with a 68% agreement rate.

Citing learning as the key reason for attending school, 96% of the original cohort expressed a genuine interest in learning. Additionally, no student gave outside variables, such as, race or socioeconomic status, as reasons for their poor learning. Rather, when asked to describe their learning experiences, 91% of those interviewed described schoolwork as unchallenging, too easy, and overly repetitious resulting in a certain degree of student boredom. Adding to their boredom and leading to frustration, were teachers who often got off topic, didn't explain concepts well enough, or mismanaged the classroom. Attempting to avoid particular instructional strategies or methods that the teacher often used, students admitted to intentionally socializing, withdrawing, and/or conspiring to keep the teacher off track. For example, students reported an overuse of cooperative groups (72%) and poor teaching methods (70%), such as,

worksheets, end-of-chapter questions, and oral readings. Anger, ridicule, and a lack of care were also perceived by students (72%) as they described their teachers and the classroom environments. Unsure as to the cause of a teacher's misbehavior or whether it was in response to student frustration or the misuse of specific instructional methods, the findings suggested that students are interested in learning when taught in a positive atmosphere and instructed in a manner that meets their unique needs. What was less clear in this study were the specific instructional strategies teachers could use to make lessons more interesting and whether or not the elementary students' perspectives would be the same as high school special education students. This demonstrates the need for further research as to how high school special education students perceive SDI and the instructional strategies math teachers could use to impact student learning.

In another study with the school's graduation rate at 57% and a one-to-three rate of teacher turnover, the teachers at a San Francisco area high school realized the need for change. Receiving a major grant from the Bay Area School Reform Collaborative to commence a three-year reform effort, the school's leadership team decided to seek the perspective of their students. Unhappy with their school's reputation in the community, the relationship they had with staff, and feeling frustrated with their inability to reach higher learning standards, the students agreed to participate. This study (Mitra, 2003; Mitra, 2008) based upon over 100 interviews and observations over a two-and-a-half year period examined how student voice influenced teacher perspectives. The findings created a collaborative environment whereby students and teachers participated in the school's effort to improve student learning.

Led by the high school's veteran guidance counselor and a fourth-year teacher, focus groups of students (n = 10 to 12) representing a diverse background of race, socioeconomic status, and academic achievement, provided their perspective on the types of academic supports students needed in order to succeed. Students as co-researchers in the examination of the focus-group data identified four areas in need of reform and presented them to staff:

1. Improving the school's reputation;

2. Increasing counseling and information for incoming ninth graders;

3. Improving communication between students and teachers; and

4. Raising the quality of teaching.

Students in these focus groups, excited that their voices were being heard in matters that were typically off limits to students, evolved into a Student Forum that met daily to discuss how their school could improve. Initially worried about the community's perception of their school and the opinion their teachers had of them, pairs of students took teachers on tours of their neighborhood. Teachers, unaware of the dangers of what some of their students faced and the conditions in which they lived, found the experience valuable, raising the consciousness about how certain neighborhoods were viewed and its potential impact on student learning. With this newfound insight and shared understanding, the Student Forum felt that they would be able to bridge the gap between teachers and students as they concentrated on reframing the partnership they had with teachers. Co-participating in professional development, for example, students shared their perspectives on how students might perceive new instructional strategies, ways in which lessons could be more interesting and applicable to students' needs, and how course

objectives could be rewritten in terms that students better understood. Likewise, teachers shared their perspectives on school policy, assessment development, and the research that supports the use of particular strategies. Although this study did not provide evidence that it actually improved student learning nor did it seek the perception of special education students, it did demonstrate how involving students in the reform process created a shared understanding between students and teachers. Not only were students able to deepen their understanding of the changes teachers were trying to make in the classroom, but the study also provided teachers the immediate feedback they needed to adjust their lessons in a manner best understood by the students.

Mathematics Instruction

Remarkably, the importance of acquiring basic math skills for functioning effectively in the 21st century as compared to reading skills has only recently gained recognition (Berch & Mazzocco, 2007). In Murnane and Levy's (1996) book on the principles of educating children, they found that the basic math skills required in an average workplace are those that should have been acquired by ninth grade, yet according to the U.S. Department of Education (2008), almost half of America's 17-year-olds do not have the basic understanding of math necessary for the average job. Comparatively speaking, the information and research on mathematics instruction compared to reading has been significantly disparate, especially at it relates to special education (Carnine, Silbert, Kame'enui, & Tarver, 2004). For example, when Berch and Mazzocco (2008), in preparation for their book on the difficulties of math, "Googled" the phrase *math disability,* it yielded 10,400 hits. Yet when the phrase *reading disability* was searched, it yielded 331,000. Curious to see how the supply of information has changed, I replicated Berch and Mazzocco's

(2008) search at the time of this writing (May 28, 2012). The phrase *reading disability* yielded 3,890,000 hits; whereas, the phrase *math disability* yielded only 11,200. In an era of technological advancement, it's hard to believe that in four years a mere 800 pieces of information on the topic of math disability has been added to the internet, yet the information on reading has increased ten times. Although the research on the origins of mathematical difficulties has taken center stage, I would argue that the information on math instruction is not as widely studied or understood as reading given the number of multiple meta-analyses conducted on reading instruction (e.g., Jeynes, 2008; Benner, Nelson, Ralston, & Mooney, 2010). Rather, a substantial share of mathematics research has consisted of the content or the standards that should be addressed within a prescribed ideology rather than examining the impact of varying instructional strategies on student learning in regard to different grade levels, across different settings, and with diverse student populations, (Berch & Mazzocco, 2008). Educators interested in learning more about how to effectively provide mathematics instruction founded on rigorous and replicable evidence may find it difficult—a concern expressed in Jones and Southern's (2003) review of a meta-analysis on math instruction. Pedagogy or the science of how math should be taught has been addressed less frequently, especially with secondary age learners (Kilpatrick, 1992). For example, in Berch and Mazzocco's (2007) book on the nature and origins of mathematical learning disabilities, only three chapters are devoted to instructional interventions. The remaining sixteen chapters speak to the characteristics and neuropsychological factors associated with the difficulties in learning math. Although I understand that it is important to first understand the causes of an issue before attempting theories of intervention, the lack of pedagogical information on math disabilities presents a major

challenge for teachers faced with advancing mathematics achievement. Without this pedagogical information, strategies designed to benefit student learning are ineffective.

Instructional Framework

When selecting the appropriate set of instructional strategies to use with different learners in the classroom Engelmann and Carnine (1991) have suggested that teachers should focus their attention on the effectiveness of such known instructional practices (e.g., Maccini, Mulcahy, & Wilson, 2007; Marzano, Pickering, & Pollock, 2001), rather than becoming entangled in ideological discussions about the merits of one instructional framework over another. However, two instructional frameworks—constructivism and direct instruction— grounded in very different notions about teaching and learning, have emerged within the literature as demonstrating some promise, particularly with special education students (e.g., Gagnon & Bottge, 2006). Although, typically not discussed in direct opposition to each other, both constructivism and direct instruction characterize traditional approaches to mathematics instruction as deficient in providing a more balanced conceptualization of mathematical skills and strategies. The merits of each are presented next.

Constructivism. The constructivist model of learning offers an approach to instruction that allows students to construct their own knowledge when teachers provide appropriate instructional materials and facilitate discussions with indirect, yet probing questions (Anderson & Hidi, 1988; Mallory & New, 1994). At the high school level, when the transition from concrete to formal operations thinking begins, students are better able to think and reason within this constructivist framework. A teacher and student's ability to think abstractly, solve

theoretical problems, and answer hypothetical questions are all characteristics critical to the success of a constructivist classroom (Santrock, 2008). Students within this instructional framework become co-constructors of their learning and serve as active participants within small cooperative learning groups (Mevarech, 1999), encouraging students to solve authentic problems and to use higher order thinking (Anderson & Hoffmeister, 2007; Chung, 2004).

Gagnon and Bottge (2006) qualitatively explored the impact of a problem-solving strategy on 17 high school students with learning disabilities. The students described the strategies as meaningful, motivating, and engaging. Furthermore, Song et al., (2006) discovered that according to a study of 122 middle school and college level students, strategies aligned within a constructivist framework were helpful in a problem-based learning environment. Cooperative learning, teacher wait-time, and solving real-world problems were ranked as highly influential in a students' ability to think reflectively. Although the use of critical thinking has been shown to improve the ability to reflect and solve multi-step word problems as demonstrated in this study and in others (e.g., Bottge et al., 2006) a constructivist framework has also been shown to increase the performance of basic math skills. Bottge et al. (2007) over a 4-week period examined the impact of a problem-based learning model with 100 secondary age learning disabled math students. Both problem solving and math computation performance increased for all student participants. In addition, Mevarech (1999) randomly placed 174 seventh grade students in either a direct instruction, constructivist, or control group and measured their performance of basic math facts with algebraic concepts. The results indicated positive effects for students in the constructivist group in which metacognitive questioning strategies were used.

Constructivist approaches have also been beneficial at the elementary level. Chung (2004) in the study of 71 third grade students found the constructivist framework useful when learning multiplication facts from 0 to 5. Bracey (2007) discovered similar results with a group of second grade students when learning how to solve open-ended based math problems.

Direct instruction. Direct instruction (DI), an instructional framework developed by Siegfried Engelmann in 1964, has been favored in special education for more than twenty years (Adams & Engelmann, 1996). Although not solely intended for special education students, its ease in administration and limited preparation time required make it attractive to special education teachers when insufficient lesson preparation time has been cited as a common reason for teacher's leaving the field of education (Gersten, Keating, Yovanoff, & Harniss, 2001). More importantly, however, has been the success direct instruction has shown with struggling readers (Adams & Engelmann, 1996; Engelmann, 2007; Kuder, 1991; Kuder, 1990) and for students with a learning disability in math (Flores & Kaylor, 2006; Tournaki, 2003).

Adhering to a 3-step instructional process, DI is a fast-paced, scripted, and well-sequenced method for teaching (Adams & Engelmann, 1996; Carnine et al., 2004; Engelmann & Carnine, 1982):

1. The teacher models the question stem and answer;
2. The teacher leads with student response following a prompt; and
3. Students engage in independent practice.

When students respond, it is generally in unison with immediate corrective feedback using a specific correction procedure. Academic skills and concepts are taught explicitly and repeatedly until mastery has been achieved. Additional steps in the conceptual process are not presented

until mastery of the previous skill has been achieved (Engelmann, 1999). This scaffolding approach showed success in a study of 84 second graders with weaknesses in both reading and math (Tournaki, 2003). Compared to a traditional drill and practice strategy, learning disabled participants in the DI group made significant improvement in learning how to add and subtract using the minimum addend strategy (example: 3+5=___, the student starts with 5 and adds three more). Additionally, Phillips, Leonard, Horton, Wright, and Stafford (2003) examined the performance outcome of 22 first and second grade students in the area of math computation using a DI and a traditional instructional program. Significant differences were observed between the two groups with those in the DI group evidencing higher gains at post-test.

Success at the secondary level has also been demonstrated. Flores and Kaylor (2006) sampled 30 seventh grade at-risk math students and their response to a DI fraction skill curriculum led by pre-service teachers trained in DI. Results showed a significant increase in post-test scores as compared to those provided instruction using a traditional teacher demonstration of skill and procedure followed by student practice worksheets. Additionally, Montague (1992) over a 4-month period examined the effects of cognitive and metacognitive strategy instruction on mathematical problem solving among 6 learning disabled middle school students. At post-test, this approach led to increased knowledge and performance of problem solving among 4 of the 6 participants.

Critics of DI state that its scripted instructional program has been less effective in the retention of math skills at long-term follow up (Montague, 1992; Phillips et al., 2003). Citing reasons, such as known-answer questions (Wiebe-Berry & Kim, 2008) and lower level thinking (Grossen, 1996; Stebbins et al., 1977), DI restricts students' opportunities to learn through

authentic experiences and ignores the social context of academic learning. For example, Souvignier and Kronenberger (2007) found that when teachers asked third graders to "Explain why . . ." students felt encouraged and were able to elaborate, providing explanations of their reasoning.

As singular approaches to instruction, constructivist and DI frameworks have provided an insufficient approach to student learning, especially over an extended period of time (e.g., Ives, 2007; Shippen et al., 2006; Wilson & Sindelar, 1991). Although both frameworks advocate instruction that involves both knowing and doing mathematics, neither provides the quality of instruction necessary to meet the unique needs of special education students. Perhaps by combining the strengths of both direct instruction and constructivist frameworks—procedural skills and conceptual understanding—students with a MLD may be able to acquire more knowledge, transfer to real-world contexts, and retain learning longer (Dochy, Segers, Van den Bossche, & Gijbels, 2003; Jones & Southern, 2003). Regardless, without a collaborative approach to better understanding SDI and the instructional strategies special education math teachers could use to increase student learning, special education students will continue to fall further behind.

Mathematical learning disability. Students who qualify for special education services vary greatly in their instructional needs and background. They differ in ability, learning style, and the need for related services, such as, assistive technology or speech language therapy. Some students have cognitive impairments or physical disabilities which can range from mild to severe; whereas, others have particular emotional and/or behavioral needs that manifest themselves in the form of aggression, impulsivity, or anxiety. Students with a Mathematical

Learning Disability (MLD), however, experience significant difficulty with the recall of basic math facts, e.g., 5 + 2 = 7 (Pellogrino & Goldman, 1987) exerting so much energy computing simple addition, e.g., that they have little attention left to give to understanding and applying more difficult concepts. For example, Bottage & Hasselbring (1993) compared the performance at one high school of 36 ninth grade students from two remedial math classes and the students from all general education and pre-algebra classes in their performance response to a fraction-computation and a problem-solving instruction program. Results indicated that although both groups were able to make gains equal to one another in adding and subtracting fractions, participants in the remedial group continued to fall behind in the ability to solve word problems.

Learning math can be very difficult, even for students without a MLD. With advances in science and engineering, the mathematical expectations for many occupations have increased (Spellings, 2006). Math in today's technological age is more than being able to compute basic or even complex calculations—it is the interrelationship of procedural skills and the conceptual knowledge in understanding how to apply mathematical principles within a sophisticated realm of a particular concept (Siegler & Shrager, 1984). Additionally, math, unlike reading, advances with each grade level and its conceptual demand increases over time relying heavily on previously learned material (Geary, 1993). In an article synthesizing the research on students with MLD and other disabilities, e.g., reading, Swanson and Jerman (2006) found that students with MLD performed less on measures involving verbal working memory, visual spatial skills, and long-term memory tasks. This makes it very difficult for students to retain and later recall information necessary for higher level thinking.

According to Piaget (1973), children when making mistakes often go on to discover their errors and either correct them or find new solutions. Children, when given this opportunity, build their own way of learning. This pattern of cognitive development has been shown to be the same among normal developing children and those with learning disabilities (Gallagher & Reid, 1981); however, the rate of development is slower and reasoning for problem solving less efficient with the latter (Baker, Decker, & Defries, 1984). This has resulted in students with a MLD often displaying inaccurate or unproductive strategies, poor retention, and a slower retrieval of basic math facts (Chan & Dally, 2001; Geary, 1993). The mere exertion needed in the calculation of basic math facts has prevented students with a MLD from focusing on math procedures and problem solving skills necessary for advanced mathematical concepts (Fuchs, Fuchs, & Apprentice, 2004). This becomes especially problematic at the secondary level when teenagers have a reduced working memory capacity and tend to use inefficient approaches to learning (Pellegrino & Goldman, 1987; Westwood, 1993). However, when students with a MLD receive appropriate and effectively designed instruction, evidence of their academic progress in math has been demonstrated (Adams & Engelmann, 1996; Kuder, 1990). In a study of 30 high school students with mixed learning disabilities, Ives (2007) examined the effects of a graphic organizer taught within a constructivist classroom. At post-test and at follow up, the results showed a significant increase in the participants' math ability and conceptual knowledge of linear equations. Still, the prevalence of this disorder coupled with its complexity makes it difficult for teachers to both understand and meet the instructional demands of students with a MLD (Boardman, Arguelles, & Vaughn, 2005; Fuchs & Fuchs, 2004; Geary, 2004). However, if special education students were involved in the understanding and development of SDI and how

specific instructional strategies or methods could benefit their own unique learning needs, then perhaps the value and effectiveness of that instruction would be evident.

Summary

In general, students have said their learning is enhanced when teachers are informed of their content area (Lebedina-Manzoni, 2004; Shultz & Cook-Sather, 2001), connect lessons to matters meaningful to outside and beyond school (Bernhardt, 2005; Mitra, 2003); and offer concise and easy to understand explanations (Chiodo & Byford, 2004; Cook-Sather, 2007; Robinson & Taylor, 2007). Furthermore, students have described an ideal learning environment as one in which teachers are fair and enthusiastic (Chiodo & Byford, 2004); display a positive, caring attitude, and to a certain degree teach in an entertaining manner (Harris & Rudduck, 1993). Research also suggests that a direct influence on learning exists when school staff maintain visibility, are approachable and available, and are able to consistently engage students, motivating them to try harder and do their best (Gentilucci & Muto, 2007). In addition, when students feel cared about and are included in class discussions, they are more likely to engage with teachers, creating a motivation to want to learn (Haynes et al., 1993; Kuperminc et al., 2001; Moos, 1979).

The research on student voice thus far has been with typical learners or those deemed at-risk due to drug use or socioeconomic status. None of the research has targeted secondary special education students and a student-teacher collaboration that could exist in the understanding of SDI and its impact on student learning. Considering the unique needs of special education math students and the growing achievement gap between them and non-

disabled students, this study sought the perspective of special education math students and their teachers on how student-teacher collaboration could aid in the provision of SDI.

CHAPTER THREE

METHODOLOGY

I used qualitative methods for this study. According to Holloway (1997), qualitative research is a form of social inquiry that focuses on the way people interpret and make sense of their experiences in the world in which they live. Furthermore, because of its exploratory nature, I modified the original study's purpose based on the actual participant responses and subsequent findings, shifting the researcher lens in a slightly different direction than anticipated. The study moved from how *do* students and special education math teachers collaborate to how *could* students and teachers collaborate in the provision of SDI. My assumption of collaboration was erroneous.

Based on a study by Mitra (2003) that asked high school students to identify factors that inhibited or prevented academic progress, I asked high school special education math students and their teachers to construct meaning around their classroom experiences with specific reference to the collaboration between students and teachers in the provision of SDI. I also asked participants to describe the instructional strategies or methods used by special education math teachers in their pedagogy that reflected this collaborative process. Exploring the phenomenon of SDI from the perspective of students and teachers initially through a series of questions structured within a conversational dialogue allowed student and teacher participants to freely construct their own meaning of collaboration and effective instructional strategies (Rubin & Rubin, 2005) and helped me learn the factors associated with academic progress (Crotty, 1998).

Therefore, through the use of student focus groups, interviews, and online teacher surveys the purpose of this qualitative research was to "gather the terminology, judgments, perceptions, and experiences" (Patton, 2002, p. 348) of the special education math teachers and their students in one high school. I wanted to learn from a student and teacher point of view how the instruction provided within the context of a special education math classroom could positively impact student learning (Marshall & Rossman, 2011). By listening to the multiple student and teacher realities within these similar classroom environments (Lincoln & Guba, 1985), the data provided me a better understanding of how student-teacher collaboration could be used more effectively and what specific instructional strategies or methods special education math teachers could use to positively impact student learning.

Research Questions

1. How could special education math students collaboratively engage with their math teacher in the identification and use of the instructional strategies or methods teachers use to improve student learning?
    a. What are the shared understandings and perceived differences between special education math students and their teachers regarding this collaborative experience?
2. What are the instructional strategies or methods special education math teachers could use to improve student learning?
    a. What are the shared understandings and perceived differences between special education math students and their teachers regarding the perceptions of these instructional strategies or methods?

Site

This comprehensive high school located in Southeastern Washington with 1,875 students had a 40.7% free and reduced rate indicating a moderate level of student poverty. Additionally, with a 31.3% Hispanic population and 10.5% qualifying rate for special education services, this school represented the diversity of traditional high schools across the state, especially those that serve large rural communities. With a focus on data driven results (Schmoker, 2006), this high school has made a concerted effort to bridge the gap between their highest and lowest performing student groups. Incorporating a philosophy of one size does not fit all (Gregory, 2007), this site has implemented a differentiated instructional approach into their repertoire of course offerings, embracing the school's mission of giving every student an opportunity to be college-bound or work-ready upon high school graduation. Within a collaborative teaching model, teachers from ESL and special education work closely with the English, mathematics, science, and social studies departments to meet the learning needs of special education and students with limited English proficiency. Despite these efforts, however, this high school experienced a greater than ten percentage point drop on last year's statewide math assessment, with a current overall passage rate of 38.6% and a 6.8% passing rate among special education students (*"School report card,"* 2010)

Participants

Three special education high school math teachers and their special education students from one comprehensive Southeastern Washington high school participated in this study. The student participants in this study, 7 female and 8 male special education high school students, were enrolled in one of three special education math courses taught by a special education math

teacher. The combined racial make-up of the focus groups was 57% Caucasian and 43% Hispanic. All student participants were diagnosed with a Mathematical Learning Disability with instruction provided in a special education setting for all of their high school and middle school years. Their teachers, also participants in this study, ranged in teaching experience from 7 to 21 years with two of the teachers having taught math for the majority of their teaching career. All three teachers were Caucasian; one male and two females.

The number of participants, collectively rather small, allowed me to engage with teachers and special education students on several occasions to develop a pattern and relationship of meanings in which to interpret, analyze, and draw conclusions about the provision of SDI and how students and teachers could engage in the collaborative process of identifying and selecting the instructional strategies or methods teachers could use to impact student learning (Moustakas, 1994). Additionally, according to Crotty (1998) participants should be able to make sense of their environment, offering a perspective that is based on a long period of engagement. In this study, the participants had had several years' experience either as a teacher or learner on which to base these perspectives. No student participant had less than five years of instruction within a special education math classroom. Additionally, the teacher participants had been employed as special education teachers within the district for over ten years. This longevity for both students and teachers suggested that the ongoing interaction with the participants provided a depth and richness of experience that would lend validity to their understanding of how teachers could positively impact student learning through the use of student-teacher collaboration and appropriate use of instructional strategies.

Data Collection

Data were collected through focus groups, teacher surveys, and student interviews. These methods described how students and teachers could collaboratively engage in the provision of SDI and the instructional strategies or methods teachers used to positively impact learning.

Focus groups. Using a researcher developed interview guide (see Appendix A), 15 students participated in the initial data collection phase. After obtaining student and parent consent, three focus groups (n = 6, 5, 4) were formed and sessions were conducted twice with each group during the regularly scheduled math period. All but three students, one from each focus group, participated in both sessions. Focus group A comprised six students (3 female and 3 male); whereas, focus group B had five students (1 female and 4 male) and focus group C had four students (3 female and 1 male). Ranging in size of 4 to 6, the first session for each focus group met the entire 54 minute class period with the follow up session lasting from 15 to 35 minutes. The second session was intentionally conducted 2 to 4 days after the first session giving students an opportunity to reflect on the first session and participate in the lesson with the knowledge that they would report on their observations later that week. Following the second session, the data were transcribed and presented individually to the students. Twelve of the fifteen student participants elected to member check the accuracy of the transcription.

Question strategy. Beginning with a grand tour question (McCracken, 1988; Spradley, 1979), such as, *Describe what it is like being a student in your math class*, students within the three focus groups responded to a series questions that I wrote regarding how students and teachers could collaboratively engage in the provision of SDI and the instructional strategies or methods teachers used to positively impact learning. Increasingly focused questions, such as,

Describe the instructional strategies or methods that help you learn math? targeted the two research questions of the study, helping to clarify and give meaning to the purpose of the study. Initially, students spoke broadly of their experiences as a special education math student and what they believe teachers do to help them learn. But as rapport was established, students offered more personal examples with specific details, further elaborating on their learning experiences. As it became clear that students and teachers were not collaboratively engaged in the selection and use of instructional strategies, the focus of the second session of each focus group shifted to how teachers and students *could* collaborate on the provision of SDI. In an effort to explore this theme in depth and in great detail, I used the river and channel questioning technique encouraging the student participants in an open ended and respondent-driven manner to tell their own story using their own words (Rubin and Rubin, 2005). I put little restriction on the dialogue allowing the conversation to expand and wander before I made any attempts to narrow the conversation. On several occasions, students without interruption or comment from me engaged in a back and forth conversation about what teachers could do to encourage a more interactive exchange between teachers and students. I considered these conversations to be long quotes and cited them as such in chapter four. The ideas presented in these conversations represent a consensus of the group rather than the thoughts of one or two individuals. This flow of dialogue was not perceived as a fragmented set of different speakers and ideas, but rather a depiction of the holistic nature of the students' perceptions on student learning in the classroom and the instructional strategies or methods teachers use to teach a mathematical concept.

Interview guide. Targeting the study's two research questions, I developed an interview guide that could be structured in order to minimize variation across classrooms and between

focus groups, aid in later data transcription and analysis, and fit within the established class period (Patton, 2002). Although the use of probes and follow up questions were added, it was helpful to have a structured interview guide because I recorded and transcribed the focus group interviews for later review and theme development. Using the body of literature on instructional effectiveness (e.g., Buehl, 2001; Marzano, Pickering, & Pollock, 2001) to inform the use of elaboration and probes, I refined the interview as the participants began to share in more detail their meaning of SDI and the instructional strategies teachers used to impact student learning. For example, although students did not use a specific term when discussing visual strategies, the description students provided suggested that teachers were using the guided language acquisition design (e.g., in Lara, 2011). This strategy, adopted district-wide, has been used by teachers when teaching vocabulary across subject areas to English Language Learners and to students performing below grade level. It was also important, however, that I not allow this body of literature to limit the vivid descriptions and nuances that the participants provided. For example, as it became clear that students and teachers did not collaboratively engage in the selection and use of particular instructional strategies, students were invited in the second focus group session to share how student voice *could* be encouraged. An example that students provided was the need for *relevant* examples pertaining to student or teenage life, yet in the literature, relevant is often termed *real-life* (e.g., Goodnough & Cashion, 2006). Conversely, when teachers were asked to elaborate on the use of examples, teachers described the use of real-life examples applicable to the adult world rather than to the student's world.

Teacher surveys. Three teachers, using a similarly worded interview guide (see Appendix B), responded to a series of questions presented via two open-ended surveys by way of

an online survey tool, e.g., Zoomerang (1997). I asked teachers to describe how they engaged students in a conversation about what helps students learn. Teachers were invited to write about their perceptions and application of SDI as well as the use of any particular instructional strategy or method they believed impacted student learning. Online surveys with built-in participant protection features allow for the collection of data that is easy to collect and analyze. Additionally, given a teacher's experience, knowledge of pedagogy, and the time-constraints of their work day a survey can be more convenient giving teachers an opportunity to reflect at their own pace. Also, with its export capability, teachers were encouraged to view the results and to check for clarity and understanding.

The first teacher survey was presented following the end of the first student focus group session. The second survey, however, was not presented until several days later following the second focus group. Teachers because they often engage in a series of instructional steps when introducing and teaching a new concept, this study was designed to give both teachers and students an opportunity to engage in several instructional strategies before commenting a second time. For example, the teacher may post or clearly state the lesson's objective followed by an opportunity for students to reflect on their prior knowledge of the topic. As new information is introduced, teachers often check for understanding, giving students an opportunity to practice what they've learned. This instructional process generally does not occur in one class period, but would likely be accomplished over three or four class periods and with the use of carefully selected instructional strategies or methods. Therefore, the teachers provided input as to the number of class periods between each focus group session in order to complete the math lesson.

Student interviews. As themes and concepts emerged from the focus group interviews and teacher surveys, three students, initially self-selected at time of consent, participated in one-on-one interviews with me for the purpose of obtaining a fuller understanding of their specific learning experiences. Adopting the premise that learning is an individualized experience, especially with special education students, I conducted one-on-one student interviews for the purpose of obtaining a certain degree of clarity and understanding of SDI in the context of specific learning experiences. Although no set interview questions were developed, these students shared personal learning experiences, providing an illustration and a richer description to the understanding of how important it is for students and teachers to collaboratively engage in the provision of SDI. This in-depth focus and deeper meaning lent significance to how students with a Mathematical Learning Disability perceived the use of specific instructional strategies or methods and how important it was for teachers to incorporate a classroom atmosphere of student voice. Also serving as co-researchers, these three students, one from each focus group, participated in the examination of the conceptual analysis of the focus group data and is further described in the next section. Figure 1 provides an illustration of the data collection from the first focus group session through the student interviews.

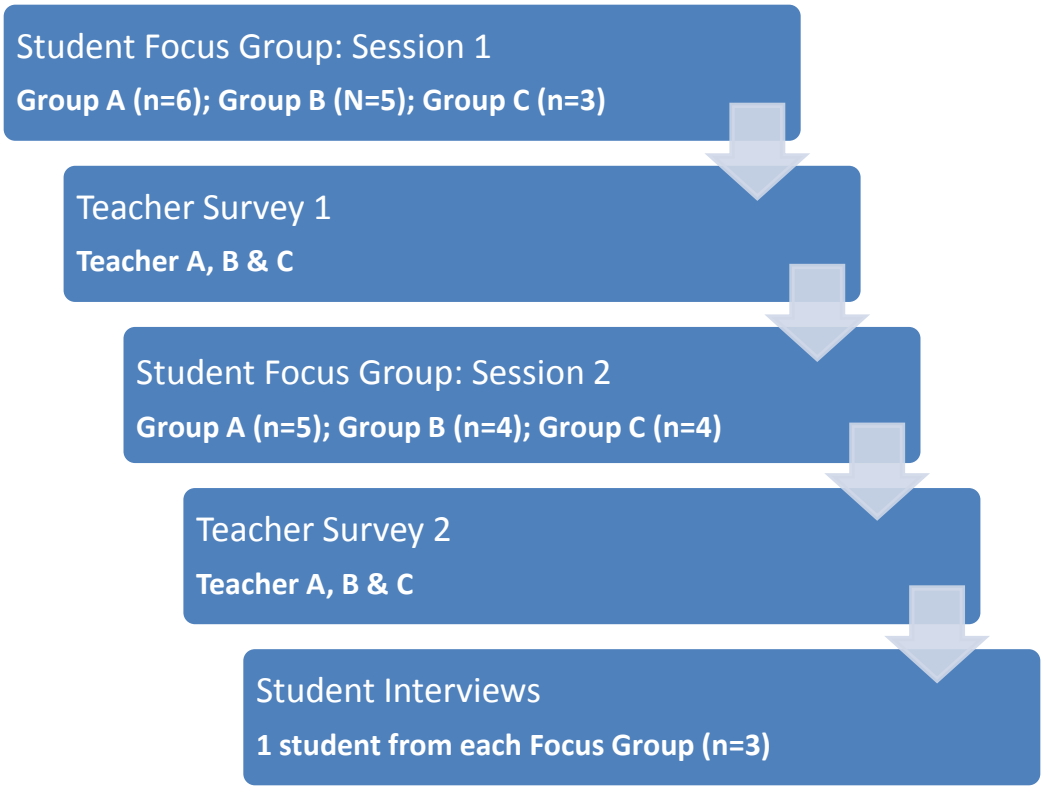

Figure 1: Illustrates the flow of data collection from each focus group, the two teacher surveys, and student interviews.

Data Analysis

The data co-analyzed by student participants and myself (e.g., in Cook-Sather, 2007; Mitra, 2003) provided the focus for later in-depth understanding of student voice and the use of specific instructional strategies or methods. The perspectives of special education math teachers via two online surveys, as to how they too construct meaning around student-teacher collaboration in the provision of SDI, were included in this analysis. The analysis of the student

and teacher data was examined in three phases over a period of six months. Although initially intended as being significantly involved in the entire data analysis, student co-researchers were not interested in coding the initial review of the data because of its length. The combined length of the focus group transcriptions and the teacher surveys was 37 pages. However, after I collated and condensed the focus group transcription into eleven pages, removing responses irrelevant to the purpose of study and abbreviating redundant responses, student co-researchers joined me in the remaining phases of data analysis.

Phase one. Upon completion of the focus group interviews, I transcribed each interview and provided an individual copy to each student participant for review. Of the 15 student participants, 3 were absent and not available to member check the transcription. The twelve remaining students expressed surprise that the document was 9 to 11 pages in length, taking little time to actually review the entire transcription for accuracy. Encouraged to take it home, participate in a small student group to review it, or have me read aloud the responses, students often said that they trusted the material to be true and representative of the actual interview. However, students did review their individual responses and made no changes to the transcription. Wanting students to be more involved in the data analysis, I condensed the transcription of each interview question through a careful and repeated examination of the individual responses over the next two months. Collating the responses into chunks of information, looking for similarities and differences within and across the multiple perspectives, I condensed the data into several pages. I was careful to remove only those responses irrelevant to the purpose of the study. The review of the data resulted in a preliminary idea of what was important to students and their overall perception of how students and teachers could collaborate

in the classroom. In Moustakas (1994) words, an "essence" of how SDI was currently perceived by special education math students resulted in the next phase of analysis.

Phase two. When school resumed the following school year, students as co-researchers (n = 3) participated with me in the further examination of the collated responses. Meeting as a group and individually, we categorized the responses into units of meaning based on the original set of interview questions. Next, we sorted the data into two columns in an effort to answer the study's research questions. Because it was unclear how students and teachers could collaboratively engage in the provision of SDI, further data collection was recommended resulting in a final phase of analysis. This phase of analysis provided the basis of the emerging themes and concepts.

While reviewing the initial coding of the data, each co-researcher met with me individually to further discuss their thoughts on the emerging themes, and provided personal examples of how their classroom experiences had or had not aligned with the focus group data. Additionally, as the co-researchers and I reviewed the teacher survey data, questions remained about how students and teachers could better facilitate a classroom atmosphere of student voice with a focus on SDI and how specific instructional strategies could be used to improve student learning. As a result, we co-wrote a series of survey questions and I presented them to the teachers via a third online survey (see Appendix C). Therefore, teachers were asked in a third survey to explain how they encouraged student participation in the instructional process and how teachers differentiated instruction based on the unique needs of the students (see Appendix C). This third survey was presented the following school year. Due to staff assignment and course changes in the special education department, only 2 of the 3 teachers from the initial teacher

sample chose to respond to this third survey. Furthermore, because many of the students from the initial focus groups had moved away or graduated, it was impossible to conduct a third focus group session with the same student participants. Therefore, rather than following the described format used with the earlier focus groups, student co-researchers asked that I not engage in a focus group process followed by a lengthy transcription, but instead present the information by way of a classroom presentation to another group of special education math students. This additional step in the eyes of the co-researchers would enable them to build confidence in their understanding of the data and the emerging themes and is further discussed in the next paragraph.

Phase three. At this phase of analysis, the co-researchers and I shifted our understanding of the data from how do students and teachers collaborate to how students and teachers *could* collaborate on the provision of SDI. The student co-researchers felt strongly that student responses indicated a desire on behalf of the students to want to be heard in classroom matters involving instruction. Feeling as if student opinions were not being considered, the student co-researchers and I recommended a third teacher survey. We formulated five follow up questions for the purpose of addressing these emerging themes, e.g., student connectedness and use of relevant examples. Citing changes in teaching assignment, one teacher withdrew from the study. The remaining two teachers responded to the third survey. Additionally, two other high school special education math teachers and I engaged in a series of conversations (e.g., J. Lewis, personal communication, September 7, 2011; P. Jones, personal communication, September 16, 2011) about their training in the understanding of math and its application through specific instructional strategies. These conversations, recorded in the form of field notes did not follow a

prescribed interview guide. They did, however, give credibility to the notion of how difficult it can be for special education teachers to collaborate with students in the provision of SDI. These teachers expressed a genuine desire to better understand how instruction could have a more meaningful impact on student learning. By openly sharing the purpose of this study and the emerging themes with my special education colleagues, this study has given us an opportunity to engage in the conversation about how to positively impact student learning and make recommendations to administration regarding professional development, curriculum, and the courses we should teach.

Following the third teacher survey and with permission from the teacher and students, I presented via power point and paper copy the purpose of this study, research questions, and the emerging themes. Six students asked follow up or clarifying questions and thirteen wrote brief comments on their personal copy of the presentation outline, turning them into me at the end of the class period. Additionally, two co-researchers, present during the presentation, took notes of student responses.

Following this process, we met again to review the individual comments, co-researcher field notes, and the results of the third teacher survey confirming our perception of the data and the themes that emerged. Conducting a final review of the data, one co-researcher and I, examined the original transcription of the student focus group responses, the three teacher surveys, one-on-one interview notes, and the co-researcher field notes. This additional step in the analysis of the data added clarity and confidence to the shared perception of how students and teachers could collaboratively engage in the provision of SDI and its potential impact on student learning (see Figure 2 for an illustration of the phases of data analysis).

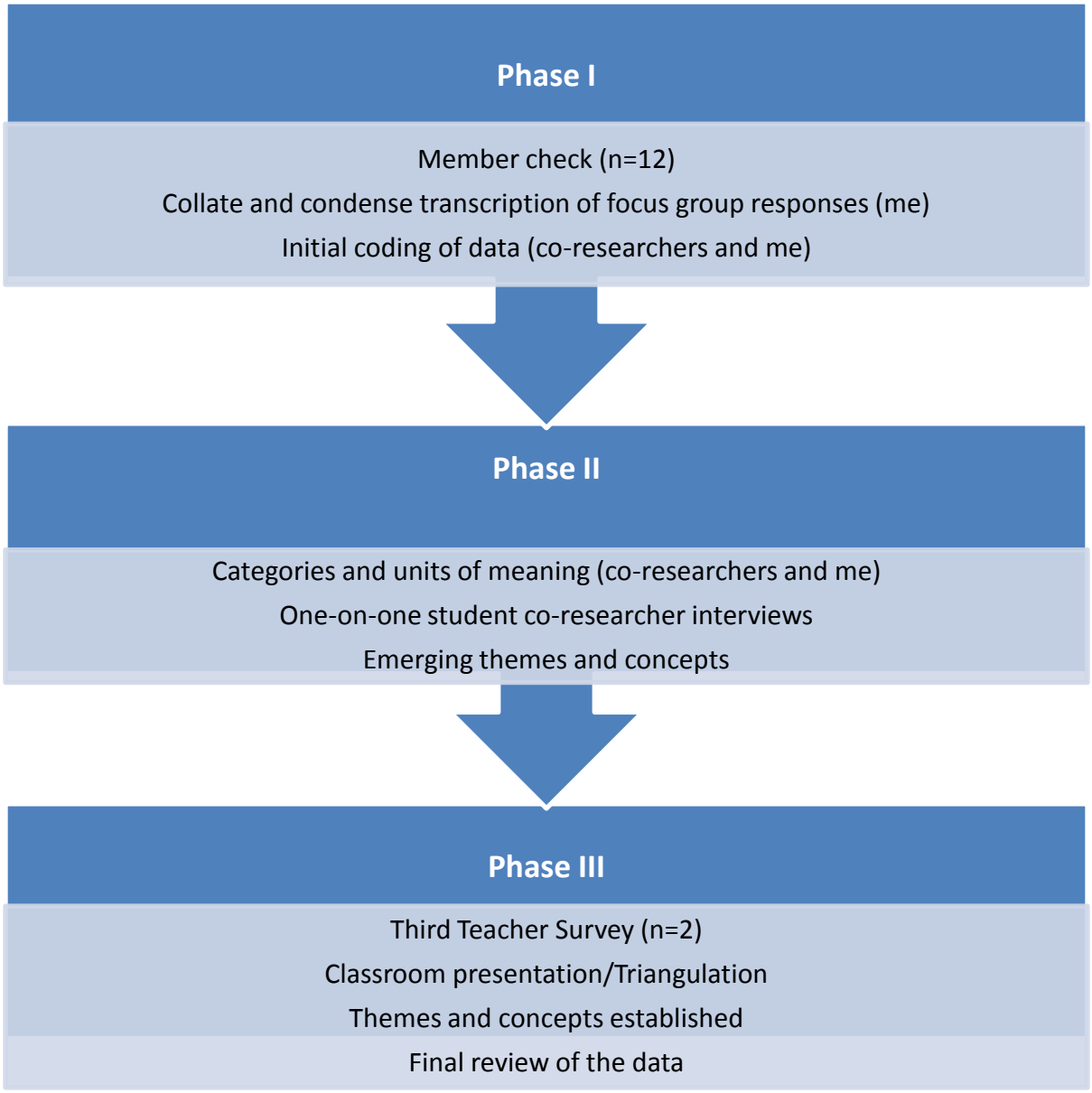

Figure 2: Illustrates the process of data analysis from phase I through phase III.

Ethical Considerations

I addressed several participant and methodological issues to ensure open, voluntary communication and a clear understanding of the study's purpose (Creswell, 2002). First, prior to obtaining student and teacher consent to participate, I spoke to the high school principal, district special education director, and the superintendent for permission to engage in this study. Next, I

visited each of the classrooms and presented a short power point presentation about the study's purpose, participant rights and benefits, and the data collection process. I encouraged students to ask questions which many did—primarily regarding confidentiality and how I intended to protect their identity. After several days, I returned to the classroom—this time without the classroom teacher present—and collected signed consent forms, while answering additional questions regarding the teacher's access to the data and the length of time students could expect the collection of the data to take.

The focus group, although conducted within the whole class setting, did not assume all special education students present at the time would be directly involved in answering the interview questions. However, I did on several occasions overhear students make comments about what participants were saying, suggesting an agreement with what was being discussed. I viewed these spontaneous utterances as giving credibility to what was being described. These students' responses were not included in the data analysis because no consent had been obtained, but their amplifications of the responses given suggested trustworthiness of the data being collected.

I asked students a series of questions during the focus groups with an individual student response range of *sometimes* to *always*. Several students participated in every question asked, elaborating with additional details and providing in-depth classroom examples; whereas, other participants chose to respond minimally. Nonetheless, every student response was transcribed exactly as spoken with the exception of identifiable information. For example, during interviewing I modeled and encouraged the use of pseudonyms when referring to their teacher and student participants. Rather than calling people by name, student and teacher participant

names were replaced with a number and a letter pseudonym, e.g., Teacher A and Student 2A. While transcribing, I would use these pseudonyms rather than identifiable information in the event students would inadvertently speak someone's name. Moreover, with only three teacher participants, 2 female and 1 male, I removed the gender spoken in all student responses and replaced gender based references in the transcription with the pseudonym, e.g., Teacher A. The only exception was when students provided examples of how other staff or para-educators impacted student learning. In these examples, I left gender based pronouns in the transcription, replacing staff names with he or she, e.g. To be clear, students and teachers were grouped into one of three groups and labeled either A, B, or C. For example, a comment reported by a student in focus group B about his or her teacher would be cited as Student 3B regarding Teacher B, e.g.

Focus groups, because of their inherent nature, required me to serve as a moderator rather than as an interviewer (Krueger, 1994). Participants of focus groups get to hear each other's perspectives and may agree or disagree with those responses choosing whether or not to elaborate. This potential for disagreement and possible unrest requires the moderator to be very skilled in the approach. If the conversation were to become comfortable and enjoyable, I had to establish and maintain an atmosphere that was encouraging and nonthreatening (Krueger, 1994) in order to obtain multiple perspectives as opposed to only one perspective. On one hand, studying the site of my employment and the familiarity with the participants gave me a unique advantage of already having established a certain degree of rapport. However, it was my experience and professional training as a Licensed Independent Clinical Social Worker and an investigator with Child Protective Services (CPS) that gave me the confidence in my ability to moderate the focus groups and conduct the personal interviews in a facile manner. Prior to

becoming a special education teacher, I attended numerous trainings on various student-related topics, e.g., child interviewing (e.g., Western Washington University, 1995), group counseling (e.g., Constructive Counseling Initiatives, 1997), managing disruptive students (e.g., Bureau of Education & Research, 2000), and investigative techniques (e.g., Office of Juvenile Justice and Delinquency Prevention, 1996). The hundreds of hours of specialized training and the countless individual and group interviews provided a solid foundation that helped me reduce the potential limitations of using focus groups and one-on-one interviews. Nonetheless, it was imperative I remained sensitive to my role as a special education high school teacher and how my familiarity with the school and participants may have shaped the study.

Trustworthiness

Establishing a high level of trustworthiness, according to Lincoln and Guba (1985) can only be accomplished if a series of techniques are used when conducting qualitative research. This study, using qualitative research methods, was not as simple as learning about a topic in more detail, but developing an in-depth understanding of what was important to the participants—in this case special education high school students and their math teachers.

Additionally, the phenomenon that was being explored, i.e., SDI, was a complex construct not easily understood or defined by teachers. Specially designed instruction, embedded within a student's Individualized Education Program (IEP), is a required component of the IEP and is intended to serve as a learning plan *for* special education students, although it is typically developed by parents and educators. Had the results of this study suggested that teachers were well equipped in understanding the provision of SDI, I would be less concerned with the absence of student voice. However, it was clear that teachers did not possess the clarity necessary in the

appropriate identification and selection of instructional strategies teachers could use to impact student learning. This study suggested than an open line of communication between special education math students and their teachers does not exist at this high school. If we want students and teachers to cooperatively engage in the provision of SDI, then a paradigm shift in our thinking is required. Demonstrating that special education students were able to articulate what teachers could do to impact their learning—positively and negatively, this study gave credibility to earlier research suggesting that students do have a strong interest in learning (Chiodo & Byford, 2004; Gentilucci, 2004) and feel valued when their voices are heard and honored (Oldfather, 1995).

Additionally, having confidence in the accuracy of the findings was increased when the data underwent a triangulation process that involved member checking. This study encouraged participants to check the truth of the findings (Lincoln & Guba, 1985). When students expressed being overwhelmed with the size of the transcribed interviews, I reviewed the focus group responses, collated the information into patterned responses and then re-engaged with the students in the analysis of the data. With the help of one student from each focus group, these co-researchers and I reviewed and summarized the patterned responses in a manner that accurately reflected the reality of the student participants. This was later confirmed when I presented the emerging themes to a different class of special education math students. Concerned that our thoughts on the emerging themes and concepts were not reliable across time, classroom settings, and based on the responses of a small sample, we chose to triangulate the data by presenting the information to a different class of special education math students. This particular class of students, primarily consisting of ninth graders, had not participated in the

previous focus groups. Additionally, two of the three student co-researchers were members of this class and took field notes during this process.

Furthermore, by engaging in personal communications with special education math teachers and adding a third teacher survey, this study examined the issue from multiple viewpoints. Moreover, the design of the study with three types of data collection methods—student focus groups, one-on-one student interviews, and online teacher surveys—provided a deeper, multilayered perspective of how students and teachers could engage in the provision of SDI and the instructional strategies or methods teachers could use to impact student learning.

Role of Researcher

Glesne and Peshkin's (1992) term "backyard" research best represents the role I took in this study. As a special education teacher at this study's site, I have become closely involved with the special education math curriculum, teachers, and the special education students over the last eight years. Because of this relationship, Glesne and Peshkin caution researchers not to compromise the confidentiality of the participants by disclosing specific information about the study's setting and participants—one of the reasons why all participant information was coded and labeled, e.g., Teacher A, in order to protect the identity and ensure anonymity of each student and teacher. Patton (2002) has also cautioned the researcher in this role not to allow professional experience and personal knowledge of, for example the teacher participants, to interfere with the perceptions of the student participants. It was important that I remained neutral and not be subject to bias based on my prior experience with either the students or teachers in an effort to gain an accurate description of the participants' perspectives.

I suspected that students and teachers would initially be apprehensive in their honest portrayal of the provision of SDI and how student-teacher collaboration was used, but that was not my experience. Although incomplete in the meaning and application of SDI, participants were immediately forthcoming in answering questions about the strategies or methods teachers used to impact student learning. Student voice, nearly absent in the classroom, did not impede participants in the explanation of how to improve student-teacher collaboration. Both students and teachers appeared to decline to use this space as an opportunity to exaggerate or minimize the benefit of a particular instructional practice, but to respond to probing or follow up questions as an attempt to accurately depict the perception of students and teachers in the pedagogy of math.

With an interest in establishing a trustworthiness of the data and a legitimate need for involving students in educational reform, I gathered multiple perspectives, triangulating the data across participants for similarities and differences between and among their perspectives and the current understandings of educational research (e.g., Marzano, Pickering, & Pollock, 2001). Exploring the classroom learning experiences of special education students diagnosed with a Mathematical Learning Disability, this study identified, from the students and teachers' perspectives, the instructional strategies special education math teachers could use and how student voice could be incorporated in the provision of SDI based on the following research questions.

In summary, this qualitative approach to interviewing was not a one-time undertaking, but an ongoing process over nine months that relied on the participants and my ability to build rapport, examine a topic in great depth by maintaining engagement over time, and foster a

mutual trust in the desire to develop a better understanding of what's being examined (Rubin & Rubin, 2005), e.g., students' perceptions of how students and teachers could collaborate on the provision of SDI. I was reminded by Rubin and Rubin (2005) to be careful and not to let emotions and biases negatively influence the interview, but to allow the relationship to deepen, creating an ethical obligation to elicit the lived experiences of the participants. Recent studies on students' perceptions of education have shown an interest and a belief in a classroom atmosphere that positively impacts learning (Chiodo & Byford, 2004; Gentilucci, 2004), recognizing factors that contribute to student learning, e.g., varied instructional strategies (Lebedina-Manzoni, 2004; Robinson & Taylor, 2007) and a positive classroom environment (Cook-Sather, 2007; Mitra, 2003). These studies demonstrated that when students were given the opportunity to participate in the conversation and have their voices heard, a democratic community of shared decision making resulted in student learning (Cook-Sather, 2001; Dorman, 2001). I wanted to replicate that atmosphere in order to elicit a true experience from the participants in this study.

CHAPTER FOUR

THEMES

The purpose of this qualitative study was to better understand how special education math students and their teachers could collaboratively engage in the provision of SDI. Based on Mitra's (2007) premise that students are capable of contributing thoughtfully to what teachers could do to positively impact classroom learning, the results of this study relied on the perceptions of special education students diagnosed with a Mathematical Learning Disability. Assuming that teaching and learning are a mutual effort by both teachers and students (Mitra, 2007), this study explored the shared and different observations of how students and their teachers described the use of specific instructional strategies or methods in an effort to better meet students' unique instructional needs.

Fifteen students from three special education math classrooms and their teachers participated in the initial data collection. Student focus groups ranging in size from 4 to 6 students responded to a series of questions around the two broadly stated research questions. Teachers responded to a similar set of questions via two online surveys. For ease of student review, I collated and condensed the transcribed responses from the student focus and teacher survey data. Then the student co-researchers, one from each focus group, and I reviewed the data, coding and grouping the responses into emerging themes and concepts. In an effort to confirm and clarify our perceptions, we co-wrote a third teacher survey. Additionally, we presented the themed responses to a different class of special education math students and asked for their input. These responses validated the descriptions as consistent with our experiences

offering additional insight into how important it is to seek the voice of students in matters involving student learning.

The themes of this study suggested that the appropriate use of instructional strategies are a classroom in which student voice was encouraged and could only exist if three broad areas, or themed responses, were evident within the classroom: Student connectedness, differentiated instruction, and subject knowledge. Two of these areas have been examined extensively (e.g., Chiodo & Byford, 2004; Fraser et al., 1987; Marzano et al., 2001); while the third, subject knowledge, has only recently received attention by scholars as a plausible reason for why students are not meeting standard (Rosas & Campbell, 2010). Based on the student focus groups and the teacher surveys, I present the themed responses and the subthemes associated with each below.

Student Connectedness

Student connectedness refers to the belief by students that their teachers care about their learning and value them as individuals (Blum & Libbey, 2004). The caring and responsive relationships established between teachers and students within schools and the classroom have promoted academic motivation (Eccles, Early, Fraser, Belansky & McCarthy, 1997; Goodenow & Grady, 1993) and in turn improved student learning (Klem & Connell, 2004). When students clearly and consistently receive praise and attention from their teachers, they experience a connection with their teachers (Beresford, 2000), creating an atmosphere in which the students in this study and others described as a necessary ingredient when creating a learning environment that could encourage student voice and positively influence instruction (Cook-Sather, 2006; Lodge, 2005; Mitra, 2003).

The students in this study affirmed these earlier findings as they consistently asked for teachers to care about them, be responsive to their learning needs, and check to ensure they understand. By doing so, students believed that their input would be valued, helping them to better understand mathematical concepts and thus impact their learning more positively.

Care. At the surface it seems rather simplistic, but when asked what teachers could do to encourage more student teacher dialogue and make learning easier, it was clear that students needed teachers that were nice, respectful, and happy—to students that meant teachers care. Students as noted in the following example shared that having a teacher who cares about them makes it easier for them to ask questions and participate in their learning. "Yeah, Teacher B is amazing. Teacher B would talk to us. Laugh. We could ask questions and we'd get help" (Student 5A); and "Teacher B was never in a bad mood" (Student 4A). Disconnected and at times angry, students complained of being belittled in front of peers and talked about negatively within ear shot as reported by three students in this conversation.

> You'll come in late, and then Teacher A will say, "Oh, that's why you're failing all of your classes. (Student 5A) Oh yeah, that gives me a lot of confidence. Remind me that I'm screwing up. Gee thanks. (Student 1A) Yeah, I hate this class because of the way the teacher talks about us. I get furious. I get so mad. I just sit there and the anger builds up and I just want to hit something. (Student 6A)

Students described this type of classroom as not conducive to learning because they never felt safe enough to admit they needed extra help; whereas, in other classrooms the learning atmosphere was remarkably different. "I can come in with a bad attitude and that teacher makes it better. The teacher still helps us; but how can you ask for help when the other [*sic*] teacher is

always mad at you?" (Student 6A). The importance of care is continued in the following examples from two focus groups: "Another teacher I have has a great sense of humor and really connects with the kids" (Student 1B); "You get a kid to laugh and they want to learn, but not in here. You just bore 'em in here" (Student 1C).

Long and Sterenberg (2007) in a study of teachers' perception of mathematics and its relationship to student care, suggested that a classroom atmosphere of positive student regard promoted a better attitude toward learning math. But it is not just the role of teachers to establish a positive learning environment—students have a role to play as well. Teachers in this study expressed frustration with students' unwillingness to participate and ask questions. "They begin talking to their classmates, get up and wander, looking around the room" (Teacher B). Students, on the other hand, attributed this apparent example of off-task behavior as an aspect of their learning style. "I can't work quiet. I need to say something sometimes. I need to talk about what I'm learning. It helps me" (Student 6A). The teachers attempted to redirect and ask students questions to get them involved, but students did not respond in the manner that was expected as teacher A wrote. "I get little feedback from the students." But students admitted that they would not ask questions if they thought the teacher was unapproachable. "Everyone's scared to put their input in. If we do, we get yelled at or snapped at. We can't ask questions" (Student 1A). Another student agreed, "She doesn't really take opinions. It's kinda just her way of teaching" (Student 2B).

Without a degree of teacher care and the inability to connect, teachers and students experienced tension. Students struggled in their ability to learn and teachers struggled to present material clearly and responsively.

Responsive feedback. Teachers who answer questions immediately, rather than asking students to wait for a minute or often longer, increased student's focus and encouraged on-task, relevant questions. Admittedly, students in all three focus groups said they have had difficulty with focus and concentration, especially at it relates to mathematical concepts. However, teachers able to interrupt their teaching long enough to answer a question not only enabled students to stay on track but it encouraged students to ask more questions. For students, that meant a better chance of understanding the steps that followed. Unfortunately, some teachers did not possess that ability as illustrated by the following conversation between two students.

> Like someone will ask a question, and Teacher A will say, "Not right now." And then Teacher A never gets back to you. (Student 1A) Teacher A just moves on, doesn't answer the question. So then we just do it on our own and we're not sure. (Student 4A) I'm not saying stop everything that you're doing, but if someone has a question about what you're doing at that moment, then you should probably answer it. If you're on the 2nd step of the problem and your question is about step two, then the teacher should answer it; because if the teacher finishes it and then you try to come back to the question, it doesn't make sense. (Student 1A)

When teachers were timely in their responses, students were able to focus on the math problem and the particular step in the solution process, rather than having to store the question in working memory, which is often very difficult for students with learning disabilities to do. Additionally, teachers who were responsive to students' questions sent a message of interest to students that their individual needs were important to them as depicted in the following example.

"If we raised our hands, Teacher B would come to us immediately and answer our question. It made us want to get help" (Student 1A).

Others imagined a scenario in which several strategies were incorporated into the classroom structure.

> I wish we had our own little math station at our own level. Like if the teacher sat with us. Then the teacher could go around and make sure everyone gets it and we could focus on it better, because our questions would be answered. We wouldn't have to wait. (Student 2C)

Teachers agreed that being prompt with a response and providing feedback was necessary and that small group instruction helped facilitate that process. For example, teacher A wrote:

> Some students work better in small groups that are as small as four or five. Students that have a hard time focusing sit in close proximity to myself or a para. I am able to go over areas where the students are struggling and help them.

In a meta-analysis of 196 studies on student feedback and responsiveness, Hattie (2009) found that providing feedback to students on a task and how to do it more effectively had the highest effect sizes when exploring the various influences on student achievement, e.g., homework and class size. Effective teaching, however, is not just the provision of feedback but it also involves the assessment and evaluation of students' understanding (Hattie & Timperley, 2007).

Check for understanding. It was evident among the three student focus groups that teachers who checked to ensure that students understood the mathematical concepts and steps to

solve the problem were able to develop a sense of openness and encourage a dialogue between the teacher and the student. Students wanted teachers willing to move around the room in close proximity and see them individually or in small groups, rather than sitting at their desk or remaining in one location near the front of class as illustrated in this example: "Literally Teacher A just sits there. I'd be like, "Hey teacher, can you help me? and Teacher A would say, Tell me what you want. And I'd be like, No, I need to show you. Help me over here" (Student 1A). Another example demonstrates how important it is for the teacher to establish a connection with all students.

> Teacher C doesn't pick on many people in the back. Most of the time I get it, but when I don't I feel ignored [*sic*]. Yeah, I'm writing on the paper trying to get it and Teacher C is clear over there and I'm trying to stay caught up, but I can't because Teacher C won't stop and help this side of the class. (Student 1C)

Students shared that they needed a more interactive teacher, one that would begin with explaining the math problem on the board but then check to ensure that everyone understood before moving on to another concept or another step in the solution process. The following uninterrupted conversation between three students provided an example of a teacher demonstrating effective use of this strategy.

> Teacher B will not only go over it, but show you. Teacher B will come around to each of us and show us how to do the problem. (Student 1B) Yeah, Teacher B makes sure everyone gets it. (Student 2B) It's like Teacher B really cares that we're learning. (Student 6B)

One teacher commented on the lack of feedback often received from students, unsure as to whether the students understood before moving on to the next step. Leading to frustration and an inability to connect with students, teachers commented on how little feedback they often received from students. "I get little feedback from the students on how they learn. They will not respond if I ask" (Teacher A). Yet another teacher pushes on refusing to let student silence be the norm. "There are some students that I have to check on individually, to make sure they understand because they won't talk. I go to their desk and check for clarification. I won't move on until I know everyone understands" (Teacher B). The students in this class agreed with their teacher. "Teacher B would go around and ask if you needed help. That was really helpful for shy people. I don't know, but that seemed to work. It's like Teacher B is doing the job better" (Student 1B).

Frustrated with the notion that teachers sometimes assume students understand or are familiar with a particular concept students stated that this hindered an open dialogue. Over half of the student participants commented on teachers making comments that insinuated students should know how to do a type or level of math—and at times the teacher comments were laced with sarcasm as indicated in this instance.

> What really kind of bugs me when is when Teacher A says, "It's not rocket science." Which makes me think that if we can't get it then we're stupid or something and I don't like that Teacher A says that. It pisses me off; I'm not going to lie. Teachers act like I already know when I don't. And then they move on and they don't really ask if you get it. (Student 1A)

Even more frustrating for students was when teachers wouldn't take the time to ask if additional help was needed. Perceiving this situation as a lack of care, students felt slighted, further hampering the chances for a collaborative relationship between the student and the teacher in which knowledge can be gained regarding the unique learning differences for each student.

Differentiated Instruction

According to Tomlinson's (2001) definition, differentiated instruction is an approach to teaching and learning that gives students different options when trying to access curriculum and better understand instruction. Based on the premise that no two students are alike, instructional practices vary and are adapted to fit the individual learner. Teachers flexible in their approach adjust their teaching and presentation of the curriculum rather than expecting students to modify themselves. Although not intended for teachers to design a different approach for each of thirty, e.g., students in their class, differentiated instruction does claim that instruction should be different based on the unique learning styles, interests, and abilities found within the classroom (Hall, Strangman, & Meyer, 2003).

Differentiated instruction operates on the notion that learning is most effective when instruction is relevant, engaging, and interesting (Tomlinson, 2001). According to the students in this study, when students were able to make connections between the curriculum and their personal interests, learning was more likely to occur. The pattern of responses emphasized the need for a better understanding of how teachers could provide explanations that were both detailed and relevant while being presented in a pace that best fit the student. Both students and teachers expressed a sense of frustration with the student and teacher behaviors that impeded the success of these instructional strategies.

Instructional pace. The amount of time given to students to learn a particular mathematical concept was a concern expressed by students in each focus group. Adjusting the instructional pace so that every student had an opportunity to learn was not always perceived by students as a priority of teachers. Increasing the pace caused confusion, discouraged questions, and often resulted in students feeling hopeless. Yet when the pace was adjusted, students were better able to understand. "Teacher A shows us slow, not fast" (Student 3A); "When Teacher A goes too fast, I get lost sometimes" (Student 2A). "It's like teachers are trying to get more done than right" (Student 1A). But in another class, students had a different experience expressing frustration with how fast the teacher taught.

> This class is a much faster pace. You have to keep up with Teacher C and it's hard. Yeah, I get really frustrated, because I want to learn, but I don't get it, so I just sit there. It just takes us longer to understand something. (Student 2C)

A student in the same focus group agreed. "Yeah, I'd rather know what I'm doing than be done with the book, 'cuz I still won't know how to do anything" (Student 1C). However, slowing the pace too much could result in boredom or a lack of interest.

> Teacher B teaches the class like everybody needs a lot of help and that's not always true. Some people don't need it. The only thing we do in here is addition and subtraction and how long does it take to learn that. I mean, it should only be a couple of lessons, not the whole year. (Student 2 B)

However, adjusting the instructional pace can be difficult for teachers when students of mixed abilities are in the same class. "It's impossible to teach math to students who range from

not being able to add or subtract to understanding all the basic math facts" (Teacher B). But students see the issue differently, suggesting that instructional pace has little to do with how much students know but rather how detailed the teacher's explanations are and the pace at which it is taught.

Detailed explanations. When students were asked, *How do you know when you've learned a particular concept in math*, students said that it was when their teacher had thoroughly explained the steps to solving the problem, and reminded them of the steps while they were completing the problem. Two students described the following classroom experience:

> Teacher B would come around to each of us and tell us or show us and say, "Remember to do this step [*sic*] in this order." Teacher B wouldn't give us the answer but would help us remember the steps. (Student 1B) Yeah, I think it's helpful the way Teacher B explains things thoroughly and goes through each problem so that everyone understands. Like adds lots of details. Teacher B is very clear. (Student 2B)

Students and teachers understood the importance of knowing all the steps needed to solve a math problem, yet according to a majority of the student participants, some special education math teachers struggled in their ability to adequately explain the process or did not repeat the process often enough.

> I wish teachers would figure out how to do the problem first before starting to tell us. Sometimes I'll ask for help and Teacher A will say, "Ok, first you do this. Well. No you really do this first. Well. No that's not it." And then I'm confused. (Student 1A)

Ideally, students asked that an objective be clearly written on the board and explained both orally and visually so that students had a sense of purpose and a direction in where the lesson was going. But more important to students was the step-by-step explanations provided by teachers that students said made learning math easier. "I think it's best to see it on the board and in steps. It's not as helpful to see it all done. Better if we can see each step" (Student 1A). But teachers did not always check to ensure students were ready for the next step as reported by two students:

> But Teacher C needs to do it more. She just does it one time and then says, "Ok on to the next problem." (Student 2C) It's like, Wait. What? I wish Teacher C would explain it again. Hearing it once or even twice is not enough to learn it. Rather than saying, "Ok everyone else gets it." And then moves on leaving me in the dust. No! Don't move on. I don't care if everyone else gets it. I don't and I want to learn it too. (Student 1C)

Admittedly, teachers said that special education math students do need more steps in order to learn the conceptual aspects of math, but struggle in their ability to problem solve and focus on solutions that require more than a few steps. Additionally, teachers described students' behavior as off-task, disruptive, with an unwillingness to participate, as noted in their written responses to how teachers know when students are not learning. "They have a glossed over look; not following along in the book" (Teacher A); and "They begin talking to their classmates; get up and wander, looking around the classroom" (Teacher C).

Students see the issues differently attributing their behavior to confusion and boredom, primarily due to the teacher's overreliance on the textbook and the limited, often inaccurate

explanations, presumably due to the teacher's lack of preparation for the daily lesson. The following conversations in focus group C illustrate the importance of clear explanations and a thorough preparation for the day's math lesson.

> Teacher C says the book is enough for us, but it's not. The book doesn't break it down very much. I know there are other ways to do the problem, ways that are easier, but this teacher goes straight from the book and shows you the harder way to do it. … some teachers don't do that. They know that their students don't learn that way, so they teach a different way. But this teacher just follows the book. Teacher C will say that there are other ways to do the problem but Teacher C never shows us. Maybe if we learned it both ways, then one way might be easier for us to learn. So at least we could actually know what we're doing. (Student 1C) Teacher C does try to explain it sometimes, but it's so boring and Teacher C repeats things too much. It just makes you not want to do math ever. (Student 3C) Yeah, Teacher C is really sweet, don't get me wrong, but teaches in a way that is so boring. (Student 2C)

The para-educator in the class, however, did a good job of explaining, offering another route to problem solving.

> When we ask for help, she shows us a different way than the teacher does. We understand her way and it's way easier. It's not how the book does it, but we get the right answer and it makes sense. (Student 1C)

In Rohrer and Taylor's (2007) study of the different ways to practice math problems, college level math students found that presenting steps to problem solving in different ways aided in

recall and the ability to reach the correct answer. However, providing opportunities for students to personalize their learning through the use of relevant examples has also been shown to positively impact learning (Brophy, 2004).

Relevant examples. Making learning relevant to real life experiences was an area where students and teachers agreed. But what teachers and students perceived as relevant to a teenager's life was different. For example, teachers often provided written examples that were career or independent living based: "I need to use real life forms, such as, checks and a ledger for keeping a checkbook" (Teacher B). However, students did not find these examples helpful, and preferred examples that were typical of teenage pop culture or of a personal interest stating, "I'm not going to pay attention if I don't have any experience with it. I'm on YouTube 24/7" (Student 3B). For some students, using examples that were pertinent to student life demonstrated a teacher's willingness to connect to students on a more personal level—a level they perceived as caring as illustrated in this uninterrupted conversation between students.

> I think teachers should grow to know their students, use them as examples in class. Like they could call on us, talk about something we like to do and use those as examples. That would really help us a lot. (Student 1B) Teachers remember what it's like . . . I mean it hasn't changed much being a teenager. They just need to connect it with how it is today. (Student 2B) Yeah, if they just learn to relax and not be so professional. I think it's great that they're professional. That's awesome, but they don't have to be so professional that they just sit there and be like a machine. Relax, connect with us; be like, "How are you doing today? Anything I can do for you?" (Student 1B)

Teachers in an effort to make learning easier, tried to make lessons relevant, explaining the significance to real life issues and connecting it to how students would use it in the future. "Making it as real life as possible is always the best way. I really feel that the students will understand it better once they actually apply the concepts in real life, which many will begin next year" (Teacher B). For some students, however, their future was too far away.

Examples provided in the textbook were insufficient according to students and most teachers were inadequate in their ability to provide additional examples that helped students learn.

> Sometimes she shows an example in the book, but she doesn't show much of it. Then she'll give us another example, but it's the same as the book. The book doesn't have much information and she doesn't give much more than that. (Student 4C)

Another student confirms,

> It's the same thing as the book puts out. It's never any different. Nothing. How am I supposed to get it if the teacher keeps using the same example that I didn't get the first time? (Student 1C)

Students also expressed the need for clarity in the examples provided and a limit on the number of examples used.

> I don't mean to complain but we don't understand the examples Teacher A is talking about half the time. Everyone learns differently and I think that sometimes Teacher A likes to talk about other things; examples of things Teacher A has done, but then Teacher A gets off topic. I'm confused about what we're talking about. I ask for help at times, but then Teacher A yells at me, so I'm not sure if I should ask again. (Student 1A)

The experience was different, however, for another student. "She always tries to connect examples to an earlier example, and then shows us on the board so that everyone can see" (Student 1B). It is this latter classroom experience that students reported as beneficial to their learning. When teachers provided examples that were relevant to a student's current situation and connected it to prior learning, students were better able to understand. However, it is difficult to connect an experience to a mathematical concept if the teacher does not have an adequate grasp of the content, which leads me to the next and final theme.

Subject Knowledge

Subject matter knowledge for teachers is not a new issue in math (e.g., Begle, 1972); however, I did not anticipate it being a concern expressed by the participants in this study. Although subject knowledge has been referenced as a contributing factor in early reform efforts as mathematicians and educators engaged in a tug of war over several decades about the merits of teaching specific mathematical concepts, questions about its definition remain (Klein, 2007). Agreement on what courses math teachers need to take in college, which aspects of a teacher's knowledge impacts teaching, and the effect it has on student achievement continue to trouble researchers, policymakers, and school districts alike (Ball, Lubienski, & Mewborn, 2001; Ma, 1999). Without a consistent thought on what math standards should or should not be taught makes it difficult for schools to track progress and make recommendations for improvement (Schilling & Hill, 2007). Even more challenging can be the demands placed on special education math teachers to provide SDI within a framework that has not been reliable. Nonetheless, given what we do know about good teaching, this study made clear that a teacher's understanding of math can influence student achievement. As Hill, Rowan, and Ball (2005)

found in their study of over 2000 first and third grade students from 53 different schools, it is both mathematical knowledge and skill that contribute to gains in student achievement. The students in this study indicated that they felt both frustrated and confused when trying to learn because they did not believe their teacher either understood how to do the math or knew how to teach the concepts. Additionally, this lack of confidence in a teacher's understanding of math, according to the students in this study, impeded student voice. Students were unwilling to ask questions or seek help as reported in the following conversation:

> I don't even want to ask for help. Teacher A doesn't know how to do the math. (Student 4A). Me too. At first I thought Teacher A got it and I got it too. But now I don't think Teacher A understands how to do it, and I don't either. It's confusing for all of us. (Student 5A) Yeah, and so when we really don't know how to do something we aren't sure if we can trust Teacher A's answer because Teacher A is wrong a lot. I guess I never know if I should say, "Thanks teacher for telling me that;" because I'm never sure if the teacher is right. Like, the teacher may want to look that over once more before you tell us for sure. (Student 1A) Yeah, but when you ask for help it just gets worse because Teacher A doesn't know. (Student 5A)

Interestingly, students did perceive a confidence in the para-educator's knowledge of math as well as their ability to provide support in the classroom. Oftentimes, the explanation given by the para-educators were more helpful than the teachers' as illustrated in this conversation between four students.

> She helps us. (Student 5A) With everything. (Student 3A) She is nice about everything. (Student 6A) And shows us how to do it. Step-by-step. (Student 5A) She actually

> explains it and tells us how to do the problem right. (Student 6A) Instead of scrambling it up and then saying, "Wait. No. Yes." (Student 1A) And she's always happy. I can come in with a bad attitude and the teacher will make it worse, but she makes it better. She still helps us. (Student 6A)

When asked in the online survey about what could make learning easier for the students, one teacher admitted to being deficient in the understanding of math and its impact on student learning. "Sometimes I don't understand the math. That's hard for me because I want them to learn." (Teacher C). Admitting to having a lack of subject competence would be difficult for any teacher, but the teachers in this study expressed frustration in being asked to teach outside the scope of their professional training and education, "I have not taught math in over 14 years. I made that clear in my interview. Yet, I teach four math classes. I know my students would learn more if they had a real math teacher." (Personal communication, October 3, 2011).

In conclusion, the findings of this study suggested limited collaboration between teachers and students in the provision of SDI. Additionally, students and teachers disagreed on the manner in which specific instructional strategies or methods teachers could use in helping students learn math. Although questions and student participation was encouraged, instruction was teacher-centered and textbook-based. Students and teachers, however, did agree that step-by-step explanations, real-life examples, and a slower pace were necessary for academic progress. Students' and teachers' perceptions of relevant examples and the interpersonal manner in which teachers could promote more of a two-way dialogue of questions and answers differed remarkably. The data proposes that in order to affect positive change within the classroom, students and teachers need to engage in a collaborative process of teaching and learning.

Additionally, there must be an atmosphere of care in which students are encouraged to ask questions and seek help. Teachers within a differentiated framework should be responsive in the provision of feedback and check to ensure understanding. Knowledge of math, knowledge of teaching, and knowledge of students comprise the basis of these findings as articulated by the following students:

> Some teachers don't know how to present it. They don't know kids these days. It's different. Like, I'm a really good wrestler, obviously. But I wasn't a very good teacher of it, 'cuz I didn't have very good social skills, I guess. (Student 3B)
>
> I need a teacher I can trust. Cuz, when we really don't know how to do something, we can't trust Teacher A to give us the right answer. Teacher A is wrong a lot. (Student 1A)

In order for students to learn math, teachers needed to be able to better connect and communicate with students. Establishing a student-teacher relationship could enable students and teachers to collaborate in the provision of SDI by knowing which instructional strategies to use. Yet being able to effectively apply an instructional strategy requires subject knowledge. The findings and recommendations related to these issues and their significance to improving education are discussed next.

CHAPTER FIVE

DISCUSSION

The purpose of this qualitative study was to better understand from the perspective of high school special education math students and their teachers how student-teacher collaboration could be used in the provision of SDI. The similarities and differences in how students and their special education math teachers described the use of specific instructional strategies or methods revealed that detailed explanations, relevant examples, and instructional pace contributed to student learning. Moreover, the examination of how students collaboratively engaged with their teacher to better meet their unique instructional needs suggested that if teachers routinely checked for understanding, demonstrated care, and responded to student questions an atmosphere of student voice could be developed. Teachers in this study agreed with student participants about the importance of specific instructional strategies and the role students play in learning; however, teachers perceived some student behaviors as impeding factors. For example, teachers expressed frustration when students interacted with peers during instruction creating a disruption to the teacher's attempt at providing SDI. Students, however, viewed this situation as peer collaboration. Being able to seek help or clarification from a peer they trust was important to students. When teachers moved too fast or did not provide adequate explanations, students indicated that it was quicker and more efficient to check for understanding with another student. Within the context of this study and with respect to the research questions, the findings and recommendations suggest specific ways for students and teachers to better collaborate in the provision of SDI.

Research Question One

In order for teachers and students to collaboratively engage in the identification and use of specific instructional strategies to improve student learning, a positive learning environment that values student voice must be encouraged. Teachers and students need to learn how to engage in a dialogue that puts learning first and sees the significance that both parties contribute. In this study, this was described as a classroom in which the teacher established a caring and open classroom. Questions would be encouraged and teachers, responsive to student needs, and teachers would stop to check for understanding providing feedback on how to better understand the math problem. Students would feel at ease and know that the questions they asked were met with concern for their learning and their contributions mattered, placing an emphasis on respect and personal responsibility (Lickona, 1992). According to McNeely and Falci (2004), for this to occur, the teacher would need to establish a clear set of expectations for mutual trust, laying the ground rules early on so that students knew their input was not only valued but necessary. As the data was reviewed, I found it disheartening to learn that this foundation for trust had not been established by all the teachers and that some students felt mistreated and ridiculed in front of their peers. A student in focus group A openly shared, "I hate this class cuz of how they talk about us. You always hear them talking, sometimes about my friends and it just bugs me." It was evident that when teachers failed to establish a caring learning environment, students were less likely to engage, creating barriers to student-teacher collaboration. Unfortunately, what was unclear from the data is why some teachers openly criticized students; there is a suggestion for further research that emanates from this finding.

Perhaps there could be an emphasis in the beginning of the school year on how to establish a greater connection between students and teachers. Behavior, once seen as off-task by teachers, could then be perceived differently as student-teacher relationships are built. As students and teachers engage in a two-way dialogue about how instruction could be modified or the instructional pace adjusted, students could provide input to their teachers to reduce confusion, avoid discipline issues, and increase student engagement. Regardless, this study suggested that students need to play a more active role in the classroom, where the exchange between students and teachers develops into a conversation about how to best meet the needs of students which leads me to the next finding related to the first research question.

Teachers and students expressed a need for relevant examples in illustrating specific mathematical concepts. These relevant examples, according to students, would need to be applicable to their lives indicating that one's culture and background would play a significant role. Culturally relevant teaching then takes relevance to another level as teachers recognize that students come from diverse cultural backgrounds and that teaching should be adjusted to reflect those differences. Although the students in this study did not mention culture or race in their desire for teachers to use real-life examples, 43% of the student participants were of Latino descent suggesting that cultural relevance could be important. In Banks and Banks (2004) review of multicultural teaching, images and practices familiar to students capitalize on the strengths students bring to school and make learning easier. With familiarity, the connection to that mathematical concept becomes relevant resulting in a higher chance of success. It is important then as teachers and students engage in the reciprocal process of learning, teachers

seek to understand student differences and students communicate with their teachers how best to meet their instructional needs with more background about who they are as people.

As referenced in Chapter Two, students taught within a constructivist framework become co-constructors of their learning and serve as active participants in providing feedback to their teachers (Mevarech, 1999). In effect this provides teachers an inherent check for student understanding and an opportunity to adjust instruction based on the student's culture or background. Although critics have argued that constructivism leads to group think stating that the two-way dialogue attribute of a constructivist classroom is not collaborative at all. Rather, a few students' voices or interpretations dominate the group's conclusions, and dissenting students' voices are forced to conform to the emerging consensus (Hirsch, 1996). With this criticism in mind, it is recommended that teachers be mindful of this criticism and be intentional in seeking the voice of every student in class so that learning is relevant to all students.

Research Question Two

In Washington State, according to the Office of Superintendent of Public Instruction, all students shall be taught by highly qualified teachers. For high school math teachers, that means at a minimum a bachelor's degree in math and be able to demonstrate a high level of competency. It is this combination of pedagogical skill and subject knowledge that has been deemed necessary for teachers to understand which instructional strategies to use to improve student learning. Without this mixture of skill and knowledge, teachers may lack the ability to provide relevant examples and detailed explanations—a finding expressed in this study. Unfortunately without adequate subject (content) knowledge, the special education teachers in this study struggled to use instructional strategies that best met the needs of the students.

The research on subject knowledge has shown that having a degree in math does not necessarily result in higher student achievement (Hill, Rowan & Ball, 2005). Because there is a lack of consensus about what is required for teachers to know, colleges of education and policy makers disagree on what should be covered in school (Fennema & Franke, 1992). In Begle's (1979) meta-analysis of studies that looked at the effects of teacher variables on student math performance, positive main effects on student achievement was found in only 9% of the cases in which math teachers majored or minored in math. Those effects decreased further when teacher knowledge reached a level of Calculus and above. However, positive main effects increased to 23% when examining the number of mathematical methods courses math teachers took in college. Begle concluded that it is not necessarily how much the teacher knows, but a combination of subject knowledge and pedagogical skill. These findings are consistent with this study in that students' responses suggested a balance between having confidence in their teacher's subject knowledge within a differentiated instructional model that included detailed explanations and relevant examples.

In summary, the teachers in this study appeared impeded by their understanding of mathematical concepts and the lack of professional development on how best to differentiate instruction. In order to provide adequate explanations and relevant examples at a pace amenable to learning, both teachers and students agreed that subject knowledge is a prerequisite. Likewise, teachers and students found it difficult to engage with one another when feelings of frustration or confusion arose over the understanding of math. As teachers give special education students a space in which to communicate the effectiveness of instruction, teachers need training on specific methods and instructional strategies so as to adequately respond. The answer, then, lies

not just with an education system that needs to value student voice, but a shift in our thinking on how teaching assignments are determined and the appropriate role of the teacher evaluation process. Although these additional recommendations and suggestions for further research must be viewed within the limitations of this study, I offer ideas and changes at the local and state level for how student-teacher collaboration could be encouraged and influence a different approach to teaching and learning.

Recommendations and Suggestions for Research

As this study suggested, both students and teachers play a pivotal role in student learning. Therefore, I am proposing that three levels of recommendations be considered in connection with ideas for further research. First, I offer suggestions for students in how to develop voice in the provision of SDI. Then at the local level I recommend improved procedures regarding how special education teachers are assigned to teach particular subjects. Additionally, this district and others across the state are implementing new procedures in which to evaluate and observe teaching. Incorporating an element of student voice would be helpful. Although some of these recommendations may seem to fall outside the scope of this study, especially considering the study's limitations, I would refer you back to Chapter One when I first defined student voice. I defined student voice as a concept that could be interpreted many ways and expressed differently depending on the degree of knowledge (Britzman, 1989). Given the lack of research on the perspective of high school special education math students and their teachers, I chose the literal definition of student voice defined solely as perspective seeking. Once a perspective is obtained, albeit limited, I feel it is my responsibility to offer recommendations that could impact change in a greater way.

Students. According to Mitra (2003), student voice has played an important role in shaping a school's curriculum and instructional methods. Students when listened to are able to offer insight into how to shape the design and delivery of instruction that best meets the students' experiences and interests. Therefore, students must assert themselves in the classroom and perceive themselves as partners in their learning. Remaining silent or engaging in disruptive behaviors impedes learning and prevents students from making academic progress. I understand that student-teacher collaboration may not fully exist without a mutual feeling of trust and respect (Freiberg, 1998). However, it is also important that students not withdraw from the classroom and surrender control over their learning to an unresponsive teacher. Students must be willing to use their voice, ask questions, and make suggestions to the teacher regarding instruction. As special education students, students should also be participating in the development of the IEP. This includes understanding what it means to have a MLD and how specific accommodations increase understanding. This will encourage students to better invest in learning and deepen their experience of the curriculum. Suggestions for further research would include a study of the impeding factors related to the inclusion of high school students in the IEP process, for example, time and frequency in the development and review of the IEP.

School districts. It is by no accident that the NCLB (2001) outlined specific requirements for teachers to be deemed *highly qualified*. Disappointed with decades of dismal academic progress, legislators strongly believed that having a highly qualified teacher in every classroom would result in increased student learning. Unfortunately, the NCLB policy made no provision for teachers without subject specific teaching experience. That was left to the school districts to sort out. Therefore, my first recommendation for school districts is that they examine

the transcripts of the teacher applicants and their specific teaching or work experience. Prospective math teachers, special education or not, should be able to produce evidence of their subject knowledge. Several college level math courses, grades noted on a college transcript, and/or an applied background in math could easily provide evidence and justification for being competent to teach math. When in doubt or as an alternate method to ensure subject competency, schools could administer a proficiency exam to prospective hires or when determining teacher assignment, e.g., Measure of Academic Progress (Northwest Evaluation Association, 2011)—a multiple choice computer generated test commonly used in Washington schools to track student progress in reading and math. Considering the time it takes to remediate or dismiss an incompetent teacher and the interim effects the teacher may have on student learning, school districts should want to take these extra steps to ensure that all students are, at a minimum, provided a math teacher who understands math. Suggestions for further research would include a comparison study of the differences between general and special education math teachers across districts with respect to levels of subject knowledge and pedagogical skill.

Teacher evaluation. Currently, school districts across the nation, backed by an unprecedented four billion dollar federal grant, compete for *Race to the Top* (2010) funds as states are awarded for their innovative and compelling educational reform around four specific areas, none of which by the way are related to subject competence. The focus instead has been on teacher evaluation, core standards and assessments, and data systems that accurately track student achievement.

In an effort to establish a more comprehensive and consistent approach to the evaluation of teachers and the instructional effectiveness on student learning, Senate Bill 5895 was signed

into law by Governor Gregoire on March 8, 2012. Seen by teachers as an opportunity to receive meaningful feedback and a principal's tool in determining whether or not the instruction has helped students learn, educators across the state have collaborated on exactly what the evaluation will entail. Although multiple measures of student growth data must be used for evaluation purposes, the manner in which the data are collected is up to the individual school district and may or may not use student voice as one of the criteria according to Senate Bill 5895.

Using one of three instructional frameworks approved by OSPI, e.g., The Marzano Teacher Evaluation Model (e.g., Marzano, 2003; Marzano et al., 2001), school districts choose which tool to use when evaluating the impact of a teacher's instruction on student learning. At this study's high school, teachers and administrators have been meeting for the past year, reviewing, selecting, and adopting elements to include in the district's teacher and principal evaluation system. Although student input was discussed, unfortunately, this high school chose not to include an element of student voice in the evaluation process.

For new teachers, their experience with student voice and its role in instructional effectiveness may look a little different. In Washington State, according to rubrics 13-15 of the *Washington Teacher Performance Assessment* (2011), teacher candidates are expected to provide evidence of their use of student voice and its relationship to how students understand the learning targets and strategies to improve student learning. As a member of a local Professional Educator Advisory Board, I have witnessed the inclusion of student voice in teacher candidate's portfolios and have been impressed with the candidate's reflection of its importance in shaping their use of instructional strategies. For example, in a conversation with one candidate, she stated, "I thought I was teaching the right way, but when I asked the class how it was working, they said they did

not understand what I was trying to teach." (Personal communication, May 17, 2012). This candidate elaborated on how she adjusted the way she taught after talking more with her students.

I am recommending that the legislature alter their opinion on the inclusion of student voice, requiring school districts to include student input in the formal evaluation process. As the students in this study made clear, subject knowledge, the ability to connect with students, and differentiated instruction are the tenets of good teaching. If principals want to ensure that teachers retain these important qualities over time, then inviting students to share their perspectives would be necessary. Likewise, it would be just as important that the evaluator, e.g., the principal, and the evaluation tool have the ability to accurately measure these qualities. These two issues and objections to student voice in the evaluation process are discussed next.

The Mathematical Quality of Instruction (MQI) (2006), an observation tool that incorporates a series of questions and classroom observations, is one example of an observation tool that could provide the necessary information in which to measure teacher effectiveness and its impact on student learning. The MQI was designed to measure the quality of mathematics instruction, while taking into consideration the teachers' pedagogical content knowledge and the student perceptions of the classroom atmosphere. Through direct observation, teacher interview and reflection, and student surveys, a principal would be able to get a holistic picture of what was happening. The MQI was designed to better evaluate the accuracy of the content, the way curriculum is communicated with students, and the evidence of a student-teacher collaborative environment. Objections to an evaluation protocol, such as the MQI (2006), could be a teacher's complaint of student bias and perhaps an inaccurate representation of the teacher's

interactions with students. However, this study and others (e.g., Gentilucci, 2004) suggest that although no teacher can be expected to be in a good mood all the time, repeated comments from multiple students suggest that some teachers do routinely engage in negative interactions with students and are cause for concern. Over time and with repeated exposure, students' willingness to ask questions can be reduced followed by students' disengagement. My recommendation as a response to this objection would be to survey several students across multiple classrooms in order to obtain a clear sense of what students perceive of the classroom environment.

Another objection stems from an evaluator's subject knowledge and degree of instructional competence. Administrators who lack an understanding of math or have limited training in differentiated instruction would give little credibility to the potential shortcomings that an evaluation may suggest. Therefore, principals would need to be highly qualified in math and be considered an instructional leader. If not, teachers, and rightfully so, could complain about the validity of the evaluation, calling into question the principal's limited understanding of math and/or instruction. Expecting this degree of expertise of smaller school districts may be difficult to accomplish, considering the number of subject areas and corresponding number of teachers and administrators. But it certainly seems possible in larger schools.

Research as to the validity of this process and whether or not it impacts student learning would be suggested. If researchers, like me, want student voice as a component of the teacher evaluation process, then additional research is needed to demonstrate the benefit to instruction.

Implications for Leaders

When the No Child Left Behind (NCLB) Act (2001) was passed making significant changes to teacher certification, principals began to worry about their ability to hire highly

qualified teachers. Already facing teacher shortages in math and special education (Brackett & Brackett, 2005; Ingersoll, 2003), schools struggled to fill open teaching positions. Using the HOUSSE method and the few remaining veteran teachers certified to teach all subjects at all grade levels, most schools were able to fulfill the legislative requirements. But with the recent reauthorization of the NCLB (2004) and an increased focus on standards-based curriculum and assessment, principals have been facing increasing difficulty in the recruitment of HQ teachers (Miller, 2011). According to a report by the Department of Education (2011), there has been a shortage of special education and math teachers in Washington since 1996.

The added responsibilities of evaluation and progress monitoring associated with the development and review of the IEPs have pushed prospective teacher candidates away from the idea of being a special education teacher. Although, some school districts may accommodate for this increased work load by giving special education teachers an additional planning period or a small stipend, in the minds of some prospective or even current special education teachers, the accommodations are not enough (e.g., Personal communication, August 31, 2011). This holds true for math teachers as well. Today's technological advances and global competition has required more from our math teachers. Becoming an expert in the field of mathematics demands a degree of intelligence and a sophisticated level of knowledge and experience. The real experts in math—the ones our public schools need—are becoming mathematicians rather than teachers (*Occupational Outlook Handbook*, 2010). This could be due to the unrealistic demands of a teacher and the comparatively low pay. For example, according to the Bureau of Labor and Statistics (2010), the median income of a math teacher was less than the lowest paid mathematician. Even the highest paid teachers are still making less than the median salary of a

mathematician. Instead of entering the teaching profession, where salaries are significantly lower, graduates have been choosing applied mathematics as their profession. Although school districts may not be able to attract math teachers with high salaries, there is another way to secure qualified math teachers. As educational leaders, we must use our position and philosophy of leadership to effect changes in teacher placement, professional development, and evaluation to recruit highly qualified teachers in an effort to improve student learning.

As stated previously, students in the area of math have made minimal progress since 1973 motivating some researchers to examine student learning from a different perspective (e.g., Mitra, 2003). Up until about ten years ago, the research was predominantly accountability-based and from a teacher or principal perspective with little interest in what students say has an impact on learning. As students, especially those diagnosed with a Mathematical Learning Disability, continued to fall further behind their peers in math, a student perspective on the examination of instructional effectiveness and its impact on academic achievement became apparent. These studies found that encouraging student voice was a necessary part of the education system demonstrating positive results in areas of curriculum and design (Mitra, 2003; Oldfather, 1995; Robinson & Taylor, 2007; Rudduck & Flutter, 2000) and teacher evaluation (Cook-Sather, 2007; Gentilucci, 2004; Gentilucci & Mutto, 2007).

As educational leaders, we must be willing, especially when others are not, to advocate for the needs of our students embracing a democratic philosophy of education that relies on the perceptions of students, staff, and community. It is not enough to recognize that a need exists, but to take careful action in remediating deficiencies that impede student learning. This study has demonstrated that at least some of our special education math teachers do not collaboratively

engage with students in the provision of SDI, yet studies have shown that a student-centered approach to instruction positively impacts student learning (Hargreaves & Fink, 2004; Hoy & Hoy, 2003). Additionally, this study demonstrated that when teachers show care and responsiveness, students are more likely to ask for help and further engage in their learning.

Secondly, when determining teacher assignment, principals should consider an in-house subject examination. Although initially unpopular for both teachers and principals, using the tools available to weed out incompetent teachers, focusing on who is the most qualified for the job, could lead to a more productive and higher quality learning environment (Yonezawa & Jones, 2007).

Next, as teachers are observed and evaluated with an emphasis on growth and development, educational leaders should incorporate student voice as an integral part of the evaluation process. Students would be especially appreciative in this role as a voice whose thoughts on improving student learning and the factors that prevent student achievement could finally be heard (Mitra, 2007).

Finally, many schools have been led by persons with the ability to positively engage students, staff, and community, welcoming the advantages of a democratic view of change. Giving others an opportunity to share their insights and ideas not only gives us a broader lens in which to see, but it sends a message that all are seen as capable and valued members of the group. This study encourages school administrators to partner with others within a democratic framework because it can positively influence communication (Mitra, 2007) and improve student learning (Jones, 2009).

Researcher Reflections

When I first embarked on this journey, little did I know that I would develop such a passion for math education and the rights of special education students. As an advocate by training and a student who has done well in math courses, I did not fully appreciate how difficult it can be for teachers to teach and for students to learn. Yet, when I dug deeper and took a closer look at what it was about math that I enjoyed, it was not just the subject—it was the teachers too. For example, my earliest memory of elementary school was being recommended by my fourth grade math teacher to the gifted program. After failing the test because of what I am sure was due more to my anxiety and lack of rapport with the examiner than my abilities, I persevered. My teacher, disappointed that I did not gain acceptance into the program, continued to nurture my abilities and praised me for my accomplishments. Later as a middle school student, where I was one of six in a geometry class, I was impressed by my math teacher's ability to articulate proofs and apply geometrical concepts to real-life. Never once did I doubt his love of teaching and his knowledge of mathematics. Addressing everyone by their last name, this teacher modeled respect and established a classroom of care and concern for every student. School, for me, was a place I could trust, and math was always something I could count on to make me feel competent and cared for as a student.

Later as I explored a career in teaching, it was not any particular subject that initially attracted me but the ability to make a difference in the lives of students. Starting out as an adjunct faculty for two local colleges, I immediately knew that I had found my calling. Developing my instructional skills, advising students, and growing my subject knowledge

required organization, competence, and personal reflection. Some of the best instructional advice I received was the written comments from students at the end of each course. My students knew my strengths and could articulate my weaknesses. For that I thank them, because without their input I would not have grown. That is why I find it strange that at public schools, student evaluations are not required. Although I choose to incorporate a self-developed student evaluation into my classes, expecting this of all teachers is a topic of contention among my peers. Yet this study shows that students are very insightful about what teachers can do to better impact student learning.

When I began exploring ideas for my dissertation and settled on the concept of math instruction and the impact student voice could have on student learning, I expected my classroom experiences to be similar to that of others. I was not expecting to learn that nearly every student in the focus groups had experienced a special education math teacher who either did not understand math or was not able to differentiate instruction in a manner that met students' needs. Although I anticipated a few complaints about the teacher being too strict or yelling once in a while, it was alarming to learn that the special education students at this high school had witnessed many negative encounters with teachers. Wanting to remain objective, I searched for reasons why my colleagues were not able to provide the instruction that these students were entitled. All were experienced special education teachers, had earned graduate degrees, and had extensive professional development in differentiated instruction. The only factor that seemed to separate the special education teachers from other math teachers was a math degree or at least recent professional development in math. I now wonder if a relationship exists between job

satisfaction and a teacher's confidence in their ability to understand and teach math; and does this relationship impact student-teacher collaboration.

Another moment of reflection was the experience of engaging with students in the understanding of how teachers and students could collaborate in the use of instructional strategies. I realized that my demonstration of care, checking for understanding, and being responsive to their questions were exactly what students were asking of their math teachers. I believe that had I not engaged in that manner, students would not have felt comfortable in sharing their perceptions. As a result, this study would have most likely resulted in weak findings.

As this journey comes to a close, I am still passionate about math education but an even greater advocate for ensuring that all students, especially those diagnosed with a Mathematical Learning Disability, receive instruction from caring, competent teachers. I am also even more intent on insisting that students be included in the training, selection, and evaluation process of teachers. Students with learning disabilities differ in ability and the need for differentiated instruction and their voice can play an important role in that instruction. The teaching profession has one central goal and that is to positively impact student learning, regardless of disability or other mitigating circumstances. If the few students and teachers in this study are even somewhat correct, then educational reformers should focus a bit more on student-teacher collaboration by growing connections with students, providing differentiated instruction, and increasing teacher knowledge.

Conclusion

This qualitative study sought the voice of high school special education students diagnosed with a MLD in an effort to better understand how students and teachers could collaboratively engage in the provision of SDI. The theoretical framework proposed a balance between constructivism and direct instruction within a student-centered classroom. This classroom atmosphere would encourage student voice and provide feedback to teachers in the provision of SDI. The literature implied that students offer a unique perspective and that when listened to can positively impact student learning. According to fifteen student participants and three special education math teachers, collaboration between students and teachers did not exist, yet suggestions for encouraging this two-way dialogue emerged. While three themes emerged in response to the two research questions, the findings were best discussed as characteristics of an effective teacher. These themes—student connectedness, differentiated instruction, and subject competence—suggest that students, school districts and policy leaders engage in a dialogue about how to improve student learning starting with every student in every classroom having a highly qualified math teacher.

Although it is in math where schools have made little progress over the last several decades, a comparison study of multiple subject areas would allow educators to gain insight into the unique differences, if any, that may exist between teachers across different disciplines. Likewise, considering that little research has been done from the perspective of students, studies examining how different age groups within and across various demographics (e.g., gender, socioeconomic status, and race) are recommended. These subgroups of students may differ in their perceptions of how teachers and students collaborate on the effectiveness and use of

specific instructional strategies and the impact it has on student learning. The recommendations from this study must are limited due to the size and scope of the study. Nonetheless, this study does raise questions and offer possible courses of action to consider.

In conclusion, the provision of SDI can be better met in a classroom where student voice is an integral part of the instructional process. With greater attention to personalized learning, special education math students and their teachers need the opportunity to voice their perspective. By incorporating student voice, students and teachers will be able to collaboratively define and describe instruction that works. Creating a critical consciousness within educational reform (Greene, 2007), schools can seek out and redefine the instructional strategies that have the most impact on student learning. Only then will we achieve a level of awareness needed to close the achievement gap in math and make the necessary academic gains.

References

Acker-Hocevar, M., Cruz-Janzen, M.I., & Wilson, C.L. (in press). *Leadership from the ground up: Sustainable school improvement in traditionally low performing schools.* Charlotte, NC: Information Age Publishers.

Adams, G., & Engelmann, S. (1996). *Research on direct instruction: Twenty years beyond DISTAR.* Seattle, WA: Educational Achievement Systems.

Albert, R. D. (1996). *A framework and model for understanding Latin America and Latino/Hispanic cultural patterns.* Thousand Oaks, CA: Sage Publishing.

Alexander, P. A., Jetton, T. L., & Kulikowich, J. M. (1995). Interrelationships of knowledge, interest, and recall: Assessing a model of domain learning. *Journal of Educational Psychology*, *87*, 559-575.

American Council on Education (ACE). (1999). *To touch the future: Transforming the way teachers are taught. An action agenda for college and university presidents.* Washington, DC: American Council on Education.

Amirali, M., & Halai, A. (2010). Teachers' knowledge about the nature of mathematics: A survey of secondary school teachers in Karachi, Pakistan. *Bulletin of Education Research*, *32*(2), 45-61.

Anderson, V., & Hidi, S. (1988). Teaching students to summarize. *Educational leadership*, *46*, 26-28.

Anderson, C. R., & Hoffmeister, A. M. (2007). Knowing and teaching middle school mathematics: A professional development course for in-service teachers. *School Science and Mathematics*, *107*(5), 193-203.

Bailey, L. B. (2010). The impact of sustained, standards-based professional learning on second and third grade teachers' content and pedagogical knowledge in integrated mathematics. *Early Childhood Education, 38,* 123-132.

Baker, L. A., Decker, S. N., & DeFries, J. C. (1984). Cognitive abilities in reading-disabled children: A longitudinal study. *Journal of Child Psychology and Psychiatry,* 25(1), 111-117.

Ball, D. L., Lubienski, S. T., & Mewborn, D. S. (2001). Research on teaching mathematics: The unsolved problem of teachers' mathematical knowledge. In V. Richardson (Ed.), *Handbook of Research on Teaching* (4th ed.). New York: Macmillan.

Banks, J. A., & Banks, C. A. (Eds.). (2004). *Handbook of research on multicultural education* (2nd ed.). San Francisco, CA: Jossey-Bass.

Barila, T. (2010). *Children's Resilience Initiative*. Retrieved from http://resiliencetrumpsaces.org/communityin.cfm

Benner, G. J., Nelson, J. R., Ralston, N. C., & Mooney, P. (2010). A meta-analysis of the effects of reading instruction on the reading skills of students with or at-risk of behavioral disorders. *Behavioral Disorders, 35*(2), 86-102.

Beresford, J. (2000). *Student perspectives on school improvement.* Paper presented at the British Educational Research Association Conference, Cardiff University. Retrieved from http://www.leeds.ac.uk/educol/documents/00001529.htm

Berch, D. B., & Mazzocco, M. M. (2007). *Why is math so hard for some children? The nature and origins of mathematical learning difficulties and disabilities*. Baltimore, MD: Paul H. Brooks Publishing Co.

Bernhardt, V. L. (2005). *Using data to improve student learning in high schools.* California: Eye on Education.

Billig, S. (2000). *The Impacts of Service-Learning on Youth, Schools and Communities: Research on K-12 School-Based Service-Learning, 1990–1999.* Denver: RMC Research Corporation with W.K. Kellogg Foundation.

Blum, R. W., & Libbey, H. P. (2004). School connectedness—strengthening health and education outcomes for teenagers. *Journal of School Health, 74*(7), 231-232.

Boardman, A. G., Arguelles, M. E., & Vaughn, S. (2005). Special education teachers' views of research-based practices. *The Journal of Special Education, 39*(3), 158-180.

Bottage, B., & Hasselbring, T. (1993). A comparison of two approaches for teaching complex, authentic, problems to adolescents in remedial math classes. *Exceptional Children, 59(6).*

Bottge, B. A., Rueda, E., LaRoque, P.T., Serlin, R.C., & Kwon J. (2007). Integrating reform-oriented math instruction in special education settings. *Learning Disabilities Research & Practice, 22*(2), 96-109.

Bottge, B., Rueda, E., & Skivington, M. (2006). Situating math instruction in rich problem-solving contexts: Effects on adolescents with challenging behaviors. *Behavioral Disorders, 31*(4), 394-408.

Bracey, G. W. (2007). U.S. performance in international comparisons: An overview. *Principal Leadership, 7*(6), 66-69.

Brackett, N., & Brackett, B. (2005). *Highly qualified teachers*. U.S. Department of Education, Office of Special Education Programs.

Brewer, W. F., & Treyens, J. C. (1981). Role of schemata in memory for places. *Cognitive Psychology, 13,* 207-230.

Britzman, D. (1989). Who has the floor? Curriculum teaching and the English student teacher's struggle for voice. *Curriculum Inquiry, 19*(2), 143-162.

Brophy, J. (2004). *Motivating students to learn* (2nd ed.). Boston, MA: McGraw-Hill.

Brophy, J., & Good, T. (1986). Teacher behavior and student achievement. In M. Whittrock (Ed.), *Handbook of research on teaching* (pp. 328-375). New York: Macmillan.

Buehl, D. (2001). *Classroom strategies for interactive learning.* Newark, DE: International Reading Association.

Carnine, D.W., Silbert, J., Kame'enui, E. J., & Tarver, S. G. (2004). *Direct instruction reading* (4th ed.). New Jersey: Prentice Hall.

Carroll, T., & Fulton, K. (2004). The true cost of teacher turnover. *Threshold,* 16-17.

Chan, L., & Dally, K. (2001). Learning disabilities: Literacy and numeracy development. *Australian Journal of Learning Disabilities, 6*(1), 12-19.

Chiodo, J. J., & Byford, J. (2004). Do they really dislike social studies? A study of middle school and high school students. *Journal of Social Studies Research, 28*(1), 3-12.

Chung, I. (2004). A comparative assessment of constructivist and traditionalist approaches to establishing mathematical connections in learning multiplication. *Education, 125*(2), 271-278.Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. L. (1966). *Equality of educational opportunity*. Washington, D.C. Retrieved from http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/06389

Cook-Sather, A. (2002). Authorizing students' perspectives: Toward trust, dialogue, and change in education. *Educational Researcher, 31*(4), 3-14. Retrieved from http://www.aera.net/pubs/er/pdf/vol31_04/AERA310402.pdfCook-Sather, A. (2006). Sound, presence, and power: Exploring student voice in educational research and reform. *Curriculum Inquiry, 36*(4), 359-390.

Corsaro, W. A. (1985). *Friendship and culture in the early years*. New Jersey: Ablex Publishing Company.

Creswell, J. W. (2002). *Research design: Qualitative, quantitative, and mixed method approaches*. Thousand Oaks, CA: Sage Publications, Inc.

Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process.* Thousand Oaks, CA: Sage Publications, Inc.

Darling-Hammond, L. (2010). *Evaluating teacher effectiveness: How teacher performance assessments can measure and improve teaching*. Washington, DC: Center for American Progress.

Delpit, L.D. (1988). The silenced dialogue: Power and pedagogy in educating other people's children, *Harvard Educational Review*, *58*(3), 280-298

Dewey, J. (1899). *My educational creed*. New York: E.L. Kellogg & Co.

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. New York: Macmillan.

Dochy, F., Segers, M., Van den Bossche, P., & Gijbels, K. (2003). Students' perceptions of a powerful learning environment. *Learning Environments Research.* Retrieved from https://perswww.kuleuven.be/~u0015308/Publications/StudentsperceptionsPBLopmaak%20Kluwer%20double%20space.pdf

Dorman, J. P. (2001). Associations between classroom environment and academic efficacy. *Learning Environments Research, 4*, 243-257.

Duncan, A. (2009). *Partners in reform*. Retrieved from http://www2.ed.gov/news/speeches/2009/07/07022009.html

Eccles, J., Early, D., Fraser, K., Belansky, E., & McCarthy, K. (1997). The relation of connection, regulation, and support for autonomy to adolescents' functioning. *Journal of Adolescent Research, 12*(2), 263-286.

Elfers, A. M., Plecki, M. L., Knapp, M. S., Yeo, G. J. and McGowan, M. L. (2007). Teaching Math in Washington's High Schools: Insights from a Survey of Teachers in High Performing or Improving Schools. Seattle, WA: University of Washington.

Engel, B. S., & Martin, A. C. Eds. (2005). *Holding values: What we mean by progressive education*. Portsmouth, NH: Heinemann.

Engelmann, S. (2007). *Teaching needy kids in our backward system*. Eugene, OR: ADI Press.

Engelmann, S., & Carnine, D. (1991). *Theory of Instruction: Principles and applications* (2nd ed.). Eugene, OR: ADI Press.

Engelmann, S., & Carnine, D. (1982). DI outcomes with middle-class second graders. *ADI News, (1),* 2-5.

Evans, B. R. (2011). Secondary mathematics teacher differences: Teacher quality and preparation in a new York city alternative certification program. *The Mathematics Educator*, *20*(2), 24-32.

Fennema, E., & Franke, M. L. (1992). Teachers' knowledge and its impact. In D. A. Grouws (Ed.), *Handbook of research on mathematics and teaching*, (pp. 147-164). New York: MacMillan.

Fielding, M. (2001). Students as radical agents of change. *Journal of Educational Change, 2*(2), 123-141.

Fielding, M. (2004). New wave: Student voice and the renewal of civic society. *London Review of Education*, 2(3), 197-217.

Fletcher, A. (n.d.). *Unleashing student voice: Research supporting meaningful student involvement*. Retrieved from http://www.soundout.org/article.103.html

Fletcher, A. (2010.). Broadening the bounds of involvement: Transforming schools with student voice. *New Horizons for Learning*, *8*(2). Retrieved from http://education.jhu.edu/newhorizons

Flores, M. M., & Kaylor, M. (2006). The effects of a direct instruction program on the fraction performance of middle school students at-risk for failure in mathematics. *Journal of Instructional Psychology, 34*(2), 84-94.

Fraser, B. J., Walberg, H. J., Welch, W. W., & Hattie, J. A. (1987). Synthesis of educational productivity research [Special issue]. *International Journal of Educational Research, 11*(2), 145–252.

Freiberg, H. J. (1998). Measuring school climate: Let me count the ways. *Educational Leadership, 56(1),* 22-26.

Fuchs, L. S., Compton, D., Fuchs, D., Paulsen, K., Bryant, J. D., & Hamlett, C. L. (2005). The prevention, identification, and cognitive determinants of math difficulty. *Journal of Educational Psychology, 98,* 493-513.

Fuchs, L. S., Fuchs, D., & Prentice, K. (2004). Responsiveness to mathematical problem- solving instruction: Comparing students at risk of mathematics disability with and without risk of reading disability. *Journal of Learning Disabilities, 37,* 293-306.

Fullan, M. (2003). *The moral imperative of school leadership*. Thousand Oaks, CA: Corwin Press.

Gagnon, J. C., & Bottge, B. A. (2006). Mathematics instruction in secondary interim, short- and long-term alternative school placements. *Preventing School Failure, 51*(1), 39-48.

Garnett, K. (1998). Math learning disabilities. *Division of Learning Disabilities Journal CEC.* Retrieved from http://www.ldonline.org/article/5896?theme=print

Geary, D. C. (1993). Mathematical disabilities: Cognitive, neuropsychological, and genetic components. *Psychological Bulletin, 114*, 345-362.

Geary, D. C. (2004). Mathematics and learning disabilities. *Journal of Learning Disabilities, 37*, 4-15.

Gentilucci, J. L. (2004). Improving school learning: The student perspective. *The Educational Forum, 68*(2), 133-143.

Gentilucci, J. L., & Muto, C. C. (2007). Principals' influence on academic achievement: The student perspective. *NAASP Bulletin, 91*(3), 219-236.

George, N. L., George, M. P., Gersten, R., & Grosenick, J. R. (1995). To leave or to stay: An exploratory study of teachers of students with emotional and behavioral disorders. *Remedial and Special Education, 16*, 227–236.

Gersten, R., Keating, T., Yovanoff, P., & Harniss, M. (2001). Working in special education: Factors that enhance special educator's intent to stay. *Exceptional Children.* Retrieved http://findarticles.com/p/articles/mi_hb3130/is_4_67/ai_n28853520/?tag=content;col1

Gerstl-Pepin, C. I & Aiken, J. (2009) Democratic educational leaders: Defining ethical leadership in a standardized context. *Journal of School Leadership, 19*(4), 406-444.

Glesne, C., & Peshkin. (1992). *Becoming qualitative researchers: An introduction.* White Plains, NY: Longman.

Glickman, C.D., Gordon, S.P., & Ross-Gordon, J. M. (2007). *Supervision and instructional leadership: A developmental approach (7th ed.).* Boston, MA: Pearson.

Goodenow, C., & Grady, K. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *Journal of Experimental Education, 62*(1), 60-71.

Goodnough, K., & Cashion, M. (2006). Exploring problem-based learning in the context of high school science: Design and implementation issues. *School Science and Mathematics, 106*(7), 280-295.

Greene, J. C. (2007). *Mixed methods in social inquiry.* San Francisco, CA: John Wiley.

Gregory, G. H. (2007). *Differentiated instructional strategies: One size doesn't fit all* (2nd ed.). Burlington, Ontario: Corwin Publishing.

Grossen, B. (1996). *How should we group to achieve excellence with equity?* Unpublished manuscript. Retrieved from http://www.eric.ed.gov/PDFS/ED460467.pdf

Hall, T., Strangman, N., & Meyer, A. (2003). *Differentiated instruction and implications for*

UDL implementation. Wakefield, MA: National Center on Accessing the General Curriculum. Retrieved from http://aim.cast.org/learn/historyarchive/backgroundpapers/differentiated...

Hallinger, P., & Heck, R. (1996). Reassessing the principal's role in school effectiveness: A review of the empirical research, 1980-1995. *Educational Administration Quarterly, 32*(1), 5-44.

Hargreaves, A., & Fink, D. (2004). The seven principles of sustainable leadership. *Educational Leadership*, 61(7), 8-13.

Harris, S., & Rudduck, J. (1993). Establishing the seriousness of learning in the early years of secondary schooling. *British Journal of Educational Psychology, 63*, 322-336.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York: Routledge.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81-112.

Haycock, K. (1998). Good teaching matters ... A lot: How well qualified teachers can close the gap. *Thinking K-16, 3*(2), 3-14.

Haynes, N. M., Emmons, C., & Comer, J. P. (1993). *Elementary and middle school climate survey*. New Haven, CT: Yale University Child Study Center.

Heider, K.L. (2005). Teacher isolation: How mentoring programs can help . *Current Issues in Education* [On-line], *8*(14). Retrieved from http://cie.ed.asu.edu/volume8/number14/

Helgesen, S. (1995). *The web of inclusion: A new architecture for building great organizations*. New York: Currency/Doubleday.

Heward, W. L. (2009). *Exceptional children: An introduction to special education* (9th ed.). New Jersey: Pearson Education, Inc.

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, *41*, 111-127.

Hill, H.C., Rowan, B., & Ball, D.L. (2005) Effects of teachers' mathematical knowledge for teaching on student achievement**.** *American Educational Research Journal 42*, 371-406.

Hirsch, E. D. (1996). *The schools we need and why we don't have them.* New York: Anchor Books.

Hitchcock, C., Meyer, A., Rose, D., & Jackson, R. (2002). Providing new access to the general curriculum: Universal Design for Learning. *Teaching Exceptional Children, 35*(2), 8-17.

Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. Beverly Hills CA: Sage Publications.

Holloway, I. (1997). *Basic concepts for qualitative research*. London: Blackwell Science.

Hoy, A. W., & Hoy W. K.. (2003). *Instructional leadership: A learning-centered guide.* Boston, MA: Allyn and Bacon.

Ingersoll, R. (2003). *Who controls teachers' work?* First Harvard University Press.

Ingersoll, R. (2002). The teacher shortage: A case of wrong diagnosis and wrong prescription. *NASSP Bulletin, 86*(631), 16-31.

Ives, B. (2007). Graphic organizers applied to secondary algebra instruction for students with learning disorders. *Learning Disabilities Research & Practice, 22*(2), 110-118.

James, D. W., Jurich, S., and Estes, S. (2001). *Raising minority academic achievement: A compendium of education programs and practices*. Washington, DC: American Youth Policy Forum.

Jeynes, W. H. (2008). A meta-analysis of the relationship between phonics instruction and minority elementary school student academic achievement. *Education and Urban Society, 40,* 151-166.

Johnson, K., & Golombek, P. R. (2002). *Teachers' narrative inquiry as professional development.* New York: Cambridge University Press.

Johnson, W. L., Johnson, M., & Zimmerman, K. (1996). Assessing school climate priorities: A Texas study. *The Clearing House, 70(2),* 64-66.

Jones, E. D., & Southern, W. T. (2003). Balancing perspectives on mathematics instruction. *Focus on Exceptional Children, 25*(9), 1-16.

Kame'enui, E. J., & Carnine, D.W. (1998). *Effective teaching strategies that accommodate diverse learners*. New Jersey: Prentice Hall.

Kemp, J.E., Morrison, G.R., & Ross, S.M. (1996). *Designing Effective Instruction*, (2nd Ed). Upper Saddle River, NJ: Prentice-Hall.

Kerachsky, S. (2009). *National assessment of educational progress: The nation's report card mathematics 2009*. The National Center for Education Statistics. Retrieved from http://nces.ed.gov/whatsnew/commissioner/remarks2009/10_14_2009.asp

Kilpatrick, J. (1992). A history of research in mathematics education. In D. Grouws (Ed.), *Handbook of research on mathematics: Teaching and learning* (pp. 3-38). New York: Macmillan.

Kirsch, I., H., Yamamoto, B.K., & Sum, A. (2007). *America's perfect storm: Three forces changing our nation's future*. Princeton, NJ: Educational Testing Service.

Klein, D. (2007). A quarter century of US 'math wars' and political partisanship. *Journal of the British Society for the History of Mathematics, 22*(1), 22-33. Retrieved from http://www.csun.edu/~vcmth00m/bshm.html

Klem, A. M., & Connell, J. P. (2009). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health, 74*(7), 262-273.

Knapp, M. S., Copland, M. A., Ford, B., Markholt, A., McLaughlin, M., Milliken, J., & Talbert, J. E. (2003). *Leading for learning sourcebook: Concepts and examples*. Seattle, WA: Center for Study of Teaching and Policy, University of Washington.

Kosc, L. (1974). Developmental dyscalculia. *Journal of Learning Disabilities*, *7*, 46-59.

Krueger, R. A. (1994). *Focus groups: A practical guide for applied research*. Thousand Oaks, CA: Sage Publications.

Kuder, S. J. (1990). Effectiveness of the DISTAR reading program for children with learning disabilities. *Journal of Learning Disabilities*, *23*(1), 69-71.

Kuperminc, G. P., Leadbeather, B. J., & Blatt, S. J. (2001). School social climate and individual differences in vulnerability to psychopathology among middle school students. *Journal of School Psychology*, *39*(2), 141-159.

Lara, M. (2011). *G.L.A.D. resource book.* Retrieved from https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxiaWxpbmdlZHVjfGd4OjU5YTdkOTJjZDAxYzliYzk

Lebedina-Manzoni, M. (2004). To what students attribute their academic success. *Education*, *124*, 699-708.

Lemke, M., Sen, A., Pahlke, E., Partelow, L., Miller, D., Williams, T., . . . & Jocelyn, L. (2004). *International outcomes of learning in mathematics literacy and problem solving: PISA 2003 results from the U.S. perspective* (NCES 2005-003). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Lesko, W., & Tsouronis, E. (1998). *Youth! The 26% solution*. Kensington, MD: Information USA, Inc.

Lewin, K., Lippit, R., & White, R. K. (1939). Patterns of aggressive behavior in experimentally created social climates. *Journal of Social Psychology*, *10*, 271-301.

Lickona, T. (1992). *Educating for character: How our schools can teach respect and responsibility*. New York: Bantam Books Publishing.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage Publications.

Lodge, C. (2005). From hearing voices to engaging in dialogue: Problematizing student participation in school improvement. *Journal of Educational Change*, *6*(2), 125-146.

Long, J. S., & Sterenberg, G. (2007). Relations of care when teaching mathematics. *Academic Exchange Quarterly.* Retrieved from http://findarticles.com/p/articles/mi_hb3325/is_2_11/ai_n29397971/?tag=content;col1

Losen, D.J. (2011). *Discipline Policies, Successful Schools, and Racial Justice*. Boulder, CO: National Education Policy Center. Retrieved from http://nepc.colorado.edu/publication/discipline-policies

Ma, L. (1999). Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States. Mahwah, NJ: Erlbaum.

Maccini, P., & Gagnon, J. C. (2002). Perceptions and application of NCTM standards by special and general education teachers. *Exceptional Children*, *68*, 325-344.

Maccini, P., Mulcahy, C.A., & Wilson, M.G. (2007). A follow up of mathematics intervention for secondary students with learning disabilities. *Learning Disabilities Research and Practice*, *22*(1), 58-74.

Mallory, B. L., & New, R. S., (1994). Social constructivist theory and principles of inclusion: Challenges for early childhood special education. *Journal of Special Education, 28*(3), 322-337.

Marshall, M. L. (2004). Examining school climate: Defining factors and educational influences. *Center for Research on School Safety, School Climate, and Classroom Management.*

Marshall, C., & Rossman, G. B. (2011). *Designing qualitative research.* Thousand Oaks, CA: Sage Publications, Inc.

Martin, E. W., Martin, R., & Terman, D. L. (1996). The legislative and litigation history of special education. *The Future of Children*, *6*(1), 25-39. Retrieved from http://www.princeton.edu/futureofchildren/publications/docs/06_01_01.pdf

Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria, VA: ASCD Publishing.

Marzano, R. J., Waters, T., & McNulty, B. (2005). *School leadership that works: From research to results.* Alexandria, VA: ASCD.

Mazzocco, M. M. M., & Myers, G. F. (2003). Complexities in identifying and defining mathematics learning disability in the primary school age years. *Annals of Dyslexia*, *53*, 218-253.

McCall, D. (2000). *Selected case studies of youth involvement in public decision making.* Centre on Community and School Health, Canadian Association for School Health for the Division of Childhood and Adolescence, Health Canada. Retrieved from http://www.hc-sc.gc.ca/hppb/childhood-youth/spsc/policy/e_policy50.htmlMcCleary v.

State of Washington, 07-2-02323-2 (SEA, Superior Court, 2009). Retrieved from http://www.kingcounty.gov/courts/SuperiorCourt/opinions.aspx

McCracken, G. (1988). *The long interview.* Newbury Park, CA: Sage.

McNeely, C., & Falci, C. (2004). School connectedness and the transition into and out of health risk behaviors among adolescents: A comparison of social belonging and teacher support. *Journal of School Health, 74,* 284-292.

Medina, J. (2008). *Brain rules: 12 principles for surviving and thriving at work, home, and school.* Seattle, WA: Pear Press..

Merrill, C., Devine, K. L., Brown, J. W., & Brown, R. A. (2010). Improving geometric and trigonometric knowledge and skill for high school mathematics teachers: A professional development partnership. *The Journal of Technology Studies*. Retrieved from http://scholar.lib.vt.edu/ejournals/JOTS/v36/v36n2/pdf/merrill.pdf

Mevarech, Z. R. (1999). Effects of metacognitive training embedded in cooperative settings on mathematical problem solving. *The Journal of Educational Research*, *92*(4), 195-205.

Mitra, D. L. (2003). Student voice in school reform: Reframing student-teacher relationships. *McGill Journal of Education*, *38*(2), 289-304.

Mitra, D. L. (2007). The role of administrators in enabling youth-adult partnerships in schools. *NASSP Bulletin*, *91*(3), 237-256.

Montague, M. (1992). The effects of cognitive and metacognitive strategy instruction on the mathematical problem solving of middle school students with learning disabilities. *Journal of Learning Disabilities*, *25*(4), 230-248.

Moustakas, C. (1994). *Phenomenological research methods*. Thousand Oaks, CA: Sage

Mulford, B., & Moreno, J. M. (2006). Sinking ships, emerging leadership: A true story of sustainability (or the lack thereof). *The Educational Forum*, *70*(3), 204-214.

Murnane, R. J., & Levy, F. (1996). *Teaching the new basic skills: Principles for educating children to thrive in a changing economy.* New York: Free Press.

National Commission on Excellence in Education (1983). *A nation at risk*. Retrieved from http://www2.ed.gov/pubs/NatAtRisk/risk.html

National Mathematics Advisory Panel (2008). *Foundations for Success: The Final Report of the National Mathematics Advisory Panel*, U.S. Department of Education: Washington, DC. Retrieved from http://www2.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf

National Research Center on Learning Disabilities (NRCLD). *And miles to go...: State SLD requirements and authoritative recommendations* (2002). Retrieved from http://www.nrcld.org/about/research/states/section4.html

O'Donnell, J., & White, P. (2005). Within the accountability era: Principals' instructional leadership behaviors and student achievement. *NASSP Bulletin, 89*, 56-71.

Office of Superintendent of Public Instruction (2011). *Washington state report card*. Retrieved from http://reportcard.ospi.k12.wa.us/summary.aspx?groupLevel=District& schoolId=266& reportLevel=District&orgLinkId=266&yrs=&year=2010-11

Oldfather, P. (1995). Learning from student voices. *Theory into Practice, 43*(2), 131-143.

Oliff, J. (2004). Core curriculum presents new challenges for special education teachers. The *Philadelphia Public School Notebook, 12*(1). Retrieved from http://www.thenotebook.org/fall-2004/04707/standardizing-curriculum

Patton, M. W. (2002). *Qualitative research and evaluation methods (3rd ed.).* Thousand Oaks, CA: Sage Publications, Inc.

Pellegrino. J. W., & Goldman. S. R. (1987). Information processing and elementary mathematics. *Journal of Learning Disabilities*, *20,* 23-32.

Perie, M., Moran, R., & Lutkis, A.D. (2005). *NAEP 2004 Trends in Academic Progress: Three Decades of Student Performance in Reading and Mathematics*. (NCES 2005-464). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Phillips, V. J., Leonard, W. H., Horton, R. M., Wright, R. J., & Stafford, A. K. (2003). Can math recovery save children before they fail? *Teaching Children Mathematics*, *10*(2), 107-114.

Piaget, J. (1973). *To understand is to invent: The future of education.* New York: Grossman Publishers.

Planty, M., Hussar, W., Snyder, T., Kena, G., KewalRamani, A., Kemp, J. . . . & Dinkes, R. (2009). *The Condition of education* (NCES 2009-081). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, D.C. Retrieved from http://nces.ed.gov/programs/coe/2009/pdf/28_2009.pdf

Rampey, B.D., Dion, G.S., & Donahue, P.L. (2009). *NAEP 2008 Trends in Academic Progress* (NCES 2009–479). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education, Washington, D.C. Retrieved from http://nces.ed.gov/nationsreportcard/pubs/main2008/2009479.asp

Ravitch, D. (2000). *Left back: A century of failed education reform.* New York: Simon and Schuster.

Revised Code of Washington 28A.655.061. Retrieved from http://apps.leg.wa.gov/rcw/default.aspx?cite=28A.655.061

Richardson, V. (1997). *Constructivist Teacher Education: Building New Understandings*. Bristol, PA: The Falmer Press.

Robinson, C., & Taylor, C. (2007). Theorizing student voice: Values and perspectives. *Improving Schools*, *10*(1), 5-17.

Rogers, A. (2005). *Student voice: Bridges to learning*. Seattle: University of Washington.

Rosas, C., & Campbell, L. (2010). Who's teaching math to our most needy students? A descriptive study. *Teacher Education and Special Education*, *33*(2), 102-113.

Rose, D. H., Meyer, A., & Hitchcock, C. (Eds). (2005). *The universally designed classroom: Accessible curriculum and digital technologies*. Cambridge, MA: Harvard Education Press.

Rubin, H. J., & Rubin, I. S. (2005). *Qualitative interviewing: The art of hearing data*. Thousand Oaks, CA: Sage Publications, Inc.

Rudduck, J., & Flutter, J. (2000). Pupil participation and pupil perspective: Carving a new order of experience. *Cambridge Journal of Education, 30*(1), 75-89.

Santrock, J.W. (2008). *A topical approach to life span development*. New York: McGraw-Hill.

Schilling, S.G. & Hill, H.C. (2007). Assessing Measures of Mathematical Knowledge for Teaching: A Validity Argument Approach. *Measurement: Interdisciplinary Research and Perspectives* (5), 2-3, 70-80.

Schmoker, M. J. (2006). *Results now: How we can achieve unprecedented improvements in teaching and learning*. Alexandria, VA: ASCD Publishing.

Shippen, M. E., Houchins, D. E., Calhoon, M. B., Furlow, C. F., & Sartor, D. L. (2006). The effects of comprehensive school reform models in reading for urban middle school students with disabilities. *Remedial and Special Education, 27*(6), 322-328.

Shultz, J. and Cook-Sather, A. (Eds). (2001). *In our own words: Students' perspectives on school*. Lanham, MD: Rowman & Littlefield.

Siegler, R. S., & Shrager, J. (1984). Strategy choices in addition and subtraction: How do children know what to do? In C. Sophian (Ed.), *Origins of cognitive skills* (pp. 229–293). Mahwah, NJ: Lawrence Erlbaum Associates.

Song, J., Grabowski, B. L., Koszalka, T. A., & Harkness, W. L. (2005). Patterns of instructional-design factors prompting reflective thinking in middle-school and college level problem-based learning environments. *Instructional Science*, *34*, 63-87.

Souvignier, E., & Kronenberger, J. (2007). Cooperative learning in third graders' jigsaw groups for mathematics and science with and without questioning training. *The British Psychological Society*, *77*(4), 755-771.

Spellings, M. (2006). "*We must raise the bar" in math instruction*. Retrieved from http://www2.ed.gov/news/pressreleases/2006/02/02092006.html

Spradley, J. P. (1979). *The ethnographic interview*. San Diego, CA: Harcourt Publishers.

Stebbins, L., St. Pierre, R., Proper, E., Anderson, R., & Cerva, T. (1977). *Education as experimentation: A planned variation model.* Cambridge, MA: ABT Associates.

Stevens, J. (2012). *Lincoln high school in Walla Walla, WA tries new approach to school discipline—suspensions drop 85%*. Retrieved from http://acesconnection.com/profiles/blogs/lincoln-high-school-in-walla-walla-wa-tries-new-approach-to

Swanson, H., Hoskyn, M., & Lee, C. (1999). *Interventions for students with learning disabilities: A meta-analysis of treatment outcomes*. New York: Guilford Press.

Swanson, H., & Jermon, O. (2006). Math Disabilities: A selective meta-analysis of the literature. *Review of Educational Research, 76*(2), 249-274.

The Education Trust (2005). *The power to change: High schools that help all students achieve.* Washington, D. C. Retrieved from http://www.edtrust.org/sites/edtrust.org/files/publications/files/ThePowerToChange.pdf

Tomlinson, C. A., (2001). *How to differentiate instruction in mixed-ability classrooms.* (2nd Ed.) Alexandria, VA: ASCD.

Tournaki, N. (2003). The differential effects of teaching addition through strategy instruction versus drill and practice to students with and without learning disabilities. *Journal of Learning Disabilities*, *36*(5), 449-458.

U. S. Department of Education, Office of Special Education and Rehabilitative Services. *History: Twenty-five years of progress in educating children with disabilities through IDEA.* (n.d.). Retrieved from http://www2.ed.gov/policy/speced/leg/idea/history.pdf

U.S. Department of Education. (2001). *The elementary and secondary education act (The no child left behind act of 2001).* Retrieved from http://www2.ed.gov/policy/elsec/leg/esea02/index.html

U. S. Department of Education. (2004). *IDEA-Building the legacy of IDEA2004*. Retrieved from http://idea.ed.gov/

Veenman, S., Denessen, Van Den Oord, I., & Naafa, F. Direct and activating instruction: Evaluation of a perservice course. *The Journal of Experimental Education*, *71*(3), 197-225.

Wallin, D. (2003). Student leadership and democratic schools: A case study. *NASSP Bulletin*, *87*(636), 55-78.

Waters, T., Marzano, R., & McNulty, B. (2004). Leadership that sparks learning. *Educational Leadership*, *61*(7), 48-52.

Wiebe-Berry, R. A., & Kim, N. (2008). Exploring teacher talk during mathematics instruction in an inclusion classroom. *Journal of Education Research, 101*(6), 363-378.

Westwood, P. (2003). Drilling basic number facts: Should we or should we not? *Australian Journal of Learning Disabilities*, *8*(4), 12-18.

Wilson, C. L., & Sindelar, P. T. (1991). Direct instruction in math word problems: Students with learning disabilities. *Exceptional Children, 57*(6), 512-519.

Yonezawa, S., & Jones, M. (2007). Students as co-researchers: How principals can recruit, train, and enlist the help of students to examine what works and does not work in their schools. *NASSP Bulletin*, *9*(4), 322-342.

Zeldin, S., Kusgen-McDaniel, A., Topitzes, D., & Calvert, M. (2000). *Youth in decision-making: A study on the impacts of youth on adults and organizations*. University of Wisconsin-Madison: National 4-H Council, University of Wisconsin Extension.

Appendix A

Student Interview Guide

Focus Group Questions

Session One

- Describe a typical day in your math class.
- Talk about something that happens in class that helps you learn.
- What role do students play in the classroom when identifying and selecting the things that helps students learn? What is the teacher's role?
- How do you learn best? How is this different or the same than what the teacher does?
- How do you communicate with your teacher about how you learn? Explain.

Session Two - Follow-up questions

- Earlier this week, we talked about what it was like being a student in this math class. You also shared what your teacher does to help you learn. As the math lesson continued, what else did your math teacher do to help you learn?
- What might make learning math easier so that students could learn more?
- How do you know when you are not learning? How do you respond?
- Closing question: What else would you like to share about what's important in how you learn?

Appendix B

Teacher Online Survey 1

Questions

- Describe a typical day in your math class.
- How do you identify and select instructional strategies and methods that help students learn? What are they?
- Are some instructional strategies or methods more appropriate for particular students? Describe.
- How do students participate in the discussion or the process about what helps them learn math?

Follow-up questions after student focus group session two:

- Earlier this week, you wrote about a typical day in your math class. You also described what you do to help students learn. As the math lesson continued, how else did you help your students learn?
- What might make teaching math easier so that students could learn more?
- How do you know when students are not learning? How do you respond?
- Closing question: What else would you like to share about what's important in how you teach and its impact on student learning?

Appendix C

Teacher Online Survey 2

Questions posed during data analysis

- How do you incorporate small group instruction into the classroom?
- How do you encourage student participation in the instructional process of learning?
- How do you connect mathematical concepts to real-life application?
- What do you attribute a lack of response in the classroom?
- One teacher said, “No one strategy works for all. It is often like trying to find a light switch for each light in a darkened room.” How do you attempt to individualize and differentiate instruction?