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Assessing Reading and Mathematics Achievement of Students with Disabilities in a Suburban Middle School

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Assessing Reading and Mathematics Achievement of Students with Disabilities in a Suburban Middle School

by
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Approval Page

This applied dissertation was submitted by Terri M. Toomer under the direction of the persons listed below. It was submitted to the Abraham S. Fischler College of Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova Southeastern University.

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Abstract

Assessing Reading and Mathematics Achievement of Students with Disabilities in a Suburban Middle School. Terri M. Toomer, 2017: Applied Dissertation, Nova Southeastern University, Abraham S. Fischler College of Education. Keywords: students with disabilities, co-teaching, inclusion, mathematics, reading, middle schools, teacher education

Co-teaching classrooms consist of general and special education teachers working together to benefit students with disabilities (SWDs). Many parents and teachers believe the content knowledge provided by general educators in the regular education setting, combined with the specialized instruction expertise of special educators, will result in the greatest academic growth for SWDs. However, it is not known if SWDs served in one service delivery model (SDM) progress at a faster rate than SWDs served in another SDM. Therefore, the focus of this study was to compare the reading and mathematics achievement of male and female middle school SWDs in two special education SDMs.

A causal-comparative research design was used to analyze archival data from two consecutive years of the Georgia Milestones Assessments in Grades 6–8 for male and female SWDs with individual education plans who were taught reading and mathematics in either co-teaching classrooms or small-group resource rooms.

Two two-way analyses of covariance were used to analyze the mean achievement scores of the inclusion and self-contained student groups. The independent variables were type of service delivery model (co-teaching classroom or small-group resource room) and gender. The dependent variables were mathematics and reading scores. A covariate was used to control for previous mathematics and reading achievement.

An analysis of the data indicated that for both reading and mathematics, SWDs in co-teaching service delivery models scored significantly higher than their peers did in small-group resource classrooms. These findings support the supposition that co-teaching is an effective instructional model for middle school students with disabilities.

Table of Contents

Page

Figures

Chapter 1: Introduction

Over the decade from 2006 to 2016, co-teaching emerged as one of the most commonly used service delivery models in special education. The popularity of co-teaching as an instructional model for students with disabilities (SWDs) came about as a result of passage of federal legislation that included mandates for the inclusion of SWDs in general education classrooms. The mandate for inclusion stipulates that after a student is identified as having a learning disability by a team of professionals, all efforts should be made to educate that student in the least restrictive environment, inclusive of the general education setting. Additional legislation stipulates that SWDs must have access to and be assessed on the same content standards as their nondisabled peers (Handler, 2006). Co-teaching emerged as a means to support SWDs in general education classrooms in light of inclusion and achievement mandates (Handler, 2006). However, research on the academic efficacy of the co-teaching model is limited and inconclusive (Murawski & Swanson, 2001).

While co-teaching has become the standard for the inclusion of SWDs in the general education classroom, the result of students' achievement is average at best (Murawski & Swanson, 2001). Carr (2013) warned that the ability to educate students with special needs effectively alongside the general population poses a challenge for both teachers and students. Toward this end, teachers frequently have difficulty implementing many of the best practices associated with co-teaching (Aron & Loprest, 2012).

Background and Justification

Prior to the implementation of the Education of All Handicapped Children Act (EAHCA) in 1975, millions of children with disabilities received inadequate or inappropriate special education services from the public school system; another one

million children were excluded from school altogether (U.S. Department of Education, 1995). Subsequent to the passage of the EAHCA (later renamed the IDEA), public schools were required to provide SWDs a free and appropriate public education in the least restrictive environment. While the initial goal of the EAHCA was to establish regulations that allowed SWDs to attend public schools and access the general education curriculum, there have been significant changes within the public education system with regard to the education of SWDs (Zigmond, Kloo, & Volonino, 2009).

In response to concerns about the state of education in the United States, the 107th Congress passed the No Child Left Behind (NCLB) Act in 2001. The goal of the NCLB Act was to ensure that all children have a fair, equal, and meaningful opportunity to obtain a high-quality education (Hardman & Dawson, 2008). The NCLB Act mandated that students at all public schools demonstrate improvements in achievement. The Act further mandated that all students evidence grade-level proficiency in reading and mathematics by the 2013–2014 school year. To this end, the NCLB Act required school districts in all states to implement standards-based accountability programs to certify the adequate yearly progress (AYP) of all students in every district across the nation. For schools to make AYP, states have to assess 95% of SWDs. Furthermore, in an effort to ensure that SWDs were not overlooked, and to prevent schools from concealing low performance, schools are required to report separately, as a subgroup, the test results of SWDs (Zigmond et al., 2009).

Failure to make AYP can result in potentially dire consequences; sanctions may ultimately include school closures or restructuring (Eckes & Swando, 2009). Most often, schools' failure to make AYP is due to the low achievement scores of the SWDs subgroup (Eckes & Swando, 2009). Research has shown that processing speed, working

memory, and executive functioning deficits affect SWDs' ability to acquire and retain math and reading skills and concepts. Special educators are trained in the use of instructional strategies that aid SWDs in reading and mathematics learning. For this reason, SWDs have historically been taught reading and mathematics by special educators in small-group resource classrooms. However, SWDs are now held to the same academic standards as their nondisabled peers. Consequently, schools have sought to implement practices that would assist SWDs in meeting the mandated progress and proficiency requirements. Co-teaching emerged as a natural remedy to this mandate (Handler, 2006). As a result, greater numbers of SWDs receive reading and math instruction in general education classrooms from general educators who are highly qualified in those content areas (Ashworth, Bloxham, & Pearce, 2010).

The setting. For this study, the setting was located in a diverse school district that, with a student enrollment of over 112,700, is the second largest in the state. At the time of this study, the demographics for the school district included a student population that was 39% White, 32% Black, 20% Hispanic, 5% Asian, and 4% designated as multiracial. Forty-five percent of the students qualified to receive free or price-reduced lunch. The district has a graduation rate of 81%.

The researcher selected a specific middle school in the district because of its unique demographics. The demographics for the school's zip code include a population that is 83% White, 6% Black, 7%Asian, and 2% designated as multiracial. The median home sale price in the school's zip code is $367,950 and the median income is $115,250. Additionally, 71% of adults who reside in the school zip code are college educated.

The researcher's role. The researcher is a veteran educator with 17 years' experience. For nine of those years, the researcher has worked as an employee of the

school district selected for the study. The researcher has served in many roles—special educator, educational program specialist, and support and services administrator—during her tenure with the district. In the present role as a support and services administrator, the researcher's duties involve oversight of the local school's special education department, supervision and evaluation of the local school's special education teachers and related service personnel, and organization and implementation of staff development. Additional roles include monitoring performance data related to SWDs and facilitating the development of individual education plans (IEPs) for SWDs, and ensuring compliance with local, state, and federal special education guidelines. All support and services administrators employed in the district meet monthly to discuss issues related to special education theory, implementation, and compliance. The primary focus of these monthly meetings is collaboration and dissemination of information.

The Research Problem

The problem addressed in this study was that committees charged with designing IEPs for SWDs are frequently at odds regarding the most effective special education placement. Many parents believe the content knowledge provided by general educators in the general education setting, combined with the instructional strategy expertise of special educators, will result in the greatest academic growth for SWDs. However, teachers in co-taught classes often find it difficult to accommodate the emotional, behavioral, and processing deficits of SWDs and provide remediation of basic skills while maintaining the pace and rigor of the general education curriculum. It is not known if SWDs served in one setting master the curriculum at greater rates than SWDs served in another setting. The identification and implementation of research-based methods that have a proven record of effectiveness in teaching SWDs is the goal of educators, as

mandated by law (Odom et al., 2005). In order to contribute to the small body of literature evaluating the academic efficacy of the co-teaching model, the study sought evidence that the co-teaching service-delivery model yields significantly higher growth outcomes in reading and mathematics for middle school students than those students served in a different setting.

Deficiencies in the evidence. Co-teaching is used extensively in middle school classrooms. However, while the co-teaching inclusion model has become the choice of many school districts, there is little evidence to support the claim of its effectiveness on the academic achievement of SWDs (Cook, McDuffie-Landrum, Oshita, & Cook, 2011). As such, further research on the value of the co-teaching model is necessary.

Audience. IDEA and NCLB are legislation enacted to guarantee that after a student is deemed eligible for special education services by a team of experts that includes the parents, all efforts are made by the school to educate the student in the least restrictive educational environment. Because of IDEA and NCLB, the audience for this study must include all stakeholders responsible for student learning, but particularly general and special educators. Because those educators are directly responsible for student learning, it is befitting that they are highlighted in this manner.

Definition of Terms

The following terms were used in this applied dissertation and may be unfamiliar to individuals who do not work in the field of education:

Adequate yearly progress. This term was introduced into federal law in the 1994 reauthorization of the Elementary and Secondary Education Act. AYP is the measure by which schools, districts, and states are held accountable for student performance under Title I of the NCLB Act, the current version of the Elementary and Secondary Education

Act. Under NCLB, AYP is used to determine if schools are successfully educating their students (U.S. Department of Education, 2004).

Co-teaching. Friend and Cook (2003) defined this term as the partnering of a general education teacher and a special education teacher or another specialist for the joint delivery of instruction to a diverse group of students. Included are those with disabilities or other special needs, in a general education setting in such a way that meets their learning needs flexibly and deliberately. For purposes of this study, co-teaching refers to all direct service models where instruction is provided in the general education setting by both a special educator and general educator.

General education. This term is used to describe the learning environment in which students without disabilities are educated without the accommodations and modifications to teaching methods that are available to SWDs (Xiang-ming, 2006).

Georgia Milestones Assessment system (GMAS). The GMAS is a comprehensive summative assessment administered to students in Grades 3–12. The assessment measures how students learned the knowledge and skills outlined in the state-adopted content standards. Grades 3–8 students are assessed at end of grade in language arts, mathematics, science, and social studies. The Georgia Milestones Assessment includes open-ended (constructed-response) items in language arts and mathematics (all grades and courses). It also contains a writing component (in response to passages read by students) at every grade level and course within the language arts assessment and norm-referenced items in all content areas and courses to complement the criterion-referenced information and provide a basis for national comparison (Fincher, 2014).

Inclusion. This term is used to describe the learning environment in which SWDs learn with the appropriate supports in place, alongside their peers without disabilities in

the general education setting (Mastropieri & Scruggs, 2001). Inclusion is also used as a synonym in the literature. The practice is often referred to as *mainstreaming*.

Lexile score. This term refers to a reading score used by educators and parents to monitor students' reading progress throughout the school year, across grade levels, and for the duration of a student's education. The norm referenced tests of all the major test publishers have been linked to allow the reporting of Lexile scores (Smith, 2004). Lexile scores, which range from below 200L for beginning readers to above 1600L for advanced readers, are used at the school level in various capacities in all 50 states. Because the Lexile scale never changes, Lexile scores provide continuity for reading growth across grades and assessments (Smith, 2004).

Mild disability. This term, also referred to as high incidence disabilities, refers to the largest population of SWDs. Mild disabilities include high-functioning autism, specific learning disability, attention-deficit hyperactivity disorder, speech and language impairment, and emotional or behavioral disorders (Gage, Lierheimer, & Goran, 2012). Ninety-four percent of SWDs have a mild disability and most students with mild disabilities are served in the general education for all or part of the day (Salend, 2005).

Small-group setting. This term is used to describe classrooms outside the general education setting where a special education teacher instructs 4–12 SWDs. Small-group classes are also referred to as resource rooms (Mattson & Roll-Pettersson, 2007).

Special education. This term refers to a specially designed instruction at no cost to parents to meet the unique needs of a child with a disability, including instruction conducted in the classroom, home, hospitals, institutions, and other settings, as well as instruction in physical education (Yell, Katsiyannis, & Bradley 2011).

Standards-based instruction. This term refers to instruction that is aligned to

state learning standards and includes appropriate and meaningful activities that engage students in the learning process. The goal is to ensure that students acquire the knowledge and skills that demonstrate grade-level proficiency (McMillan, 2014).

Students with disabilities (SWDs). This term describes students identified as having one of the 13 disabling conditions that significantly affect educational performance based on the criteria set forth in the IDEA and who, by reason thereof, need special education and related services (Pierangelo & Giuliani, 2007). For purposes of this study, SWDs include students in the following eligibility categories: specific learning disability, other health impairment, autism, and emotional behavior disorder.

Purpose of the Study

The purpose of this study was to assess the effects of two service delivery models in the instruction of reading and mathematics to SWDs. If the effectiveness of these two service models can be determined, it could prove to be a crucial part of a bigger project to assist educators in designing IEPs for SWDs that involve placement of these students. Furthermore, it is hoped that the findings from this study will assist in providing professional development for teachers to improve instructional strategies to address reading and mathematics skills of SWDS.

Chapter 2: Literature Review

For a number of years, education reforms and initiatives have called for a change in instructional practices in reading and mathematics for students with disability (SWDs) within the public school system. As a result, in recent years, co-teaching has become the preferred instructional practice for SWDs whenever possible. Nonetheless, committees responsible for designing the IEPs for SWDs are frequently at odds regarding the most effective special education placement. Toward this end, the purpose of this study was to determine if male and female SWDs taught in two co-teaching service delivery models at a middle school score significantly different in reading and mathematics.

Co-teaching is increasingly replacing the small-group resource room as the vehicle by which SWDs are taught reading and mathematics. Therefore, it is imperative that we examine its effectiveness as a research-based delivery model (Murawski, 2006). Furthermore, the factors gleaned from the review of the literature were used to develop the research questions for this study. A preliminary review of related literature resulted in an initial list of factors relevant to the evolution of co-teaching and its eventual selection as a preferred special education delivery model. To this end, the review of literature contains a discussion of these factors in eight sections.

The first section contains the conceptual framework in which the study is grounded. Sections 2 and 3, respectively, contain a discussion of the historical and legal background of inclusion. A discussion of reading achievement and instruction and mathematics achievement and instruction is in Sections 4 and 5. Specialized instruction and co-teaching instructional models as a whole are discussed in Sections 6 and 7. The chapter concludes with related studies in Section 8. Section 8 is followed by a summary of the review of the literature and the research questions.

Conceptual Framework

The conceptualization of the study is Bandura's (1977a, 1977b, 1986) social learning theory. Social learning theory recognizes social interaction as a critical foundation for both cognitive and behavioral learning. Bandura posited that learning does not occur in isolation, but within a given social context. Students learn, not only from their own actions, but also by observing the actions and outcomes of others. Based on the consequence of reinforcement or punishment, students learn to repeat or abstain from certain behaviors. The classic Bobo doll experiment demonstrates this principle by showing that children could learn simply by watching and imitating the behaviors of others (Bandura, Ross, & Ross, 1961). Co-teaching capitalizes on this theory because it provides SWDs the opportunity to observe and academically and behaviorally imitate both their teachers and their typical peers (Jenkins, Antil, Wayne, & Vadasy, 2003).

Historical and Legal Perspectives

Compulsory education laws require all minor children to attend a public or state-accredited private school for a prescribed period. However, educational policy in the United States has historically been exclusionary, with large numbers of children being omitted based on race, ability, or gender (Hardman & Dawson, 2008). Prior to the 20th century, education was typically provided, for a fee, by religious institutions. As a result, poor, disabled, and minority children were either not educated or educated informally at home. This changed between the 19th and 20th centuries when America experienced mass immigration. Because education was believed to be the most effective means of assimilating the children of immigrants, there was a desire to ensure their education was managed by the state. This desire, coupled with mounting public concern over child labor, led many states to pass compulsory education laws, which resulted in a flood of

new students (Wright & Wright, 2007). In response, school officials were forced to identify procedures for educating students who did not fit in conventional classrooms. Many states responded by grouping SWDs together in segregated, all-purpose special education schools or classes that were often poorly staffed and hidden away from the view of typical students and their parents (McGrath, Johns, & Mathur, 2004).

Prior to the mid-20th century, segregated schools were the norm. In the same way that SWDs were kept apart from their nondisabled peers, African American students were educated separately from their Caucasian peers. In 1954, African American schoolchildren from four states successfully argued before the U.S. Supreme Court that segregated public schools were inherently unequal and deprived them of equal protection under the law. *Brown v. Board of Education* (1954), a landmark civil rights decision outlawing segregation in Public Schools, was handed down by the U.S. Supreme Court. The Court found that African American children had the right to equal educational opportunities and that segregated schools had no place in the field of public education. In its ruling (*Brown v. Board*, 1954), the court described the emotional effect of segregation on children, particularly, when it had the sanction of the law:

> Segregation of white and Negro children in the public schools of a State solely on the basis of race, pursuant to state laws permitting or requiring such segregation, denies to Negro children the equal protection of the laws guaranteed by the Fourteenth Amendment—even though the physical facilities and other 'tangible' factors of white and Negro schools may be equal. (p. 486–496)

Buoyed by the passage of *Brown v. Board of Education,* parents of children with disabilities began initiating legal action against their own school districts (Wright & Wright, 2007). Parents of children with disabilities maintained that the exclusion of their

children from regular public schools and classes amounted to discrimination on the basis of disability (Wright & Wright, 2007). In the early 1970s, two landmark Supreme Court cases (*PARC v. Pennsylvania*, 1972; *Mills v. D.C. Board of Education*, 1972) applied the equal protection argument used in *Brown v. Board of Education* to SWDs (Wright & Wright, 2007). In both cases, the courts held that children with disabilities were as equally entitled as their nondisabled peers to access education, essentially establishing the constitutional right of children with disabilities to a free public school education. The Mills and PARC cases set the stage for Congress to pass the Education for All Handicapped Children Act of 1975—renamed the IDEA in 1990—the first law to declare that all U.S. public schools must to provide free education for all children, regardless of their disability (Wright & Wright, 2007).

The late 20th century saw a renewed focus on educational quality and ushered in the modern era of educational reform. In 1983, shortly after being elected to a first term as President, Ronald Reagan commissioned the National Commission on Excellence in Education to assess the quality of teaching and learning in America's primary, secondary, and postsecondary schools. In 1983, the commission published a report containing its findings. This report, entitled *A Nation at Risk* (National Commission on Excellence, 1983), was a scathing indictment of America's schools. The committee concluded that America's schools were failing, and that the declines in educational performance were attributable, in large part, to inadequate curricula, lowered expectations, poor use of instructional time, and an inability to attract and retain quality teachers. The commission's assessment initiated a wave of educational reform at the federal, state, and local levels that continued for two decades. The federal government sporadically increased incentives for states to improve results for students voluntarily through

standards-driven reform (Vinovskis, 2015; Zigmond et al., 2009). Federal legislation, such as Goals 2000: Educate America Act in 1994 and the Improving America's School Act in 1994 continued to provide financial support to help state leaders develop high standards, increase student achievement, improve the quality of teaching, and establish greater public school accountability (Hardman & Dawson, 2008). Nevertheless, according to Gandal (2002), by the turn of the 21st century,

> Most states had not even established academic standards in each grade, let alone tests, and some were experiencing significant resistance from educators in the few grades where they were already testing. In a good number of states, moreover, policymakers did not believe grade-by-grade testing was necessary or desirable. (p. 7)

Teaching and learning had traditionally been afterthoughts when it came to the education of SWDs. Legislation tended to focus primarily on access, with the objective being simply to safeguard SWDs from discrimination (Karger & Boundy, 2008). However, efforts to reform the quality of education provided to America's students eventually extended to SWDs. In 1997, Congress amended and reauthorized the IDEA. Lawmakers believed that low expectations and an inadequate focus on research-based instructional strategies impeded the implementation of IDEA of 1997 (Karger & Boundy, 2008). As a result, substantive changes were made to the IDEA.

The 1997 reauthorization of IDEA shifted the focus of IDEA from simple access to quality of education (Hardman & Dawson, 2008). In an effort to mitigate deficiencies and improve the quality of education for SWDs, members of Congress highlighted the importance of granting SWDs increased access to the general education curriculum. The magnitude of general education access was underscored by mandatory reporting

requirements. Other significant revisions were included in the 1997 reauthorization; one of the most notable being the call for the full participation of SWDs in state and district assessment programs through the use of reasonable adaptations and accommodations. State leaders were further expected to establish performance goals and indicators for SWDs and to provide assessment reports that included disaggregated data on their performance (Kaufman & Blewett, 2012).

The 1997 revisions simultaneously underscored the claim that the persistent underachievement of SWDs was attributable, in part, to curricula and separate expectations (Zigmond et al., 2009). The revisions also championed the notion that mandated participation in the high-stakes accountability assessments would foster increased expectations for SWDs, which would, in turn, result in improved teaching and better academic outcomes (Defur, 2002; Zigmond et al., 2009). To ensure compliance and monitor outcomes, the Office of Special Education Programs prepares an annual report for Congress on the implementation of the IDEA (Zigmond et al., 2009).

In 2001, Congress passed the NCLB Act, a comprehensive overhaul of federal efforts to support elementary and secondary education in the United States. Designed to improve student achievement and close achievement gaps, the NCLB received overwhelming bipartisan support and was signed into law by President G. W. Bush on January 8, 2002. Though not specifically designed for SWDs, the NCLB played a significant role in the evolution of special education. The NCLB Act has an overarching theme of responsibility and results, supported by four pillars: (a) accountability for outcomes, (b) an emphasis on doing what works based on scientific research, (c) expanded parental options, and (d) expanded local control and flexibility (U.S. Department of Education, 2004). To this end, NCLB established the expectation that all

students, including those with disabilities, would perform at a proficient level on state accountability assessments by 2014 (Albrecht & Joles, 2003). Consequently, Zigmond et al. (2009) reported,

> Students with disabilities—protected under IDEA because they had a disability and were in need of a special education—would be taught the same content as all other students are taught, be held responsible for the same coverage of the general education curriculum without any reduction in breadth or depth, and be expected to master the same academic standards as all other students. (p. 194)

In addition to establishing standards and assisting states in improving local performance, NCLB was the first federal legislation to ascribe fiscal sanctions and corrective actions for states and schools that failed to meet prescribed benchmarks (Hardman & Mulder, 2004). For this reason, NCLB may be the most meticulous and demanding effort made by Congress to improve student achievement and reform education in the United States to date (Hardman & Dawson, 2008).

The shift in focus from access to proficiency obliged teachers to deepen "both their content knowledge and their knowledge of the specific pedagogy necessary to promote student proficiency in that content" (Kloo & Zigmond, 2008, p. 12). The NCLB Act introduced the term *highly qualified* and required all teachers of core academic subjects to meet minimum requirements related to content knowledge and teaching skills for all teachers, kindergarten through Grade 12. Teachers of core academic subjects, such as English, reading or language arts, mathematics, science, foreign languages, civics and government, economics, arts, history, and geography, must meet the following criteria for highly qualified designation: (a) hold a bachelor's degree, (b) obtain full state certification (can be alternative certification), and (c) demonstrate subject-matter

competency in the core subjects taught.

Special educators who teach two or more core academic subjects exclusively to children with disabilities are also required to be highly qualified. However, special educators are often required to teach multiple subjects and many are not certified in all academic subjects as defined by the NCLB (Rice, Drame, Owens, & Frattura, 2007). Obliging special educators to demonstrate competencies across several academic areas to meet the highly qualified mandate may be unreasonable, and could deter individuals from pursuing careers in special education (Hyatt, 2007). This conundrum forced schools to reconsider how they could most efficiently use their staff (Carpenter & Dyal, 2007). The co-teaching model ensures that content instruction is delivered to SWDs by content specialists. Co-teaching consequently emerged as a viable and effective way to simultaneously serve the needs of all students in general education settings, as required by the IDEA, and comply with the spirit of the NCLB highly qualified teacher provisions (Villa, Thousand, & Nevin, 2004).

While the mandates of the IDEA and NCLB established an amalgam of educational responsibilities and expectations for the academic success of SWDs, the objectives of the two acts were congruent in that they sought to increase the educational outcomes for SWDs. In 2004, the IDEA was amended and renamed the Individuals with Disabilities Education Improvement Act (IDEIA). Among the most substantive changes to IDEIA was the requirement that all IEPs include a statement of measurable annual goals that allow SWDs to access, participate in, and progress in the general curriculum (Hardman & Dawson, 2008). In drafting the IDEIA of 2004, policymakers espoused the belief that SWDs could only be as successful as their nondisabled peers if they were afforded the opportunity to learn the same instructional content (Hardman & Dawson,

2008). Moreover, the improvements outlined in the IDEIA communicated the belief that educational access alone would not result in the intended outcomes of employment, independence, and community involvement. Subsequently, general educators have adopted a more active role in the development of student IEPs by assisting in the identification of accommodations and modifications that are required for SWDs to access the general education curriculum (Turnbull, Huerta, Stowe, Weldon, & Schrandt, 2009).

Although the NCLB Act had a focus on the collective subgroup and school or district, while the IDEIA focused on the individual child, both were outcomes-oriented funding statutes. Jones, Zirkel, and Barrack (2008) contended that they deserve simultaneous consideration. The 2004 amendments to IDEA reinforced the requirements of NCLB by providing relatively limited adjustments, with respect to AYP and highly qualified teachers. Bowen and Rude (2006) believed that the purpose of reauthorizing IDEA in 2004 was to align it with the NCLB. Parallel goals aside, the various layers of accountability, programming, and assessment resulted in questions about how educators can realize the tenets of the IDEA in light of the NCLB directives, which included inclusion in general education, highly qualified content area teachers, and participation in standardized assessments (Handler, 2006). Modern day co-teaching evolved as a natural remedy for this conundrum because the co-teaching model bypassed the NCLB mandate that all teachers be highly qualified in the subjects they teach while facilitating the inclusion of SWDs (Dowdy, Nichols, & Nichols, 2010).

Inclusion Classrooms

Federal mandates enacted as a result of 20th century education reform efforts obliged staff in the schools to provide educational instruction to SWDs in the general education classroom (Fletcher, 2010). To that end, states have designed policy and

procedures designed to increase the numbers of students educated in inclusive school environments (Kalambouka, Farrell, Dyson, & Kaplan, 2007). Statistics from the 29th Annual Report to Congress on the implementation of the IDEA included indications that these policies have been largely successful in yielding their intended outcome. The percentages of SWDs educated in regular classes for most of the school day (i.e., outside the regular class for less than 21% of the day), increased from 46% in 1996 to 54% in 2005, while the percentage of students educated outside the regular class for most of the day (from 21% through 60% of the day, but no more than 60% of the day) decreased from 29% in 1996 to 26% in 2005.

While the term *inclusion* does not appear in the language of the IDEIA, it is the mechanism by which schools comply with the least restrictive mandates of the IDEIA. Turnbull et al. (2009) reported that inclusion "is how educators implement the core concept of integration. The core concept is integration; the implementing technique is inclusion" (p. 360). There are multiple definitions of inclusion. However, the general principle of inclusion is that SWDs are educated in the general curriculum with their nondisabled peers in the general education classroom. While there are multiple inclusion models, each shares features that include classroom composition, staff, professional development, instruction, and school characteristics.

Downing and Peckham-Hardin (2007) reported that because of the rich, natural learning atmosphere of the general education classroom, there has been an increase in the use of the inclusive models for SWDs. Because inclusion requires an individualized approach to student learning where teachers work in teams along with parents, it presents the opportunity for everyone involve to take advantage of natural resources. The Council of Administrators of Special Education (1997) identified six ways wherein SWDs benefit

from inclusive educational settings: (a) increased academic achievement, (b) opportunities to create friendships, (c) improved interpersonal and social skills, (d) increased facilitation of language and communication skills, (e) accessibility of role models, and (f) collaborative and supportive learning environments. Paige (2004) endorsed these benefits, affirming that,

> Students with disabilities are placed in general education classes most often because they will make greater gains in these classrooms. During the past 12 years, the period in which inclusion has been used more extensively, the number of students with disabilities who have graduated from high school has tripled; the number attending college has doubled. (p. 4)

Reading Achievement and Instruction

Increased numbers of SWDs are receiving instruction in general education classrooms and are being held to the same academic standards as their nondisabled peers. Yet, the reading challenges of SWDs are well documented in the literature (Biancarosa & Snow, 2006). Nearly eight million students in Grades 4–12 read significantly below grade level (Heller & Greenleaf, 2007). Of those struggling readers, close to 70% have deficits in reading comprehension (National Center for Education Statistics, 2015; Roberts, Torgesen, Boardman, & Scammacca, 2008). This is cause for concern given that reading difficulties become more problematic as students transition to middle school where they are expected to use reading as a tool for acquiring, locating, and using information (Shanahan & Shanahan, 2008). Largely, the reading proficiency of middle school students has not improved appreciably. Moreover, reading proficiency has not kept pace with the rising demand for literacy in the workplace (McNamara, 2009).

In 2015, 63% of eighth-grade SWDs performed at the below basic level on the

NAEP reading assessment, indicating reading skills significantly below grade-level expectations, while only 8% performed at the proficient level (National Center for Education Statistics, 2015). In an era when economic success has never been more dependent on education, it is imperative that schools identify and implement instructional methods and models that lead to increased literacy.

In response to the need for research-based guidance on the selection and implementation of reading interventions for secondary students, Scammacca, Roberts, Vaughn, and Stuebing (2013) conducted a meta-analysis of the empirical literature on interventions for struggling readers in Grades 4–12 published between 1980 and 2011. The results of their research indicated that reading interventions produce positive results for students in Grades 4–12. The literature supports the belief that the reading deficits of SWDs can be assuaged through explicit instructional strategies and implementation of interventions that address word-level decoding and fluency (Kim, Linan-Thompson, & Misquitta 2012; Scammacca et al., 2013; Vaughn, Denton, & Fletcher, 2010). Reading intervention of any kind is missing in most secondary reading classrooms. Instead, assessment and monitoring of comprehension is the instructional focus in most secondary reading classrooms (Kent, Wanzek, & Al Otaiba, 2012; Klingner, Urbach, Golos, Brownell, & Menon, 2010). More individualized attention, flexibility in groupings, and an increase in student time-on-task behavior have all been identified as a benefit of a co-teacher (Hang & Rabren, 2009; Magiera, Smith, Zigmond, & Gebauer, 2005).

Mathematics Achievement and Instruction

Mathematical competence has individual benefits as well as benefits to the wider society (National Mathematics Advisory Panel, 2008). To compete in the 21st century global economy students must be proficient in mathematics. Solid mathematics skills are

requisite for both college-bound students and those who intend to enter the workforce immediately. American students lag behind other developed nations in mathematics proficiency (Gonzales et al., 2009). In 2015, 33% of eighth-grade students performed at or above the proficient level in NAEP mathematics. Yet, only 8% of SWDs performed at or above proficient at Grade 8 (National Center for Education Statistics, 2015).

Increased numbers of SWDs are receiving mathematics instruction in general education classrooms and being held to the same academic standards as their nondisabled peers (van Garderen, 2008). Yet, many students continue to struggle with math concepts and skills. Difficulty performing math tasks is common among SWDs. Processing speed, working memory, and executive functioning deficits are common among SWDs across disability categories. Geary, Hoard, Byrd-Craven, Nugent, and Numtee (2007) identified intelligence, processing speed, and the central executive component of working memory as predictors of achievement or achievement growth in mathematics.

Processing speed refers to one's ability to perform a cognitive task smoothly and automatically, particularly when under pressure to maintain focused attention and concentration. Students with weaknesses in processing speed often struggle with basic math fact fluency and mental math and have difficulties working problems quickly on paper (Rohde & Thompson, 2007). Working memory affects one's ability to simultaneously hold new information in short-term memory and concentrate and manipulate the information to produce some result or reasoning processes. Working memory is critical to higher-order thinking, learning, and achievement, and the relationship between performance working memory and mathematics achievement and cognition tasks is well established (DeStefano & LeFevre, 2004; Geary et al., 2007; Swanson & Sachse-Lee, 2001).

Students with working memory deficits have difficulty retrieving math facts, solving multistep problems, and keeping track of steps within math problems (Mabbott & Bisanz, 2008; Schuchardt, Maehler, & Hasselhorn, 2008). Executive functioning involves the control or self-direction of cognitive resources and processing. Students who suffer from executive dysfunction may have difficulty in planning, organization, and time management. They often struggle to initiate academic tasks, develop a plan of action, or generate ideas independently (Bull & Lee, 2014; Samuels, Tournaki, Blackman, & Zilinski, 2016).

Wei, Lenz, and Blackorby (2013) used a national dataset to depict math growth trajectories for SWDs across 11 disability categories. The researchers found that SWDs presented as a heterogeneous group relative to math achievement. Mathematics achievement of SWDs in elementary school was lower than that of their nondisabled peers. However, as SWDs entered middle school, their rate of growth in math achievement slowed and plateaued. Rapid growth in mathematics achievement is required to close the mathematical achievement gap between SWDs and their nondisabled peers. Additionally, this rapid growth will necessitate substantial changes in the method and intensity of mathematics instruction (Schulte & Stevens, 2015).

Because SWDs have difficulty acquiring and retaining math skills, it is imperative that teachers use effective instructional procedures and testing accommodations (Maccini & Gagnon, 2006). Students with disabilities struggle with a myriad of basic facts as well as with tasks such as generalization, applying metacognitive strategies, discriminating key points from irrelevant information, and solving multistep problems (Maccini & Gagnon, 2006). Special educators have historically accommodated these deficits by emphasizing skill instruction and using behavioral strategies such as mnemonics, task

analysis, chunking, and drill and practice, and these approaches have been found to be effective. However, policy does not always match practice (DeSimone & Parmar, 2006). The general educator brings deep knowledge of math content to the co-taught mathematics classroom while the special educator adds expertise of instructional strategies and student learning. The expectation is that SWDs will have access to the general education curriculum and general educator while receiving the specialized instruction and accommodations they require to access and master grade-level standards (King-Sears, Brawand, Jenkins, & Preston-Smith, 2014).

Magiera et al. (2005) observed real-life co-teaching programs to examine co-teaching practices in secondary mathematics classes and found that the format of mathematics instruction did not change despite the addition of another certified teacher. Whole-group instruction was the primary instructional model and special educators had very few opportunities to provide individual instruction or assist learners with special needs. The one teach-one assist model, wherein the general educator assumes the role of primary instructor was noted in 33 of 49 observations. The one teach-one assist model, wherein the special educator assumes the role of primary instructor was noted in only three of 49 observations, and team teaching was observed in only nine of 49 observations. On only two occasions, over the course of the study, were co-teachers observed delivering instruction to small groups of students. The total small-group instruction time over the course of the study was less than 20 minutes.

In its 2008 report, The National Mathematics Advisory Panel noted that for SWDs, “explicit instruction has yielded consistently positive effects on performance with word problems and computation” (p. 425). However, in recent years, the instructional focus of general educators has shifted from direct instruction to inquiry-based teaching.

In inquiry based-teaching, students work cooperatively to solve real world problems that require them to apply of an array of mathematical skills. The ability to memorize facts and apply algorithms is secondary to conceptual understanding (Cole & Washburn-Moses, 2010). While it may appear that math instruction for general student population and SWDs is at odds, the National Mathematics Advisory Panel asserted that direct instruction and inquiry-based math instruction are compatible. The panel recommended a balanced approach rather than one that is either completely inquiry-based or focused solely on direct instruction. What is most important is that special educators and general educators collaborate to advance instruction for all students (DeSimone & Parmar, 2006).

Specialized Instruction

By definition, SWDs have difficulty acquiring and independently applying knowledge and skills. However, students with learning difficulties are not a homogeneous group. Rather, they are a diverse group who demonstrate difficulties in a variety of domains. In fact, the only common characteristic shared by SWDs is uneven development of academic skills. This commonly results in poor academic achievement (Wong, Graham, Hoskyn, & Berman, 2011). It is for this reason that the core of special education is specialized instruction.

Under IDEA, special education means that the instruction is designed specially to meet the needs of SWDs. Specially designed instruction is adapting, as appropriate, to the needs of an eligible child the content, methodology, or delivery of instruction. This adaption addresses the unique needs of the child that result from the child's disability and ensures the child access to the general curriculum, so that the child can meet the standards that apply to all children (Sayeski, 2009). The needs of the SWDS are numerous and varied. These needs include knowledge of a student's processing deficits,

cognitive ability, academic strengths and weaknesses, medical conditions, social/ emotional/behavioral challenges, functional skills, and sensory weaknesses. Identifying these deficits and developing a plan to mitigate them can be daunting (Wong et al., 2011).

It is true that SWDs who are served through special education have academic deficits. Elliott et al. (2010) contended that specialized instruction and accommodations can be used to bridge the academic gap between SWDs and their nondisabled peers effectively. Similarly, results from studies conducted by Elliott, Kratochwill, McKevitt, and Malecki (2009); Doyle and Giangeco (2013); and Roden, Borgemenke, and Holt (2013) supported the belief that, when provided the appropriate instructional accommodations, SWDs can perform academically at a rate comparable to their nondisabled peers. Consequently, it is essential that teachers of SWDs be well versed in the use of instructional strategies (Dieker, 2001; Weiss & Lloyd, 2002).

Differentiated instruction and universal design for learning are instructional strategies that are commonly used by teachers of SWDs. Thompson, Johnstone, and Thurlow (2002) defined universal design for learning as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (p. 1). Universal design for learning offers flexibility in the manner in which information is presented, in the manner in which students respond or demonstrate knowledge and skills, and in the manner in which students are engaged, thereby allowing teachers to provide SWDs access to the general curriculum without extraordinary means. Differentiated instruction is a teaching approach whereby educators actively plan for students' differences so they can provide instructional methods and materials that are congruent with the students' individual needs (Scruggs, Mastropieri, & Marshak, 2012).

As the number of SWDs served in the general education setting increases, educators must find ways to simultaneously maintain rigor for nondisabled students and effectively adapt the content, methodology, or delivery of instruction for SWDs who in many cases are performing far below grade level. There are strategies and instructional methods designed to cater to individual student needs. However, effective implementation of these instructional strategies requires knowledge, flexibility and extensive planning (Aron & Loprest, 2012). Kilanowski-Press, Foote, and Rinaldo (2010) and Nowicki and Brown (2013) asserted that co-teaching is an ideal instructional model because of the emphasis on shared instructional support. In co-teaching classrooms, the pressure of instructing a diverse population is divided (Kilanowski-Press et al., 2010; Nowicki & Brown, 2013; Teixeira, Mosquera, & Stobäus, 2015).

Co-Teaching Instructional Models

Two teachers instructing a diverse group of students in the same space requires planning and effort (King-Sears et al., 2014). Although co-teaching programs differ from district to district (Wilson, 2006), as a rule, co-teachers use an array of methodologies because they must select instructional strategies and approaches that meet the needs of all learners (Hudson, Browder, & Wood, 2013; Roden et al., 2013). Kloo and Zigmond (2008) reviewed co-teaching models and the research base for co-teaching to suggest a blueprint to guide in the effective implementation of co-teaching. The researchers believed that small-group instruction, rather than whole-class instruction, should be the norm. Kloo and Zigmond advocated the use of models that use dual instructional groups to provide students increased opportunities to respond, allow teachers more opportunities to monitor student engagement, provide frequent and faster corrective feedback, and facilitate a reduction in the teacher-student ratio.

Friend, Cook, Hurley-Chamberlain, and Shamberger (2010) outlined the following six most common approaches or instructional configurations of co-teaching: (a) one teach-one observe, (b) station teaching, (c) parallel teaching, (d) alternative teaching, (e) team teaching, and (f) one teach-one assist. The approaches are grouped into two categories: small group and large group. The small-group approaches to co-teaching are station teaching, alternative teaching, and parallel teaching. The large group approaches to co-teaching are team teaching, one teach-one observe, and one teach-one assist. A number of factors may affect the selection of a specific approach. These factors include classroom space, comfort of teacher with content and activities, content to be covered, room setting, students' needs, IEP goals and objectives, and learning activities (Kramer, Olsen, Mermelstein, Balcells, & Liljenquist, 2012). Despite a preference for a particular approach, teachers must make certain that students' needs are the focus. A closer look at each approach provides more insight about how each co-teaching model works.

One teach-one observe. In this model, the general educator teaches, while the special educator observes and monitors behaviors (Friend et al., 2010; King-Sears et al., 2014). The one teach-one observe model relies solely on the instructional knowledge of the general education teacher. The result is special educators, who assume the role of observer, are perceived as teacher assistants (Friend et al., 2010). This model is less than ideal and it is not recommended because the expertise of both teachers is not used and whole-group instruction is used to instruct a class of diverse learners**.**

One teach-one assist. In this model, one teach-one assist, one teacher delivers instruction and manages student discipline while the other teacher circulates, offers redirection, and assists individual students (King-Sears et al., 2014). The one teach-one assist model provides the lowest risk to both teachers because it requires little planning

and is easy to implement. However, the model does not harness the skills of both teachers during the teaching and learning experience (King-Sears et al., 2014). Consequently, Cook (2004) suggested restricting the use of the one teach-one assist model to new co-teaching arrangements and assessments. Cook further explicated that the one teach-one assist model should not be used exclusively because students may begin to view the observing teacher as a well-paid assistant rather than a teacher in the class. It can be argued that the one teach-one assist model is also not a preferred model for reaching the needs of students with various learning styles.

Station teaching. In station teaching, "Various learning stations are created" (Scruggs, Mastropieri, & McDuffie, 2007, p. 392). Each station targets a specific skill or content area (King-Sears et al., 2014) and students are assigned to small groups and allowed to work together to investigate, discover, or explore a given concept or skill (King-Sears et al., 2014). Students move from station to station with co-teachers assuming responsibility for teaching and explaining directions at their assigned stations (Friend et al., 2010). Station teaching provides students with peer interaction, affords teachers an opportunity to have direct instructional time with students, and allows students to participate in instructional activities that appeal to a variety of learning styles (Obiakor, Harris, Mutua, Rotatori, & Algozzine, 2012). Station teaching is most effective when the content is complex, but not hierarchical, and in lessons that involve a review. Station teaching is advantageous because it allows all students to work in small groups and receive small-group instruction (Obiakor et al., 2012). The principal disadvantage to this approach is an increase in the noise level in the classroom (Cook, 2004). Although station teaching is most often used in elementary schools, it can also be useful in middle and high school settings.

Parallel teaching. In this model, co-teachers jointly plan instruction, but they instruct separate, heterogeneous groups. The general educator instructs one group, while the special educator instructs the other. It is imperative that both teachers simultaneously teach the same content (Friend et al., 2010; King-Sears et al., 2014). Cook (2004) suggested using this approach when a lower teacher-student ratio is needed to improve instructional efficiency. Classroom management can be negatively affected by this approach due to increased noise and activity levels. It should also be noted that this model is only effective if both teachers have a sufficient content knowledge base (Dieker & Murawski, 2003). A benefit of this model is that it affords teachers increased opportunities for immediate re-teaching and learning. Parallel teaching is most effective when students require practice and when there is an opportunity for discussion, student response, and hands-on activities (Anderson & Ward, 2004).

Alternative teaching. This co-teaching model offers teachers a unique way to target the needs of struggling students without holding back students who have mastered specific concepts. In alternative teaching, co-teachers divide their classes into a large group and a small group. One teacher works with a smaller group of three to eight students while the other teacher instructs the remaining students. The teacher who is providing instruction to the smaller group may provide enrichment activities, re-teach a concept, or review needed information. The smaller group of students may be moved to a different location for a set period for specialized instruction (Friend et al., 2010; King-Sears et al., 2014). Because alternative teaching allows teachers to identify and target specific learning gaps or provide reinforcement for academic content, it is effective for students who require extra help or remediation (King-Sears et al., 2014).

Alternative teaching should be implemented when extremely high levels of

mastery are expected for all students, when enrichment is desired, and when students are working on a parallel curriculum (Cook, 2004). Alternative teaching is a preferred model because it employs the knowledge, skills, and expertise of both teachers. However, one disadvantage of the alternative teaching model is the potential stigma attached to students who are repeatedly members of the small group (Wunder & Lindsey, 2004). To prevent special education students from feeling singled out and to mitigate the potential negative stigma, it is advisable to include some students without disabilities in the small groups.

Team teaching. Team teaching draws on the strengths of both the general and special educator and communicates to students that both teachers are equipped with the resources and skills required to instruct all students (Friend et al., 2010; King-Sears et al., 2014). In the team teaching model, co-teachers share equal responsibility for the success of their students. They jointly instruct and assess the class using their individual teaching styles (King-Sears et al., 2014). In this model, co-teachers frequently alternate lead and complementary roles (Anderson & Ward, 2004). They deliver lessons in concert with either teacher raising points or interjecting at any time. Team teaching is the most highly recommended co-teaching model because it allows teachers to fully collaborate and assume varied roles and responsibilities (Miller, 2001). Cook (2004) noted that co-teachers consider team teaching the most complex, but satisfying collaborative model.

Studies Related to Co-Teaching

Despite the proliferation of co-teaching as a special education service delivery model, its research base is limited, particularly at the secondary level. Murawski and Swanson (2001) and Cook et al. (2011) provide a broad overview of the empirical data surrounding the efficacy of the co-teaching model. Murawski and Swanson examined 89 articles in their meta-analysis of the effect of co-teaching. However, they found that only

six of the 89 articles they examined provided sufficient data to provide an effect size. Based on data gleaned from those six studies, the researchers reported a moderate effect size of .40 for co-teaching, indicating the potential for positive results. However, in a critical analysis of empirical literature on co-teaching, Cook et al. noted that none of the studies in the meta-analysis employed a group experimental design and only one employed a quasi-experimental design. Cook et al. further noted that several other frequently cited studies failed to meet even 50% of the recommended quality indicators for methodological rigor (Fontana, 2005; Murawski, 2006; Murawski & Swanson, 2001). Consequently, Cook et al. believed the findings reported in those studies should not be considered evaluative when considering co-teaching as a research-based method.

Overall, studies on the efficacy of co-teaching have produced mixed or inconclusive results. Hang and Rabren (2009) conducted a review of students' academic records to examine the efficacy of co-teaching as an instructional model for SWDs. The researchers compared Stanford Achievement test scores of 58 SWDs who received reading and math instruction in co-taught classes against their records from the year prior to co-teaching. The researchers noted an increase in academic achievement during the co-teaching year. Similarly, Fontana (2005) compared the final averages of eighth-grade students with LD who received instruction in co-taught classes with their final averages as seventh graders. Fontana reported an effect size of 0.81 for English grades and an effect size of 0.40 for math grades; thereby, endorsing the efficacy of co-teaching as an instructional model for SWDs.

Conversely, Murawski (2006) studied the effects of co-teaching on student academic outcomes related to the instruction provided in a high school English classroom using a pretest-posttest group design. The scores of SWDs served in small-group resource

classes, co-taught classes, and general education classes without special education support were compared. Murawski found no statistically significant differences across settings. Likewise, a Dutch study compared SWDs who were included in the regular education classroom with SWDs who were educated in a special education setting and found no differences by setting on either academic or psychosocial development (Karsten, Peetsma, Roeleveld, & Vergeer, 2001). Idol (2006) also found that the test scores of students both with and without disabilities were little affected by co-teaching.

Many of the arguments in favor of co-teaching are supported by qualitative data. Magiera et al. (2005) investigated the additive effect of a special education teacher by comparing the instructional experiences of middle school SWDs served in co-taught and solo-taught classes under normal conditions. The researchers sought to determine if the presence of a special educator provided an instructional advantage for SWDs. Statistically significant differences were found concerning one-to-one instructional interactions and interactions with the general educator. SWDs in solo-taught classes were engaged in one-to-one interactions less than 1% of the time while their counterparts who were served in co-taught classes received individual instructional interactions 2.2% of the time. Additionally, general educators in co-taught classes interacted with SWDs in only 45% of the observation opportunities while general educators in solo-taught classes were observed interacting with SWDs in 62% of the observation opportunities. The researchers noted that while general educator interaction with SWDs was less frequent in co-taught classes, special educators more than made up for the time.

Other qualitative studies have focused on perceptions of co-teaching. Short and Martin (2005) investigated students' attitudes on inclusion to explore the premise that stakeholder perceptions regarding inclusion could enhance the implementation of

inclusion. The results of their study indicated that students with and without disabilities supported the concept of inclusion in cases where teachers offered choices in classroom activities and when they were allowed to choose the classroom where they were placed. Both student groups perceived that increased class size due to inclusion resulted in less personalized attention by teachers. In a study conducted by Leafstedt, Richards, LaMonte, and Cassidy (2007), SWDs similarly reported not receiving the support they needed in co-teaching classrooms. Specifically, when compared to the special education classroom, students reported less learning time and less access to the special education teacher. These same students also reported that in co-taught classrooms, special education teachers differentiated instruction less than they did in self-contained, special education classrooms. Moreover, the style and pace employed by special educators in the co-teaching setting was characterized by some students as overwhelming or ineffective.

Students with disabilities in the Short and Martin study (2005) also indicated that they did not always feel welcomed by their teachers. The belief that SWDs were not fully accepted by general education teachers was shared by SWDs and special education teachers alike. Conversely, Dieker (2001) examined students' perspectives of co-teaching and found that students who were taught by effective co-teaching teams indicated satisfaction with the model. The students in Dieker's study reported increased academic assistance and fewer behavior problems in the co-taught classroom. Hang and Rabren (2009) similarly reported that SWDs perceived co-teaching positively, citing increased academic assistance and fewer behavior incidents in inclusive classrooms.

Wilson and Michaels (2006) surveyed 346 secondary school students (127 SWDs and 219 nondisabled students) about their perceptions of co-teaching. Results of their study also indicate that students hold an overall favorable view of co-teaching. Moreover,

students associate the model with a wide array of benefits. Both student groups noted that co-teachers employed multiple instructional approaches and offered diverse perspectives that resulted in increased comprehension of subject matter. Additionally, all students, with and without disabilities, felt that they received better assistance and more individualized attention for the teachers in co-taught classes. However, SWDs ascribed greater importance to these factors. Both groups also reported improved reading and writing skills in the co-taught class.

In the last decade, the use of special education inclusion models has become commonplace, with parents being advised that inclusive settings allow for optimum academic and social growth (Tichenor, Heins, & Piechura-Couture, 2000). Overall, parents of children with disabilities have generally been found to hold a positive disposition toward inclusion (Frederickson, Dunsmuir, Lang, & Monsen, 2004; Gallagher et al., 2000; Leyser & Kirk, 2004; Tichenor et al., 2000). This positive disposition is particularly true among college-educated parents, parents of younger children, and parents of children with mild disabilities (Leyser & Kirk, 2004).

Garrick Duhaney and Salend (2000) conducted a meta-analysis of research on the perceptions of parents of students with and without disabilities with regard to inclusive education programs. They found that parents of SWDs held mixed, but generally favorable views of inclusion. Parents of SWDs voiced a belief that inclusion promotes the acceptance of SWDs, affords SWDs greater access to appropriate role models and friendships, and better prepares them for the real world. Moreover, parents of children with disabilities believed inclusive settings enhanced their children's self-image and made them more confident. Parents of students without disabilities also held generally favorable views of inclusion, noting social cognition, prosocial personal characteristics,

and greater acceptance of human diversity as benefits. However, some parents doubted the instructional effectiveness of inclusion for their nondisabled children, while others voiced concern that their children would mimic the inappropriate behaviors of their classmates with disabilities.

Leyser and Kirk (2004) examined the perceptions, views, and concerns regarding inclusion of 437 families of SWDs. Overall, parents strongly supported the philosophy or ideology of inclusion, viewing it as a civil rights issue and an issue of social justice and choice. Congruent to the parental sentiments reported by Garrick Duhaney and Salend (2000), parents in the Leyser and Kirk study noted socialization, friendship development, enhanced self-esteem, and increased understanding and sensitivity of peers as benefits of inclusion. Although parents of SWDs endorsed the social emotional benefits of inclusion, they also had some reservations. Negative attitudes, social isolation, quality of instruction, teacher training, teacher skills, and support from teachers were all reported as areas of concern. Specifically, parents had doubts about the instructional skills and availability of general education classroom teachers. They believed special education teachers were more adept at instructing SWDs.

As the number of SWDs served in inclusive settings increases, researchers have also investigated the experiences, attitudes, and opinions of the teachers charged with educating them. Teachers are a critical resource whose value extends beyond the delivery of instruction and assessment (Doyle & Giangeco, 2013; Ford, Stuart, & Vakil 2014). The teacher sets the tone for learning, motivates students, establishes academic expectations, and fosters and develops high academic standards (David & Kuyini, 2012; Ouellette-Kuntz, Burge, Brown, & Arsenault, 2010). The literature supports the notion that teachers must be supportive of inclusion, if inclusion models are to be successfully

developed and implemented (Mastropieri et al., 2005; Villa et al., 2004). Teachers' attitudes can significantly affect students' attitudes toward the instructional environment (David & Kuyini, 2012). When teachers exhibit a posture of helplessness or uncertainty, students develop limited confidence in their abilities (Yildiz, 2015). The opposite holds true in environments where teachers make obvious a belief that all students can learn (Lundie, 2009). When teachers have high expectations, students tend to perform better (Aron & Loprest, 2012; David & Kuyini, 2012; Dessemontet, Bless, & Morin, 2012).

Previous experiences, classroom factors, and student characteristics influence teachers attitudes toward SWDs, and ultimately toward inclusion (Leatherman & Niemeyer, 2005). The challenges teachers must overcome in inclusive settings are abundant. As a result, co-teaching is sometimes viewed as less than ideal (Doyle & Giangeco, 2013). Students with disabilities enter general education classrooms with an assortment of academic and behavioral deficits and teachers are required to address these deficits while delivering standards-based instruction in accordance with county and state pacing guides (Humphrey, Wigelsworth, & Squires, 2013; Yildiz, 2015).

Essentially, teachers must teach grade-level concepts while simultaneously providing remedial instruction for students with academic deficits (Timberlake, 2014; Yell, Conroy, Katsiyannis, & Conroy 2013). However, planning and executing effective lessons for a group of students with varying abilities and different learning styles can be a daunting task (Aron & Loprest, 2012). Consequently, many teachers become overwhelmed by the day-to-day pressure of instructing students in the general education classroom (Doyle & Giangeco, 2013). However, when teachers feel they have sufficient knowledge related to disabilities and inclusive practices, they are more motivated to work with SWDs (Ozer et al., 2013; Sharma, Forlin, & Loreman, 2008). Teachers who are

confident in their instructional practices and content area are more comfortable teaching SWDs in inclusive settings (Berry, 2010; Combs, Elliott, & Whipple, 2010).

Early studies indicate that teachers almost overwhelmingly hold negative perceptions regarding inclusion. They tend to support traditional, pull-out special education programs while opposing inclusive programs (Kauffman, 1993; McKinney & Hocutt, 1988; Reeve & Hallahan, 1994). However, recent studies indicate that teachers generally hold positive attitudes about inclusion. Hang and Rabren (2009) affirmed that both general and special educators held positive opinions of co-teaching. Both groups believed inclusive classrooms provided SWDs with sufficient support. Additionally, both groups of educators reported a belief that SWDs learned more, exhibited better behaviors, and demonstrated increased self-confidence in inclusive classrooms. These findings were similar to those reported by Horne and Timmons (2009) and Scruggs et al. (2007).

Although support for inclusion among both general educators and special educators has increased, some negative attitudes persist. This is potentially problematic because teachers who do not fully agree with inclusive models are less likely to individualize instruction to meet student needs (Avramidis, Bayliss, & Burden, 2000). A review of the relevant literature also revealed preparation for inclusion as an area of concern for teachers. Many teachers feel unprepared to meet the needs of SWDs. Limited skills, lack of knowledge regarding co-teaching, and lack of administrative support have all been identified as obstacles (Tsakiridou & Polyzopoulou, 2014). Many teachers have had to alter their teaching styles to accommodate SWDs in general education classes. However, teachers are often fearful of change and hesitant to accept a new educational paradigm (Hwang & Evans, 2011). In an examination of inservice and preservice teachers' attitudes toward co-taught classroom, Gökdere (2012) found that some teachers

were opposed to co-teaching because they equated the model with extra work and intraclass problems. Moreover, many teachers believed general education students would not receive the interaction and attention they require because teachers would need to devote additional time and energy to supporting SWDs (Hwang & Evans, 2011).

Another factor that has consistently been shown to affect teachers' perceptions of inclusive classrooms is the severity of students' disabilities (Dusseljee, Rijken, Cardol, Curfs, & Groenewegen, 2011). Dukmak (2013) and Katz, Porath, Dendu, and Epp (2012) reported that teachers embrace students with milder disabilities, but are less accepting of students with intellectual disabilities and behavior disorders. Scruggs and Mastropieri (1996) synthesized 28 investigations regarding general education teachers' perceptions of inclusion. An examination of the data revealed that 65% of general education teachers supported the idea of inclusion. However, their support varied based on the severity of the disability. Overall, support decreased as the severity of disability increased.

Summary

For a number of years, a call for a change in the instructional approaches used to educate SWDs has been at the forefront of the education reform movement. Because of the move to reform teaching of SWDs students, federal legislation mandated equal access to education for SWDs. A crucial part of the mandate calls for inclusion, by stipulating that after a student is identified as having a learning disability by a team of professionals, all efforts should be made to educate that student in least restrictive environments, inclusive of the general education setting. Realizing the importance of inclusion, educational policymakers made a number of decisions to make the general education classroom more accessible for all students. Included in these decisions is the use of co-teaching, an instructional delivery model that seemingly provides added benefits when

compared to the models typically employed by general education teachers.

While co-teaching has become the standard for the inclusion of SWDs in the general education classroom, proof of the model's efficacy has been inconclusive (Murawski & Swanson, 2001). The review of literature, however, suggests that the proper implementation of inclusion models in the classroom may prove beneficial to the academic success of SWDs. The review of literature also stresses the importance of knowing what factors affect the successful implementation of co-teaching. The increased use of co-teaching as an inclusion model in schools has not been without complications. This has led essential stakeholders to question the frequent implementation of co-teaching models amid the limited research on its efficacy.

Research Questions and Hypotheses

The purpose of this study was to determine if male and female SWDs taught in two service delivery models at a middle school scored significantly different in mathematics and reading. The independent variables were type of service delivery model (co-teaching classroom or small-group resource room) and gender. The dependent variables were mathematics and reading scores. A covariate was used to control for previous mathematics and reading achievement. Lexile reading levels and math scale scores were collected from the GMAS testing results in 2014–2015 and 2015–2016 school years. The data were used to answer the following research questions:

1. Is there a significant main effect of service delivery model on mathematics scores of middle school SWDs after controlling for previous mathematics achievement?

2. Is there a significant main effect of service delivery model on reading scores of middle school SWDs after controlling for previous reading achievement?

3. Is there a significant main effect of gender on mathematics scores of middle

school SWDs after controlling for previous mathematics achievement?

4. Is there a significant main effect of gender on reading scores of middle school SWDs after controlling for previous reading achievement?

5. Is there a significant interaction between service delivery model and gender on the mathematics scores of middle school SWDs after controlling for previous mathematics achievement?

6. Is there a significant interaction between service delivery model and gender on the reading scores of middle school SWDs after controlling for previous reading achievement?

Chapter 3: Methodology

The problem addressed in this causal-comparative study is that committees designing IEPs for SWDs are frequently at odds regarding the most effective special education placement. It is not known if SWDs served in one setting progress at a faster rate than SWDs served in another. Therefore, the purpose of this study was to determine if male and female SWDs taught in different service delivery models at a suburban middle school score significantly different in mathematics and reading.

Participants

Participants were drawn from a population of SWDs identified as having a mild disability. Mild disabilities include autism, specific learning disability, other health impairment, and emotional behavioral disorder. Selection of student records was based on their classification in either an inclusion or small-group resource classroom for math and/or reading. Reading and mathematics scores were collected from archival data of students enrolled in Grades 6–8 in 2014–2015 and 2015–2016 school years (see Table 1).

Table 1

Number of Students by Year, Type of Delivery Model, Subject, and Gender

		Students in small-group resource				Students in co-teaching			
		Reading		Mathematics		Reading		Mathematics	
Year	Grade	M	F	M	F	M	F	M	F
2014–2015	6	4	2	5	3	11	3	13	3
	7	3	4	3	4	11	8	13	8
	8	5	2	4	4	6	7	10	6
2015–2016	6	4	2	5	2	14	5	13	7
	7	1	4	3	4	13	6	10	9
	8	5	1	4	3	1	5	11	9
Total		22	15	24	20	56	34	70	22

Instrument

Data to analyze the research questions came from the Georgia Milestones Assessment system (GMAS). The GMAS measures how well students have acquired the knowledge and skills outlined in the language arts, mathematics, science, and social studies content standards for each grade level. The GMAS generates information on academic achievement at the student, class, school, system, and state levels. This information is used by students, teachers and parents, the public, and policymakers, including local school districts and boards of education, to determine the quality of educational opportunity provided in the state of Georgia. As a result, the GMAS serves as a key component of the state's accountability system, the College and Career Ready Performance Index. Fincher (2014) reported that the GMAS end-of-grade assessments

- Provide a valid measure of student achievement of the state content standards across the full achievement continuum.
- Provide a clear signal of students' preparedness for the next educational level.
- Allow for detection of the progress made by each student over the course of the academic year.
- Aid in promotion and retention decisions at Grade 3 (reading), Grade 5 (reading and mathematics), and Grade 8 (reading and mathematics).
- Support and inform educator effectiveness measures.
- Inform state and federal accountability at the school, district, and state levels.

Criterion-referenced tests, such as the GMAS, are designed to measure how well students acquire, learn, and accomplish the knowledge and skills set forth in a specific curriculum or unit of instruction. Features of the GMAS include open-ended (constructed response) items in language arts and mathematics, and a writing component (in response

to passages read by students) at every grade level and course in the language arts assessment. Norm-referenced items are also included in all content areas and courses to complement the criterion-referenced information and to provide a national comparison. The GMAS reports student achievement at four levels:

Distinguished. Students who are classified as distinguished learners demonstrate advanced proficiency in the knowledge and skills as specified in Georgia's content standards. These students are prepared for the next grade level or course and are prepared for college and career readiness.

Proficient. Proficient learners demonstrate proficiency in the knowledge and skills as specified in Georgia's content standards. Proficient learners are prepared for the next grade level or course and are on track for college and career readiness.

Developing. Students who demonstrate partial proficiency in the knowledge and skills as specified by Georgia's content standards are classified as developing learners. These students need additional academic support to ensure success in the next grade level or course and to be on track for college and career readiness.

Beginning. Beginning learners are classified as students who do not yet demonstrate proficiency in the knowledge and skills as specified in Georgia's content standards. Beginning learners need substantial academic support to be prepared for the next grade level or course and to be on track for college and career readiness.

The results of the mathematics achievement tests are reported as scale scores. Scale scores are the total number of correct answers converted to a consistent and standardized scale across different forms of the test. The scale score range varies from subject to subject and grade to grade (Fincher, 2014).

The GMAS reports a Lexile score for each student who takes the English

language arts test. The Lexile framework for reading is a scientific approach to measuring reading ability and the text demand of reading materials. The framework measures a text's complexity and a reader's skill level. Lexile scores range from below 200L for beginning readers to above 1600L for advanced readers (Smith, 2004).

Validity. Validity, which provides the foundation for technical quality in assessment, begins with a clear identification of the purpose of the assessment and continues through item construction and review. In the case of the Georgia Milestones assessment, the purpose, as identified by the state legislature, is to measure how well students have acquired the skills and knowledge described in the state's mandated content standards in language arts, mathematics, science, and social studies. The evidence for the validity of Georgia Milestones relies primarily on how well the assessment instrument matches the intended content standards and how the score reports inform the various stakeholders—students, parents, and educators—about student performance (S. R. Smith, personal communication, August 19, 2016).

State educators, curricular specialists, and assessment contractors are involved in the development of the assessment. Once the purpose of the test is established, committees of educators review state content standards. The committees determine which standards will be evaluated, how they will be represented on the assessment, and how individual standards or elements will be grouped into reporting categories. To ensure that stakeholders are informed, the GMAS Guides, GMAS blueprints, and content weight documents are all posted on the Georgia Department of Education website. These documents detail the tests' content and method of assessment and the relative proportion of items by domain that are included on each content area test. The public posting of these documents and the inclusion of Georgia educators serve as one piece of evidence of

the GMAS validity as a measure of the state's content standards (S. R. Smith, personal communication, August 19, 2016).

All GMAS items are written by qualified, professional assessment specialists who are recruited specifically for Georgia tests. After the items are written, Georgia educators review the items and accept, revise, or reject them. Accepted items are embedded in an operational test to ensure they function appropriately. This commonly used and well-regarded practice ensures the items are taken by a representative group of motivated students under standard conditions.

Following the field test, another committee of Georgia educators reexamines the item. Accepted items are banked for future inclusion on an operational test form. Development of the actual test form is the next stage of test development. Items are selected based on the blueprint developed by Georgia educators. Content and statistical data are considered to ensure that each test form assesses the same range of content and carries identical statistical attributes. Test forms are also equated to ensure all test forms are of equal difficulty. This is critical because it ensures that students are always held to the same standard. Because of equating, differences in test performance can be interpreted as the result of changes in student achievement rather than variations in the properties of the test form (S. R. Smith, personal communication, August 19, 2016).

Reliability. Reliability refers to the degree to which test scores for a group of test takers are consistent and stable over time. Cronbach's alpha reliability coefficient is used by the test developers to measure and report reliability (Johnson & Christensen, 2008). The median reliabilities are similar across grades and subject areas and suggest that the GMAS are sufficiently reliable for their intended purpose. The reliability for mathematics on the GMAS for Grades 5, 6, 7, and 8 is .93, .92, .93, and .91 respectively.

The reliability for language arts on the GMAS for Grades 5, 6, 7, and 8 is .90, .89, .89, and .89 respectively (S. R. Smith, personal email, August 19, 2016).

Procedures

The study used archival data from the GMAS; therefore, there was no direct contact with the students whose records were accessed. Throughout the investigation, no identifying marks were used on any documents in the study that could be used to determine directly or indirectly the identities of the students. Based on the nature of the study, parental consent was not necessary to access the students' records on the GMAS. However, parents were aware of the school improvement plan SIP to improve reading and mathematics performances of SWDs on the GMAS.

Upon receiving approval from both the local school district and the university's institutional review board, the researcher gathered all data directly from school records. The archival data for the SWDs on the GMAS for 2014–2015 and the 2015–2016 school years were collected and recorded. The reading Lexile scores and mathematics scale scores of students was organized by co-teaching, small group, and gender. The results were analyzed to determine if differences existed in the mathematics and reading achievement of SWDs in the two types of service delivery models.

Design. This study used a causal-comparative research design. The causal-comparative method is one of four quantitative designs introduced by Leedy and Ormrod (2001). In causal-comparative research, the investigator tries to determine the causes or outcomes of differences that already exist (post hoc) between two groups that are similar in every aspect except for the differences being studied (Leedy & Ormrod, 2001). The aim of causal-comparative research is to find cause and effect relationships that may exist between independent and dependent variables. For the current study, the co-teaching and

small-group service delivery models, as well as gender, served as the independent variables. The dependent variables were comprised of mathematics and reading scores as reported by the GMAS.

After assessing the reading and mathematics achievement of SWDs, the study addressed six research questions:

1. Is there a significant main effect of service delivery model on mathematics scores of middle school SWDs after controlling for previous mathematics achievement?

2. Is there a significant main effect of service delivery model on reading scores of middle school SWDs after controlling for previous reading achievement?

3. Is there a significant main effect of gender on mathematics scores of middle school SWDs after controlling for previous mathematics achievement?

4. Is there a significant main effect of gender on reading scores of middle school SWDs after controlling for previous reading achievement?

5. Is there a significant interaction between service delivery model and gender on the mathematics scores of middle school SWDs after controlling for previous mathematics achievement?

6. Is there a significant interaction between service delivery model and gender on the reading scores of middle school SWDs after controlling for previous reading achievement?

Data analysis. The data collected from the GMAS were uploaded to the Software Package for the Social Sciences. Each research question was addressed by testing the null hypotheses that among the groups defined by the characteristic being examined that there were no differences in the mean scores. Two two-way analyses of covariance were evaluated at $\alpha = 0.05$ to compare the mean scores of the co-teaching and small-group

service student groups in mathematics and reading. The independent variables were the type of service delivery model (co-teaching and small-group) and gender. The dependent variables were GMAS mathematics and reading scores. A covariate was used to control for previous mathematics and reading achievement.

Limitations

Because SWDs are assigned to co-teaching and small-group classes through the IEP process, one limitation of this study was the researcher's inability to randomize the students into service delivery models. Another limitation was the extent to which generalization is possible due to the limited population size. The student body of the selected schools consists primarily of Caucasian students from middle- to upper-middle class, socioeconomic backgrounds. Therefore, a lack of student diversity was a limitation.

Chapter 4: Results

Committees charged with designing IEPs for SWDs are frequently at odds regarding the most effective special education placement. It is not known if SWDs served in inclusive settings master the curriculum at greater rates than SWDs served in self-contained settings. In order to contribute to the body of literature evaluating the academic efficacy of the co-teaching model, this study sought evidence that the co-teaching service-delivery model yields significantly higher growth outcomes in reading and mathematics for middle school students than those students served in small-group resource settings. The following research questions were addressed:

1. Is there a significant main effect of service delivery model on mathematics scores of middle school SWDs after controlling for previous mathematics achievement?
2. Is there a significant main effect of service delivery model on reading scores of middle school SWDs after controlling for previous reading achievement?
3. Is there a significant main effect of gender on mathematics scores of middle school SWDs after controlling for previous mathematics achievement?
4. Is there a significant main effect of gender on reading scores of middle school SWDs after controlling for previous reading achievement?
5. Is there a significant interaction between service delivery model and gender on the mathematics scores of middle school SWDs after controlling for previous mathematics achievement?
6. Is there a significant interaction between service delivery model and gender on the reading scores of middle school SWDs after controlling for previous reading achievement?

The study used a causal-comparative design to determine the cause or outcome of

differences that already exist (post hoc) between students in two instructional groups. Data were collected on the growth outcomes of SWDs in Grades 6, 7, and 8 who were assigned to either an inclusive or small-group service-delivery model to determine if one model yielded significantly higher scores in the core subjects of math and reading. The study also sought to determine if a significant interaction existed between service delivery model and gender after controlling for previous achievement.

Participants were drawn from a population of SWDs in Grades 6–8 who were identified as having a mild disability. Mild disabilities included autism, specific learning disability, other health impairment, and emotional behavioral disorder. Selection of student participants was based on placement in either a co-teaching or small-group service delivery model for math and/or reading. The dependent variables collected were the end of the year mathematics GMAS and reading Lexile scores for 2015–2016; while the covariate variables were the same students' end of the year mathematics GMAS and reading Lexile scores for 2014–2015. The GMAS test scores were analyzed using two two-way analyses of covariance (ANCOVA). The results of the ANCOVAs were used to compare the mean scores of the inclusion and small-group resource student groups. The independent variables were type of service delivery model and gender.

Description of the Sample

Table 2 contains a breakdown of the sample by demographics. Mathematics and reading outcomes were collected from 45 SWDs who were placed in the small-group resource model and 112 SWDs in co-teaching settings in 2015–2016 (See Table 2). The dependent variables collected were the end of the year mathematics GMAS and reading lexile scores for 2015–2016, while the covariate variables were the same students' end of the year mathematics GMAS and reading lexile scores for 2014–2015. Twelve male and

eight female SWDs were served in a small-group resource setting for reading and 14 male and 11 female SWDs were served in the same small resource setting for mathematics. At the same time, 31 males and 20 female SWDs were served in a co-teaching environment for reading instruction. Another 33 male and 28 female SWDs were served in a co-teaching environment for mathematics instruction.

Table 2

Number of Students by Setting, Grade, Subject, and Gender (n = 157)

	Small group				Co-teaching			
	Reading		Mathematics		Reading		Mathematics	
Grade	M	F	M	F	M	F	M	F
6	4	2	5	2	14	6	12	7
7	2	4	3	5	15	8	10	9
8	6	2	6	4	2	6	11	12
Total	12	8	14	11	31	20	33	28

Analysis of the Research Questions

Two two-way ANCOVAs were used to analyze the data. The results of the ANCOVAs were evaluated at $\alpha = 0.05$ to compare the mean scores of the inclusion and small-group resource student groups. The independent variables were type of service delivery model (co-teaching or small-group resource classroom) and gender. The dependent variables were 2016 GMAS mathematics and reading scores. The covariates were the SWDs' previous year (2015) GMAS scores and reading lexile scores. Means and standard deviations of the students' 2014–2015 (pretest) and 2015–2016 (posttest) GMAS mathematics scores and reading lexile scores by subject, setting, and gender are presented in Table 3.

Table 3

Pretest and Posttest Mathematics and Reading Means and Standard Deviations by Subject, Setting, and Gender

Subject	Setting*	Gender	Test	*n*	*Min*	*Max*	*M*	*SD*
Math	CT	Male	Pretest	33	463	623	529.30	36.88
			Posttest	33	464	607	535.15	32.29
		Female	Pretest	28	463	654	517.64	37.16
			Posttest	28	449	632	527.04	36.05
	SG	Male	Pretest	14	433	527	472.71	22.86
			Posttest	14	446	544	485.71	25.30
		Female	Pretest	11	433	499	461.36	21.73
			Posttest	11	431	499	469.55	20.64
Reading	CT	Male	Pretest	31	620	1325	966.94	195.10
			Posttest	31	640	1460	1063.55	189.46
		Female	Pretest	20	820	1400	1066.00	161.78
			Posttest	20	780	1400	1139.75	174.34
	SG	Male	Pretest	12	595	1185	890.00	179.140
			Posttest	12	710	1255	905.83	166.79
		Female	Pretest	8	555	1080	790.63	194.30
			Posttest	8	505	1080	764.38	187.40

*CT = Co-teaching; SG = small group

Six research questions guided the analysis of the data. The research questions were converted into null hypotheses:

1. There is no significant main effect of service delivery model on mathematics scores of middle school SWDs after controlling for previous mathematics achievement.

2. There is no significant main effect of service delivery model on reading scores of middle school SWDs after controlling for previous reading achievement.

3. There is no significant effect of gender on mathematics scores of middle school SWDs after controlling for previous mathematics achievement.

4. There is no significant effect of gender on reading scores of middle school SWDs after controlling for previous reading achievement.

5. There is no significant interaction between service delivery model and gender on mathematics after controlling for previous mathematics achievement.

6. There is no significant interaction exists between service delivery model and gender on the reading scores of middle school SWDs after controlling for previous reading achievement.

The first assumption of ANCOVA is that the homogeneity of the variables should be similar for all groups. Table 4 contains results of the Levene's test, verifying that the homogeneity of the groups was similar (*p* values were > .05). The second assumption of ANCOVA is that the residuals should be normally distributed. The standardized results in each subject for each SWD were evaluated using the Shapiro Wilk test of residuals (See Table 5) and histograms (See Figures 1 and 2). The assumptions of ANCOVA were met and the values in Table 3 were appropriate for use in an ANCOVA.

Table 4

Levene's Test of Equality of Error Variances

Subject	*F*	*df1*	*df2*	*p*
Mathematics	.23	3	82	.88
Reading	.57	3	67	.64

Table 5

Shapiro Wilk Test of Residuals

Subject	Statistic	*df*	*p*
Mathematics	.98	86	.21
Reading	.98	71	.25

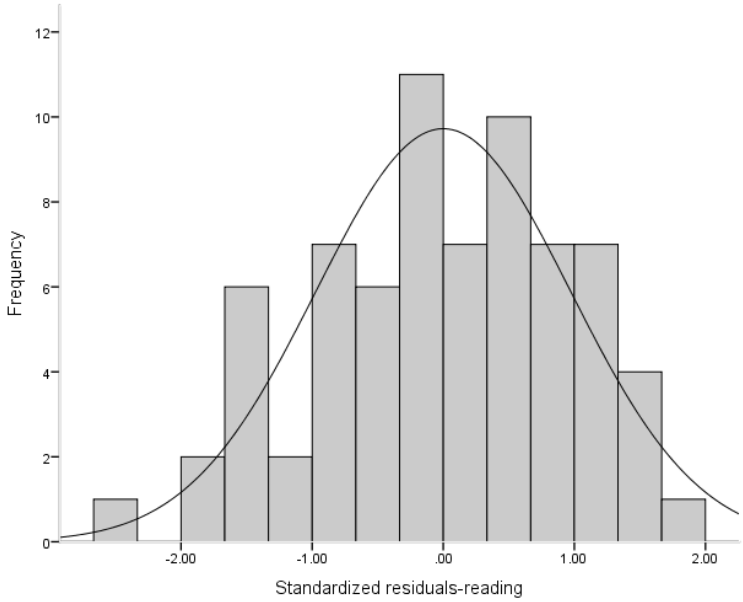

Figure 1. Histogram of standardized residuals of posttest reading scores.

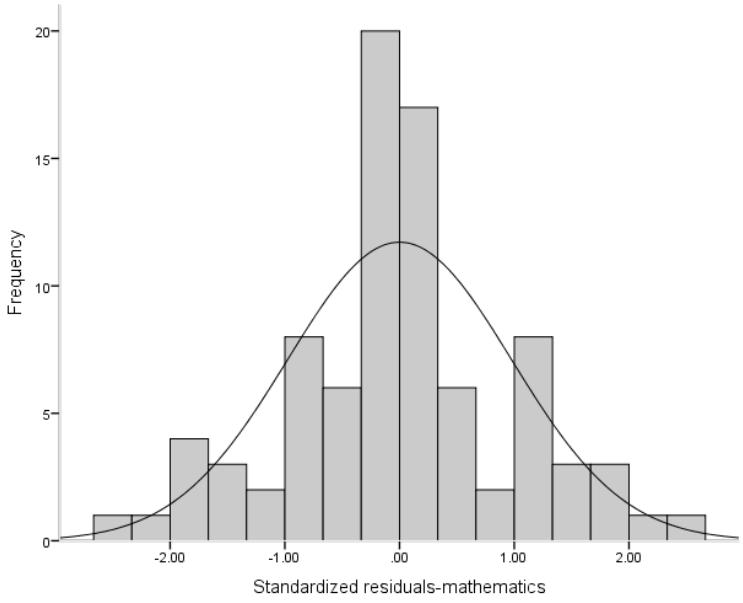

Figure 2. Histogram of standardized residuals of posttest mathematics scores.

Tests of Hypotheses

Two two-way ANCOVAs were conducted to determine if a statistically significant difference existed between type of service delivery model and gender on mathematics and reading scores while controlling for pretest scores. The results are presented in Table 6.

Table 6

Differences Between Mathematics and Reading Posttest Scores by Gender and Service Delivery Model, Controlling for Pretest Scores

Subject	Source	*SS*	*df*	*MS*	*F*	*p*	Partial *eta*^{2}
Math	Corrected model	81949.16	4	20487.29	32.43	< .01	0.62
	Intercept	18569.79	1	18569.79	29.39	< .01	0.27
	Pretest	29856.37	1	29856.37	47.26	< .01	0.37
	Gender	535.73	1	535.73	0.85	0.36	0.01
	Service delivery model	4986.51	1	4986.51	7.89	< .01	0.09
	Gender * service delivery model	296.54	1	296.54	0.47	0.50	0.01
	Error	51176.42	81	631.81			
	Total	23037334.00	86				
	Corrected total	133125.58	85				
Reading	Corrected model	2031548.91	4	507887.23	27.99	< .01	0.63
	Intercept	302226.45	1	302226.45	16.65	< .01	0.20
	Pretest	1008329.68	1	1008329.68	55.56	< .01	0.46
	Gender	14561.32	1	14561.32	0.80	0.37	0.01
	Service delivery model	256221.54	1	256221.54	14.12	< .01	0.18
	Gender * service delivery model	23457.37	1	23457.37	1.29	0.26	0.02
	Error	1197817.29	66	18148.75			
	Total	77772500.00	71				
	Corrected total	3229366.20	70				

Hypothesis 1. There was a significant effect of service delivery model on mathematics ($F = 7.89$, $p = .01$). The partial eta squared value indicated the effect size and should be compared with Cohen's (1977) guidelines (0.2 = small effect, 0.5 = moderate effect, 0.8 = large effect). It can be seen that for service delivery model, the effect size was small (0.09). This value is also used to describe how much of the variance in the 2016 GMAS mathematics score is explained by type of service delivery model (9%).

Hypothesis 2. There was a significant effect of service delivery model on reading ($F = 14.12$, $p < .01$). The partial eta squared value indicated the effect size and should be

compared with Cohen's (1977) guidelines (0.2 = small effect, 0.5 = moderate effect, 0.8 = large effect). It can be seen that for service delivery model, the effect size was small (0.18). This value is also used to describe how much of the variance in the 2016 reading lexile scores is explained by type of service delivery model (18%).

Hypothesis 3. There was no significant effect ($F = 0.85$, $p = .36$) of gender on mathematics scores of middle school SWDs after controlling for previous mathematics achievement.

Hypothesis 4. There was no significant effect ($F = 0.80$, $p = .37$) of gender on reading scores of middle school SWDs after controlling for previous reading achievement.

Hypothesis 5. There was no significant interaction ($F = 0.47$, $p = .50$) between service delivery model and gender on mathematics after controlling for previous mathematics achievement.

Hypothesis 6. No significant interaction ($F = 1.29$, $p = .26$) existed between service delivery model and gender on the reading scores of middle school SWDs after controlling for previous reading achievement.

Summary of results. Tables 7–9 contain the estimated marginal means in the interaction between gender and service delivery model and by the main effects of gender and service delivery model. In both mathematics and reading, SWDs instructed in a co-teaching service delivery model scored significantly higher than SWDs placed in a small-group resource service delivery model (See Table 9). However, no significant interaction between gender and service delivery model or a significant effect of gender was present.

Table 7

Estimated Marginal Means of Mathematics and Reading Posttest Scores by Gender and Service Delivery Model

Subject	Gender	Service delivery model	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Math	Male	CT	522.81[a]	4.73	513.40	532.22
		SG	505.56[a]	7.31	491.01	520.10
	Female	CT	521.33[a]	4.82	511.73	530.92
		SG	495.84[a]	8.49	478.95	512.73
Reading	Male	CT	1060.23[b]	24.20	1011.91	1108.55
		SG	953.95[b]	39.42	875.24	1032.65
	Female	CT	1070.21[b]	31.54	1007.25	1133.17
		SG	878.92[b]	50.05	779.00	978.84

a. Covariates appearing in the model are evaluated at the following values: pre = 507.60.
b. Covariates appearing in the model are evaluated at the following values: pre = 961.97.

Table 8

Estimated Marginal Means of Mathematics and Reading Posttest Scores by Gender

Subject	Service delivery model	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Math	Male	514.18[a]	4.05	506.14	522.23
	Female	508.59[a]	4.72	499.20	517.97
Reading	Male	1007.09[b]	23.10	960.97	1053.20
	Female	974.56[b]	28.34	917.98	1031.15

a. Covariates appearing in the model are evaluated at the following values: pre = 507.60.
b. Covariates appearing in the model are evaluated at the following values: pre = 961.97.

Summary

The analysis of the data sought evidence that the co-teaching service-delivery model yields significantly higher growth outcomes in reading and mathematics for middle school SWDs than those SWDs served in a small-group resource service delivery

Table 9

Estimated Marginal Means of Mathematics and Reading Posttest Scores by Service Delivery Model

Subject	Service delivery model	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Math	CT	522.07[a]	3.49	515.13	529.01
	SG	500.70[a]	6.08	488.61	512.79
Reading	CT	1065.22[b]	19.93	1025.43	1105.01
	SG	916.43[b]	32.62	851.30	981.57

a. Covariates appearing in the model are evaluated at the following values: pre = 507.60.
b. Covariates appearing in the model are evaluated at the following values: pre = 961.97.

model. Selection of student records was based on their classification in either an inclusion (co-teaching) or small-group resource classroom for math and/or reading in 2015–2016. Two ANCOVAs were used to analyze the data and answer six research questions. The results of the analyses indicated that for both reading and mathematics, SWDs in co-teaching service delivery models scored significantly higher than their peers did in small-group resource classrooms. A discussion of these results, conclusions that can be drawn from the results, implications for practice, and recommendations for further study are presented in Chapter 5.

Chapter 5: Discussion

Committees charged with designing IEPs for SWDs are frequently at odds regarding the most effective special education placement. This confusion was brought on because of the demands of NCLB and IDEA, both created to ensure that SWDs received a quality public education. The IDEA requires public schools to provide SWDs a free and appropriate public education in the least restrictive environment, while NCLB tries to ensure all children have a fair, equal, and meaningful opportunity to obtain a high-quality education (Hardman & Dawson, 2008). To this end, the NCLB requires school districts in all states to implement standards-based accountability programs to certify the AYP of all students, including those with disabilities.

Because SWDs are held to the same academic standards as their nondisabled peers, schools have sought to implement practices that would assist SWDs in meeting the mandated progress and proficiency requirements. Co-teaching emerged as a viable means to support SWDs in general education classrooms in light of inclusion and achievement mandates (Handler, 2006). Toward this end, greater numbers of SWDs started to receive reading and mathematics instruction in general education classrooms from general educators who were highly qualified in those content areas (Ashworth et al., 2010).

Based on the tenet that co-teaching has become the standard for the inclusion, the purpose of the current study was to assess the effects of two service delivery models used in the instruction of reading and mathematics to SWDs. As a result, post hoc data were drawn for the records of SWDs in Grades 6–8 who took the Georgia Milestones Assessment during the 2014–2015 and 2015–2016 school years. An extensive review of related literature on the teaching and learning of SWDs generated six research questions. A causal-comparative design was used to analyze the data to determine differences that

may have existed between students in two instructional groups.

Discussion and Conclusions

Of the six tested null hypotheses, two were rejected: (a) there was a significant main effect of service delivery model on mathematics scores of middle school SWDs after controlling for previous mathematics achievement and (b) there was a significant main effect of service delivery model on reading scores of middle school SWDs after controlling for previous reading achievement. The findings of the analyses indicated that for both reading and mathematics, SWDs in co-teaching service delivery models scored significantly higher than their peers did in small-group resource classrooms. There was no significant main effect of gender, nor was there a significant interaction between gender and service delivery in either mathematics or reading achievement.

Research Question 1. The findings of the study provided support for rejecting Null Hypothesis 1. Students with disabilities in the current study who received mathematics instruction in the inclusive setting scored higher than did SWDs who received instruction in a small-group resource classroom. The results of this study are consistent with those of Fontana (2005) who also determined that co-teaching positively influenced the reading and math grades of middle school SWDs.

During the elementary school years, the mathematics achievement of SWDs is lower than that of students without disabilities. As SWDs enter middle school, their math achievement continues to slow (Wei et al., 2013). It is often argued that the needs of SWDs go beyond the scope of the general education classroom. Thus, IEP committees often attempt to mitigate deficits by placing students in small groups with students affected by similar weaknesses. It is believed the small group is an optimal setting to provide intensive specialized instruction. However, students with and without disabilities

have shown an increase in the comprehension of subject matter as a result of the multiple instructional approaches used in co-teaching classrooms (Wilson & Michaels, 2006). Likewise, the results of the current study indicate that co-teaching affects the mathematics achievement of middle school SWDs positively. Therefore, rather than approach placement considerations from a deficit position, IEP committees may do well to consider the benefits of the co-teaching model. In co-teaching classrooms, general education teachers who are highly qualified to teach mathematics can focus on the instruction of grade-level math content and the use of research-based math strategies. Special educators can then concentrate on the provision of instructional accommodations and differentiate the content so SWDs can learn in ways that are compatible to their learning styles and processing deficits.

Research Question 2. In the current study, the co-teaching service delivery model yielded significantly higher achievement in reading for SWDs than did the small-group resource model. These results mirror those of Hang and Rabren (2009), who found that SWDs who received co-teaching instruction for a year produced significantly higher SAT national curve equivalent scores in reading than they did prior to receiving instruction in a co-taught setting. Likewise, a study by Walsh (2012) indicated that SWDs increased proficiency in reading at twice the rate of the rest of the sample population. In small-group classes, special educators, who are trained to meet students where they are, often provide intensive instruction in reading strategies using texts that are specific to student's Lexile level, while SWDs instructed in co-taught reading classes benefit from assessment and comprehension monitoring at grade level, while receiving specialized instruction in the use of reading strategies. These results provide validation for the supposition that SWD experience increased reading achievement when both a general

educator and a special educator in a general education class teach them.

Research Question 3. Researchers have confirmed the existence of gender gaps in math achievement. In fact, disparities in math achievement favoring boys have been identified as early as kindergarten. Moreover, the gap has been found to widen through third grade and persist at Grades 4, 8, and 12 (Husain & Millimet, 2009; LoGerfo, Nichols, & Reardon, 2006). However, in the current study, gender was not found to affect the mathematics achievement of SWDs.

Research Question 4. Reading achievement data reveal increased achievement for girls in Grades 2–8 (Husain & Millimet, 2009; Rampey, Dion, & Donahue, 2009). Although research suggests disparities in reading achievement tend to favor girls, gender did not influence the reading achievement of SWDs in the current study.

Research Question 5. The disproportionate representation of boys in special education has been a cause for concern for decades (Bruce & Venkatesh, 2014; Coutinho & Oswald, 2005; Hibel, Farkas, & Morgan, 2010). Likewise, researchers have long studied the persistent gap in mathematics achievement between male and female students (Husain & Millimet, 2009; LoGerfo et al., 2006). While it could be argued that the achievement gap indicates a greater need for specialized mathematics instruction, in the current study, gender did not influence the main effect of service delivery model on the mathematics achievement of students with disabilities.

Research Question 6. Research shows that gender differences exist in both reading achievement and special education placement. Girls demonstrate higher reading achievement than do their male classmates (Husain & Millimet, 2009; Rampey et al., 2009), and they are less likely to be placed in special education (Bruce & Venkatesh, 2014; Coutinho & Oswald, 2005; Hibel et al., 2010). These facts notwithstanding, in the

current study, gender did not influence the main effect of service delivery model on the reading achievement of students with disabilities.

Post-Limitations

The limitations and research methodology should be considered when evaluating the results of the current study. Findings and conclusions were based on research conducted on a relatively small sample. Furthermore, participants for the study were drawn from a pool of primarily middle- to upper-middle class Caucasian students. These factors limit the extent to which generalization is possible. Additionally, all study participants were considered identical for purposes of research, despite differences in IDEA eligibility categories. The researcher did not examine the relationship between test scores, service delivery model, and disability type. Therefore, it is not known if results of the study were affected by disability type.

Implications

For both reading and mathematics, SWDs in co-teaching service delivery models scored significantly higher than their peers did in small-group resource classrooms. These findings have significant implications for IEP committees who are charged with making placement decisions and for general and special educators who are responsible for providing instruction to SWDs. LRE mandates require IEP committees to consider the general education setting first for all students. If an IEP committee decides that a student should receive special education services outside the general education setting, they must document why the general education classroom was rejected. Specifically, the committee must note the specialized instruction the student requires and explain why the instruction cannot be provided in the general education classroom.

Academic deficits and the need for remediation are frequently cited as the

rationale for small-group placement. However, in the current study, SWDs in co-taught classes demonstrated greater achievement in both reading and math than did their peers who were instructed in small-group resource classrooms, after controlling for previous achievement. Therefore, IEP committees may need to shift their focus from remediation to strategic intensive intervention.

Strategic intensive interventions prepare students for new learning. In general education classrooms, mastery of grade-level standards is the primary objective. As a result, there is little time to teach in reverse. Therefore, co-teachers must teach previously missed skills and concepts purposefully and in the context of the current curriculum. Addressing academic deficits in the context of new learning prevents students from falling farther and farther behind. Conversely, special educators remediate in small groups. Remediation focuses on isolated skills that are often unrelated to the current grade-level curriculum. Because students are engaged in learning activities that are related to standards from earlier grades, the achievement gap persists.

Access to the general education curriculum and the establishment of high expectations is a recurrent theme in IDEIA, NCLB, and inclusion research. In the current study, instruction in the general education setting had a positive effect on the reading and mathematics performance of middle school SWDs. This finding supports the legislative shift from access to quality of instruction and underscores the assertion that accountability and high expectations will improve the academic success of SWDs.

Recommendations

The increased use of inclusive instructional models in public schools has resulted in greater student diversity in the general education classroom. This diversity has in turn, placed increased instructional demands on both general and special educators. Shared

instructional responsibility and accountability, a basic tenet of the co-teaching model, can minimize the pressure of teaching to diverse group of students. Therefore, school leaders should provide ongoing professional development related to the effective implementation of the co-teaching model.

Given the mandates of IDEA and NCLB, there is a critical demand for teachers who are trained and equipped to teach SWDs. However, many teacher education programs offer general educator teacher candidates nothing more than a cursory examination of SWDs. General education teacher preparation programs should require substantive coursework related to the instruction of SWDs and practical preservice experience in inclusive classrooms

To close the achievement gap, special educators should shift their focus from remediation to strategic intensive intervention. SWDs who are separated for remedial instruction progress more slowly than do their peers in inclusive settings, often falling further behind. Therefore, special educators should participate in ongoing professional development opportunities related to effective instructional interventions.

Co-teaching is predicated on the notion that two teachers, with different specialties, collaborate to provide high-quality instruction to a diverse group of students. Therefore, it is not surprising that common planning has been identified as integral to the success of co-teaching. Co-teachers in the current study all had common planning. This practice may have contributed to the success of the co-teaching model. School leaders must make common planning for collaboration a priority when scheduling.

Suggestions for Further Research

The results of the study suggested that SWDs demonstrate better reading and mathematics achievement outcomes when they receive instruction in inclusive classroom

settings. Nonetheless, support of this finding in the literature is not unanimous. Research surrounding the efficacy of co-teaching has been both limited and inconclusive. While older studies suggest co-teaching benefits SWDs academically, these results should be replicated to demonstrate with certainty that co-teaching positively influences the academic achievement of SWDs.

Self-efficacy is a pillar of the social learning theory (Bandura, 1977a, 1977b, 1986) on which co-teaching is based. In an educational setting, self-efficacy refers to students' beliefs about their ability to participate successfully in an educational activity or to master academic content (Montgomery & Mirenda, 2014). Self-efficacy plays a vital role in determining the level of effort a person expends to complete a task. Therefore, a student's academic success is not solely reliant on external factors. Rather, it is rooted in a person's determination to succeed (Bandura, 1977a). Future studies should investigate the degree to which students' self-efficacy affects their achievement in various settings.

Co-teaching is most effective when the instructional approach is selected purposefully because quality of instruction is essential to student achievement. Several factors, including student needs and characteristics, teacher proficiency and instructional style, content and instructional strategies, and physical environment should be considered when selecting an approach for a particular lesson. Yet, researchers have found that co-teachers often default to the one teach-one observe model because it requires little planning and is the easiest approach to implement. A quantitative study on how specific co-teaching models affect student achievement should be completed to determine if different approaches yield significantly different outcomes.

Finally, in the current study, SWDs were evaluated as a heterogeneous group. However, IDEA lists 13 categories under which students are eligible to receive special

education services and protections. Specific traits and educational challenges are associated with each disability type. Future research should differentiate academic outcomes to ascertain if achievement in different settings is influenced by disability type.

Summary

In 2001, Congress passed legislation that established the expectation that all students, including those with disabilities, would demonstrate improved student achievement and evidence proficiency in reading and math. As a result, schools were obliged to widen their special education focus to include quality instruction in grade-level standards. Co-teaching emerged as a viable and effective way to simultaneously provide high quality content instruction and address the specialized learning needs of SWDs in the least restrictive environment. However, little research exists supporting the academic efficacy of this model.

In the current study, data were collected on the achievement of SWDs in Grades 6–8 who were assigned to co-teaching or small-group resource classrooms to determine if one model yielded significantly higher scores in the core subjects of math and reading on the Georgia Milestones Assessment. An analysis of the data indicated that for both reading and mathematics, SWDs in co-teaching service delivery models scored significantly higher than their peers did in small-group resource classrooms. These findings support the supposition that co-teaching is an effective instructional model for middle school students with disabilities.

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