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Co-Taught Inclusive Classrooms and Algebra I Achievement of Students with Disabilities

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Walden University
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Abstract

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by

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MA, LaGrange College, 2011

BS, LaGrange College, 2009

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Co-teaching has become an increasingly important topic for students with disabilities (SWDs) to access to the general education curriculum. The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive non-co-teaching classroom instruction for SWDs using Algebra I End of Course (EOC) scores and whether these effects differed by gender. Cook and Friend's principles of co-teaching provided the framework for the study. The first research question was: is there a significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching. The second research question was: is there a significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching. Participants included 247 ninth-grade Algebra 1 SWDs at a single high school in a rural region of southeastern Georgia. The research design consisted of a posttest only with control group and a test group. Analysis of covariance (ANCOVA) was used to analyze the results. Results showed that co-teaching did not significantly benefit either male or female SWDs in algebra1. The fact that SWDs in inclusive settings who did not receive co-teaching scored higher than those in inclusive settings who did receive co-teaching is significant and has important implications for practice and research. Future research should investigate studies with larger sample size and proficiency of teachers in co-taught educational classes. The results of this study contribute to social change by increasing the knowledge base of preferable instructional settings for algebra 1 courses with SWDs.

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Dedication

I would like to dedicate my doctoral study to my family, for without them I would not have pursued this endeavor. To my son and daughter, Sinclair and Poppy, thank you for all your love, kisses, and cuddles throughout this time.

To my wife, Amanda, thank you for taking control of our lives when I needed to write. I love you and I could not have done this without you and your support. Thank you for being the person I fell in love with.

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Chapter 1: Introduction to the Study

Educational systems are expected to be responsive to potential barriers that all learners encounter during the process of learning (Treviranus, 2018). Educators rely on current research as they make informed decisions regarding SWDs and students without disabilities (SWODs; Brown & Babo, 2017). Legislative mandates to support inclusive education have led to an increasing number of schools that include SWDs in the same classrooms as SWODs (Blazer, 2017; Bottge et al., 2018). It is therefore necessary for policymakers and educators to understand how such environments influence students with special education needs as well as their nondisabled counterparts (Brown & Babo, 2017).

The goal of this quantitative study was to examine the effects of co-teaching on Algebra I achievement among SWDs. While there have been various studies on co-teaching as a promising approach to inclusive education, along with studies showing positive effects of co-teaching models on the general academic achievement of SWDs, there continues to be a need for evidence-based information regarding best teaching practices needed for mathematics pedagogy in the classroom. Results of this study can extend research regarding applicability of teaching practices, particularly within the context of mathematics education among SWDs.

I provide a brief background in this chapter regarding the context of the study, as well as an explanation of the specific research problem addressed by the study. The purpose of the study is also presented, followed by research questions and hypotheses that guided the research. The theoretical foundation of the study was the co-teaching

principles of Cook and Friend, and the methodological nature of the study is also briefly explained. Definitions of key terms are included to further provide structure to the research. Limitations, delimitations, and assumptions of the study are highlighted. Finally, the significance of the study is provided, followed by a summary of the chapter.

Background

A disability is considered one of the most marginalizing factors in a child's life due to various physical, attitudinal, and instructional barriers (Bulat et al., 2017). The United Nations' Convention on the Rights of Persons with Disabilities (UNCRPD) recognized the right of all persons with disabilities to inclusive education. They defined inclusive education as an educational system that includes all students and supports their learning, whatever their abilities or requirements (United Nations Children's Fund, 2017). The most effective way to educate children with special education needs (SENs) is to include them in general education classrooms as opposed to segregating them in different classrooms, or even placing them in special needs schools (Bulat et al., 2017; Chitiyo, 2017).

Since 2001, national content standards for mathematics instruction have emphasized the importance of making high-quality mathematics instruction accessible to SWDs (Moeller & McLeod, 2017). The Common Core State Standards in Mathematics (CCSM) sponsored by the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO) mandates that all students, including SWDs, must meet the same high standards and have the same opportunities to learn if they are to

achieve skills and knowledge that they need in order to be successful during their post-academic lives (Fromme, 2018).

National standards reflect widespread recognition that all students, regardless of their background, can learn mathematics and their optimal learning processes may vary, and therefore offering identical instruction to every student may no longer be enough to help students learn standards (Chitiyo, 2017; Moeller & McLeod, 2017). Proponents of inclusive education argue that SWDs who are educated within inclusive classroom settings are likely to benefit both academically and socially from being surrounded by their peers who demonstrate model-appropriate social behavior. Moreover, SWODs who are educated with their SWDs counterparts are taught to be more tolerant of differences (Brown & Babo, 2017).

SWDs can learn mathematics when instruction is appropriate for their learning needs (Bottge et al., 2018; Jitendra et al., 2018; King et al., 2016; Spooner et al., 2019). Teachers in inclusive education must change their instructional approaches in order to meet learning needs of a diverse student population and ensure the academic achievement of their students (King et al., 2016; Sailor, 2017; Schulte et al., 2016). While legislation advocating for the inclusion of persons with SENs is now common across the developed world, the implementation of such inclusive practices continues to be met with various barriers involving economic factors, variations in school policies on inclusion, and low self-efficacy of teachers in terms of their understanding, knowledge, and skills to create inclusive learning environments (Brennan et al., 2019).

There is growing research regarding the importance of developing competence in the field of inclusive education, as the translation of policy into practice is shaped by how teachers understand this overall concept. As a result of The Individuals with Disability Education Act (IDEA, 2004) pushing for inclusive education in the Least Restrictive Environment (LRE), co-teaching has evolved quickly as one of the main strategies for ensuring that learners with SENs have access to the same curriculum as other students, while simultaneously having access to specialized instruction to which they are entitled (Friend et al., 2010). Effective instructional practices can promote academic achievement, and the co-teaching model is more effective than non-co-teaching in narrowing math achievement gap between SWDs and SWODs when teachers engage in differential instruction (Blazer, 2017; Elliott et al., 2017; Spooner et al., 2019).

Co-teaching is a collaborative teaching practice rooted in the inclusive education philosophy, which is based on the belief that all children can learn given opportunity, effective teaching and appropriate resources (Chitiyo, 2017; Drescher, 2017). Co-teaching has been identified as a promising school-based practice; however, more research is necessary in relation to its practice and execution, including factors that may hinder its successful implementation.

Problem Statement

The problem is that individual school systems do not know enough about the instructional effectiveness in co-teaching versus inclusive classrooms for SWDs using Algebra I EOC scores and whether these effects differ by gender. Furthermore, despite prior studies showing the moderating effect of gender differences on the mathematics

achievement of students, there is insufficient evidence in terms of how co-teaching practices influence the Algebra I achievement of students based on gender. In addition, there is a corresponding gap in practice that suggests that the implementation of co-teaching is not systematic and therefore leads to inconsistent results. This study helped address the gap in practice as it relates to actual student outcomes and showed that further development of co-teaching is still needed to be validated as a service delivery model for SWDs in the general education setting. In recent decades, due to IDEA, 2004 and LRE legislative mandates, SWDs in the same classrooms as SWODs has increased from 45% to 64% (Cheshire, 2019; Hurd & Weilbacher, 2018).

Academic achievements between SWDs and SWODs also continue to show significant gaps, especially in terms of reading and mathematics. For instance, 68% of all eighth grade SWDs scored below the basic grade level achievement mandated by the United States Department of Education, in comparison to 29% of SWODs (Bottge et al., 2018; Moeller & McLeod, 2017). Variations in mathematics achievement were also found by gender, with males outperforming females (*F value= 10.01, p<.001, mean difference= 0.19*) in SWDs and SWOD groups (Stevens & Schulte, 2017; Stewart et al., 2017).

In 2015, the Every Student Successds Act (ESSA) used value-added measures to evaluate, promote, compensate, or even dismiss underperforming administrators and teachers has made it crucial for local, state, and federal policymakers to be aware of best practices that can benefit all students. As a result the Georgia Department of Education (GaDOE) began to measure the effectiveness of teachers based on achievement of their

students (Brown & Babo, 2017). Teachers in inclusive education are expected to change their instructional approaches and meet learning needs of diverse student populations in order to improve academic achievements (Elliott et al., 2017; King et al., 2016; Sailor, 2017; Schulte et al., 2016).

Co-teaching has emerged as a promising approach to inclusive education. Researchers have documented positive effects of co-teaching on the academic achievement of SWDs. Bottge et al. (2018) said SWDs and SWODs co-taught by a mathematics teacher in collaboration with a special education teacher were able to obtain similar scores *(t=3.23, df=752, p =.001)* in terms of math achievement; however, more evidence of best practice is needed. I addressed the insufficiency of existing evidence regarding the effectiveness of co-teaching for mathematics achievement within the literature based on suggestions for further research regarding co-teaching approaches to mathematics within classrooms catering to SWDs. The gap in practice is the inconsistence implementation of co-teaching practices and its effecticeness in algebra 1 achievement based on gender differences. This study helped address the gap in practice as it relates to actual student outcomes and showed that further development of co-teaching is still needed to be validated as a service delivery model for SWDs in the general education algebra 1 setting.

It is not apparent what best practices with the greatest benefits are for students. Jitendra et al. (2018) said it is crucial to understand the efficacy of specific instructional practices and how they can be systemically implemented for SWDs during instructional time for best results. This is important because each SWDs IEP provides a map of

accomdations at which best supports that individual better than interventions, although they do help with learning.

Purpose of the Study

The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether these effects differed by gender. Cook and Friend's principles of co-teaching provided the framework to model relationships between study variables. Participants in the study were a minimum of 128 SWDs enrolled in co-teaching and inclusive instruction without co-teaching classrooms. I used secondary data which were collected from school records over a 3-year period (2016-2017, 2017-2018, and 2018-2019). The school site was a high school in southeastern Georgia. Variables of interest for the study were demographic descriptors of students, including their disabilities. In addition, covariates were whether students were enrolled in Algebra I sections with or without co-teaching during a given year. Students' EOC scores served as the dependent variable. Covariates were academic year, class average EOC, and gender.

Research Questions and Hypotheses

RQ1: Is there a significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching?

H_01: There is no significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching.

H_A1: There is a significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching.

RQ2: Is there a significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching?

$H_0$2: There is no significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching.

H_A2: There is a significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching.

The variables were operationalized as follows: students' gender was a binary variable based on biological gender. Their enrollment in co-teaching classes was also a binary variable depending on whether the student participated in a co-teaching classroom for a given year for Algebra I. Students' EOC scores were used to operationalize course outcomes as a comprehensive measure of their comprehension of course materials.

Theoretical Foundation

The theoretical foundation for this study was Cook and Friend's principles of co-teaching. Cook and Friend (1995) defined co-teaching as "two or more professionals delivering substantive instruction to a diverse or blended group of students in a single physical space" (p. 2). A co-teaching team consists of a general educator with expertise in

curriculum and pacing and a special educator with expertise regarding processes of learning, differentiation, and teaching towards mastery (Friend et al., 2010).

Team partners combine knowledge and expertise and share responsibilities during all parts of the lesson to obtain tangible outcomes involving student engagement and learning (Cruz & Geist, 2019; Ferguson & Wilson, 2011). Thus, co-teaching is not just the presence of two persons in the classroom; rather, this approach is about changing the process of teaching (Cruz & Geist, 2019). I used the principles of co-teaching presented by Cook and Friend to frame the results of this study regarding how co-teaching practices can influence tangible outcomes of students' mathematics achievement. According to Cook and Friend (1995), co-teaching has four key components: (a) it involves two or more educators with specific sets of skills, (b) educators must deliver substantive instruction, (c) student groups must be diverse and must include SWDs, and (d) instructional delivery must be collocated. Inherent in the conception of co-teaching is that this approach benefits students. It was appropriate to use this theory to address the problem and purpose of the current study because more quantitative research is needed to validate co-teaching's instructional effectiveness as model for SWDs in the general education setting. Different principles and components of co-teaching are further explained in Chapter 2.

Nature of the Study

The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether these effects differed by gender. I focused on students

in ninth grade algebra as a specific population of interest and collected archival data involving mathematic achievement over a span of 3 years. The independent variable was whether the students received co-teaching or not. The dependent variable was EOC exam scores. Covariates were academic year, class average EOC, and gender. To answer the research questions, I used analysis of covariance (ANCOVA) in order to determine the extent, if any, to which a dependent variable differs across different levels of an independent variable while controlling for known covariates.

Qualitative research involves understanding actions and phenomena through personal experiences and following an inductive process to derive hypotheses or theory from data. This method was not suitable for this study because it is less tangible than quantitative. Quantitative research starts with specific hypotheses and involves statistical measures to analyze data (Creswell, 2013; Howitt & Cramer, 2011). Experimental design involves allocating participants into different groups and manipulate variables. Experimental design addresses causal relationships between two variables and is not suitable for this study based on the multiple covariates. Quantitative design is research design that seeks to find relationships between multiple variables that have already happened. Quantitative posttest only or *ex post facto* research design was appropriate for this study because no pretest was admintered, the use of secondary data collected from high school records and to control for unknown covariates.

Definitions

Co-teaching: The partnering of a special education and general education teacher with the goal of jointly delivering instruction to a diverse group of students, including

SWDs or learners with SENs within a general education setting in a manner that meets the learning needs of all students within the group (Friend et al., 2010).

Inclusive education: Inclusive education a type of reform which involves welcoming and supporting diversity amongst all learners from diverse cultures, children with limited resources, and children with disabilities. It is also the process of strengthening an education system's capacity to reach out to all learners (Imaniah & Fitria, 2018).

Special education: Specially designed instruction which has the goal of meeting the needs of children with disabilities. It involves adapting appropriately to the needs of the child in regard to methodology, content, and delivery of instruction (Dickens & Shamberger, 2017).*Special education needs (SENs):* SENs are learning difficulties which call for the provision of special education. Students with SENs have significantly greater difficulty learning than the majority of their peers and have a disability that prevents them from making use of educational facilities that are generally provided for children (Alkahtani, 2016).

Students with disabilities (SWDs): SWDs are students who often require specialized services and scaffolding to master the content they are being taught (Hayes & Bulat, 2017).

Teacher self-efficacy: Teachers' convictions or beliefs that they can influence how well students learn the content they are teaching, even among those who may be considered unmotivated or difficult (You et al., 2019).

Assumptions

Assumptions are truths that are beyond the scope of control of the researcher (Leedy & Ormrod, 2013). I made specific methodological, theoretical, and topic-specific assumptions while conducting this study. The use of quantitative and posttest only research design required the assumption that the variables of the study were related and that no treatment or intervention was administered. I also assumed that assessments accurately represented the mathematical achievements of students in this study.

In addition, I assumed that teachers applied co-teaching approaches in accordance with legislative mandates and peer-reviewed educational literature pertaining to co-teaching. These assumptions were necessary because I could not control the manner through which the co-teaching model was applied to the context of the study. I also assumed that secondary data were accurate and unaltered. The county in which this school is located has student population guidelines for each EOC class. Only seven to 10 SWDs or a maximum of 33% of the class could be classified as SWDs.

Scope and Delimitations

Delimitations are factors that set the boundaries for research in terms of what it is exploring and addressing (Marshall & Rossman, 2014). This study was focused on SWDs in grade 9 algebra 1 at a single high school in a rural region of southeastern Georgia. As this study focused primarily on the mathematics achievement of ninth grade Algebra I SWDs, results of this study were not directly transferable to SWDs in other grade levels and subjects, and could not be directly applied to classroom achievement of SWODs.

This study did not highlight students' academic achievement as a whole, but rather focused on learning results based on results of their EOC mathematics exam scores.

Limitations

Limitations in research pertain to potential weaknesses of the study or factors that may influence outcomes of the study as a result of elements that are beyond the control of the researcher (Taylor et al., 2015). One limitation of the study was that results only represented the individual school included in the study and not a wider population of students. Generalizability of data was limited by the focus on SWDs from a particular grade level and Algebra I achievements within a single site. I aimed to ensure that results of the study were contextualized properly in order for future researchers to be aware of this potential weakness. Another potential limitation that is common in studies that seek to empirically compare results of different groups is individual teacher effects. Results of the study may be skewed if students have especially good or bad teachers. The study was also limited by adequacy of administered tests in terms of accurately measuring instructional outcomes of Algebra among students.

Significance

This study has both academic and practical significance. This study helped to bridge the gaps in the literature by focusing directly on how Algebra I achievement is influenced by co-teaching practices based on quantitative metrics of mathematics learning. Examining the co-teaching approach therefore offered insight into an instructional practice's efficacy. Through this study, I also sought to bridge a gap in literature by providing empirical information regarding how co-teaching practices

influence the mathematics achievement of students based on SWDs gender differences. By addressing these research gaps, the study has academic significance.

In terms of instructional practice, I sought to help close the mathematics achievement gap for SWDs. Examining the efficacy of co-teaching approaches therefore leads to insights into efficacy of instructional practices. While co-teaching has emerged as a suitable approach to address different problems encountered in inclusive classrooms, its implementation is often not systemic, thus leading to variations in terms of its effectiveness. Through this study, I addressed this gap in practice as it relates to actual student outcomes that showed further development of co-teaching is still needed to be validated as a service delivery model for SWDs in the general education setting.

Results of this study will contribute to social change by providing quantitative measured student outcomes in co-taught classrooms, which will inform decision-makers regarding co-teaching environments in terms of meeting the needs of SWDs in Algebra I. Educational professionals may want to use this research as a guide when designing special education programs that focuse on how to meet the needs of SWDs through Algebra I co-taught classrooms. Finally, results from this study could also be used to further current knowledge regarding the efficacy of co-teaching in Algebra I related to academic performance among SWDs.

Summary

As educational institutions continue to be expected to adapt to various barriers that learners encounter during the process of learning, legislative mandates to support inclusive education continue to be introduced in the United States. As a response to these

legislative mandates, more schools are including SWDs in the same classroom as SWODs (Cheshire, 2019; Hurd & Weilbacher, 2018). The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether effectiveness differed by gender. I sought to bridge the gap in the literature by providing empirical information regarding effects of co-teaching models on academic achievement of SWDs. The principles of co-teaching by Cook and Friend were the theoretical foundation for the study. In Chapter 2, I provide a thorough review of existing literature on inclusive education, mathematics achievement, and co-teaching.

Chapter 2: Literature Review

There is a lack of empirical evidence regarding the effectiveness of co-teaching in terms of improving the mathematics achievements of SWDs. The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether these effects differed by gender. Cook and Friend's principles of co-teaching provided the framework to model relationships between study variables. Participants of the study were a minimum of 128 SWDs in co-teaching and inclusive classrooms without co-teaching. The study involved using secondary data which were collected from school records over a 3-year period. The school site was a high school in southeastern Georgia. In this chapter, I provide an in-depth analysis of the literature regarding the theoretical foundation of the study. Key concepts of the study are also explained in detail. First, I provide a background of the concept of special education and its development in the US. Following this, the concept of inclusive education and its implementation is detailed. Co-teaching models and approaches are also detailed in this chapter, followed by an analysis of literature involving the influence of co-teaching on the academic achievements of students. Mathematics achievement within co-taught as well as inclusive classrooms without co-teaching is also explored in this chapter.

Literature Search Strategy

The following databases were used: ERIC, Google Scholar, Taylor & Francis Online, Education Source, JSTOR, Scholarworks, Springer Link, EBSCOHost, PubMed,

ProQuest, Academic Journals, Sage Journals, ScienceDirect, and ResearchGate. The key search terms used were: *algebra, academic achievement, best practices, co-teaching, collaboration, challenges of co-teaching, efficacy of inclusion, experimental research, disabilities, gender, high school teacher, inclusive education, inclusive classrooms, inclusive education, inclusive pedagogy, interventions, implementation strategies, learning, mathematics achievement, mathematics performance, perceptions, pedagogy, research design, research methods, secondary co-teachers, teaching strategies, self-efficacy, social cognitive theory, special education needs, special education, statistical tests, student academic outcomes , student-centered classrooms, students with disabilities, team teaching, and quantitative*. Most of the research sourced in this study was published between 2017 and 2019, except for older articles that were used for the theoretical foundation of the study and other seminal works which were necessary in order to provide a historical overview of the research topic.

Theoretical Foundation

The theoretical foundation for this study is Cook and Friend's principles of co-teaching. Co-teaching is applied when general and special education teachers share their responsibilities within a co-taught heterogeneous classroom (Cook & Friend, 1995). Special education has long been characterized by collaboration, with groups of educators making decisions about the most appropriate educational avenues for SWDs and maintaining close working relationships with students' parents (Friend et al., 2010). In the special education classroom, paraprofessionals have assisted special educators in terms of supporting the needs of SWDs alongside other professionals like physical

therapists, school psychologists, counselors, and speech-language therapists (Friend et al., 2010).

EHA in 1975 laid the groundwork for co-teaching to become a model to improve the individual needs of SWDs. Co-teaching is when general and special education teachers collaborate to educate SWDs and SWODs in the same classroom (Cook & Friend, 1995). In 1990, the landmark law IDEA, grew the concept of inclusive education, and special education and related services could be offered to SWDs within general education settings through the creation of partnerships that crossed traditional boundaries between different professional perspectives (Friend et al., 2010). This led to the introduction of co-teaching models.

Literature often involves professionals' perceptions of effectiveness and not outcomes of SWDs within co-taught classrooms. Therefore studies before have not quatified the effectiveness of co-teaching. Without direct data available, teachers are left to generalize what teaching models are effective for both general and special education students sharing the same classroom. Instruction must be done in a general education setting in a manner that deliberately and flexibly meets all students' learning needs (Friend et al., 2010).

Cook and Friend (1995) said there are four key components to co-teaching in the context of special education. First, co-teaching is a collaborative approach to instruction that involves two teachers. One is a general education teacher or a content specific teacher and the second teacher is a special education teacher. Co-teaching requires strong

and parity-based relationships between partners in terms of developing and delivering instruction.

Second, co-teaching requires educators to deliver substantive instruction (Cook & Friend, 1995). Substantive instruction requires educators to be actively involved in the instruction of their students. Teachers are expected to develop parity both in and outside of the classroom, understand their distinct roles in the classroom, and communicate these roles properly to parents and students (Friend, 2016).

Third, co-teaching educators must educate a diverse group of students, including SWDs (Cook & Friend, 1995). Special educators or related service specialists must be involved in co-teaching to ensure Individual Educational Plans (IEP) of SWDs are being legally met (Cook & Friend, 1995). Finally, co-teaching instruction must be delivered primarily within a single classroom or physical space (Cook & Friend, 1995). This does not preclude the occasional separation of groups of students for instruction that may require considerable activities that involve high levels of distraction and noise; however, it does eliminate situations in which general education and special education teachers coordinate their instruction but deliver them to separate groups of students in separate physical spaces. The co-location of SWDs and SWODs is a crucial component of co-teaching (Cook & Friend, 1995). SWDs are expected to receive accommodations that will help them be successful within general education settings (Watson, 2019).

Ultimately, co-teaching blurs traditional boundaries that separate SEN students from their peers. It allows educators to work together to create a more inclusive classroom for all diverse learners. While co-teaching is not a panacea for effective SWD

education, it presents great potential in terms of helping educational institutions embrace collaboration as a standard of practice and create innovative approaches within a single educational system that is responsive to the needs of increasingly diverse learners.

The introduction of legislation like the No Child Left Behind (NCLB) Act of 2001 contributed greatly to the interest in co-teaching, as it required that all students, including SWDs, must have access to the general curriculum, be included in the accountability of teaching professionals for achievement outcomes, and be taught by highly qualified educators (Friend et al., 2010). The reauthorization of IDEA of 2004 was also a key factor in the growing interest in co-teaching. ESSA also redefined the roles of general and special educations by mandating a shared responsibility to serve all students (Alsarawi, 2019). Co-teaching seemed to be a vehicle for achieving the legislative expectations of the act, which requires educational institutions to educate SWDs in non-isolated contexts while still providing the specially designed instruction and scaffolding to which the students are entitled (Friend et al., 2010). Participation within the co-teaching environment is expected to benefit SWDs by improving their social development and their access to qualified teachers (Watson, 2019).

Literature Review Related to Key Concepts and Variable

Special Education in the United States

Education is considered critical for closing the opportunity gap for disenfranchised youth, particularly children with limited resources, diverse cultures, racial backgrounds, and children with disabilities (National Council on Disability [NCD], 2018; Sharma & Dunay, 2018a; Sharma et al., 2018b). Special education has

continuously evolved in the field of psychology, and education and has continued to evolve over the past 4 decades (Alkahtani, 2016; Merck & Johnson, 2017). Early studies that were conducted in the United States, however, reported that SWDs often underperformed relative to their SWODs peers on various assessments and that this gap in achievement often widens over time as students progress from elementary education to the secondary levels (Kang & Martin, 2018).

Special education learners encompass a broad array of students with different physical, cognitive, emotional, and behavioral learning needs and demonstrate different abilities and levels of academic achievement (Kang & Martin, 2018; Plessis & Ewing, 2017). While children with special learning needs have always existed, special educational programs are a relatively recent development and are enveloped in considerable controversy regarding their history and legal and moral implications (Alkahtani, 2016). There were several factors found to contribute to the achievement gap between learners with special education needs and their general education peers, as learners with special education needs had limited access to standards-based curriculum and had fewer opportunities to engage in significant and meaningful hands-on activities that were designed to promote conceptual understanding (Kang & Martin, 2018).

Traditionally, children with special needs were provided with services that focused on protecting and sheltering them from the outside community (Alkahtani, 2016). Students with mental and physical disabilities have been the target of discrimination across the globe (Olore, 2017). The democratic ideals championed by the American and French revolutions called for SWDs to be educated in special schools of

their own (Alkahtani, 2016). As late as the 1960s, it was still standard for SWDs to be excluded from the public education system; however, by the 1970s, parents began asserting their children's right to an education (NCD, 2018).

The modern notion of special education began with the emergence of institutions that specialize in special education legislation, which created programs for different categories of special education that ensure that children receive a minimum level of necessary education (Alkahtani, 2016). The special education system emerged because of the perceived non-adaptability of regular classrooms (Dickens & Shamberger, 2017). The spread of special education, which was gradual at first, resulted in the growth of the number of special classes and schools that were designed specifically to meet the needs of disabled and disadvantaged students (Powell, 2016). Despite this progress, however, there were still traditionally separate cultures between general and special education (Olore, 2017).

The inability of SWDs to achieve at "normal levels" used to be attributed to their limited computational abilities, their cognitive deficits which affect their memory, and their need for additional time to adequately process information (Kang & Martin, 2018). These attributions often framed the low achievement of SWDs as a deficiency that was wholly located within the student rather than as a phenomenon influenced by various structural factors that may prevent SWDs from achieving academic success (Kang & Martin, 2018). Over the last few decades, however, the United States has taken the initiative of passing various legislation that support the education of SWDs, with current

research outlining some of the legislation for people with special education needs (Alkahtani, 2016).

Prior to The Rehabilitation Act of 1973 (HR8070), students with disabilities were never served through the public education system. While the HR8070 increased equal access to facilities, services, and treatments for SWDs, however, it did not necessarily grant access to the public education system (Merck & Johnson, 2017). The Family Education Rights and Privacy Act of 1974 also aimed to protect the rights of people with disabilities and support the funding of their education (Alkahtani, 2016). IDEA, which was first passed in 1975 as the Education for All Handicapped Children Act (EHA), first granted SWDs access to self-contained academic classrooms within the public-school system (Dickens & Shamberger, 2017; Merck & Johnson, 2017; NCD, 2018). IDEA aimed to ensure that appropriate education was given to all SWDs throughout the various states in the country (Alkahtani, 2016) and that disabled children with SEN were able to face their educational needs by following and assessing the case in proportion to the severity and circumstances of the disability and providing the necessary special education and related services (Alkahtani, 2016). The act opened schoolhouse doors and mandated appropriate and free public education for SWDs to prepare them for further education, employment, and independent living (NCD, 2018).

LRE is a tenet of IDEA, which required schools to educate all students in regular classrooms as much as possible based on the presumption that SWDs would learn best alongside other students but that particular circumstances would require alternative placements (Merck & Johnson, 2017; Olore, 2017; Schwartz et al., 2019). IDEA also

allowed SWDs general access to certain disciplines because SWDs must be mainstreamed in the public education system whenever possible (Merck & Johnson, 2017). Following IDEA was the American with Disabilities Act of 1990 (ADA), which aimed to halt discrimination towards all Americans with some form of disability in the workforce, thus providing graduating SWDs various opportunities for future employment. Such legislation led to the evolution of special education and changes to better educate SWDs (Merck & Johnson, 2017).

While not all students with special needs are promised complete success, in order to adhere to special education legislation, SWDs must be guaranteed an education that is broad-based, individualized, and highly supported (Dickens & Shamberger, 2017). By federal definition, special education must be specially designed instruction developed to meet the unique needs of a child with a disability, thus implying that such education for students with qualifying disabilities must be beyond normal instruction delivery (Dickens & Shamberger, 2017). Specially designed instruction is defined as an adapted form of instruction as appropriate to the perceived needs of the eligible child regarding methodology, content, and delivery of the instruction. It is necessary to provide this specially designed instruction to ensure that the child has access to the general curriculum and that the child can meet the education standards mandated by the public agencies that govern their education (Dickens & Shamberger, 2017).

The concept of what makes special education *special* is widely debated, and some studies contend that there is insufficient evidence to support specialist pedagogy for certain categories of special education needs. It has also been emphasized, however, that

specialist knowledge regarding certain subsets of SEN is valuable to inform the pedagogical decisions of educational institutions (Brennan et al., 2019). Critics argue that the lack of a clear definition of what constitutes special education often leads to the segregation of SEN students from students in inclusive education, which ultimately does not benefit the children it aims to protect (Alkahtani, 2016). Others argue that teaching at different points in the continua may seem different but might not be qualitatively different enough to warrant specialist pedagogies. It has been supported by other researchers that children with special education needs can learn from the same pedagogical approaches, given that the adaptation and differentiation they need are supported (Brennan et al., 2019).

With IDEA being amended in 2004, alongside the reauthorization of the NCLB Act and the ESSA of 2015, schools were required to service SWDs in their LRE's and establish accountability standards for the academic success of SWDs in core subjects (Alsarawi, 2019). Core subjects include language arts, English, reading, mathematics, science, and civics, among others. As a result, there has been growing research in the area of inclusive education, which places SWDs in the general education classroom (Dickens & Shamberger, 2017; Merck & Johnson, 2017; Powell, 2016). The current policy context is driving educational institutions to develop a pedagogy that is inclusive and adaptive (Ranjeeta, 2018).

Inclusive Education

According to Mugambi (2017), "inclusive education is the process of strengthening the capacity of the education system to reach out to all learners as a

strategy to achieve education for all" (p. 93). The inclusion movement is predicated on disabled individuals' rights to full access to communities of choice, thus putting an end to separation and segregation (Grynova & Kalinichenko, 2018; Van der Klift & Kunc, 2019; Van Essen, 2019). Inclusive education assumes that every learner matters and should have the right to receive opportunities for effective education (Cheshire, 2019; Grynova & Kalinichenko, 2018; Imaniah & Fitria, 2018; Mugambi, 2017).

The conflation of special education with special education tends to marginalize inclusive education to the periphery of agendas to improve and transform education, rather than emphasizing it as key to the process (Cheshire, 2019; Imaniah & Fitria, 2018). Individualized interventions that are based on a response to a special difficulty or impairment can add to the problem of difference by segregating the learner as different (Brennan et al., 2019; Imaniah & Fitria, 2018). On the other hand, inclusion in the classroom involves using specialist knowledge to inform the teachers' approaches to group work, teaching practices, and ability to attend to the individual differences of the students in ways that avoid stigmatization (Brennan et al., 2019). Over the past 2 decades, inclusive education as a concept has grown to encompass all vulnerable and marginalized groups resulting in inclusive education underpinning the international evaluations of the disparities in the educational systems, not only based on accessibility, but also based on the quality of education (Cheshire, 2019).

Enhancing the learning and social experiences of SWDs within inclusive schools has been a long-standing topic of legislative, advocacy, and research efforts (Carter, 2019). Inclusive education also coincides with the United Nations' call to alleviate

extreme poverty across the globe through the achievement of Sustainable Development Goals (SDG; Cheshire, 2019). The Goal 4 of SDG, in particular, exhorts countries to extend the access to education, from primary to secondary education, to all children (Opoku et al., 2019). SWDs who can achieve better in school are more likely to continue their post-secondary education, have opportunities for employment, and develop positive social connections (Specht & Bennett, 2019).

At the systemic and policy level, sector planning, financing, data-gathering, and teacher training and support are some of the important aspects of systemic planning to ensure that inclusion is present at different levels of education (Cheshire, 2019). The development of an inclusive curriculum is also crucial, as it must be a continuous process that is closely related with social inclusion, ensure both the equity and quality of education in the classroom, address students' diversities, foster comprehensive education, and provide a wide array of learning opportunities and learning activities (Mugambi, 2017). A rigid and inflexible curriculum can also limit the system's adaptability in supporting the individual differences of the learners, which can further lead to a learning breakdown (Zwane & Malale, 2018). At the classroom level, the successful implementation of inclusive education is dependent on the teacher's ability to effectively plan lessons, apply universal design for learning principles, and ensure that classroom management is effectively differentiated (Cheshire, 2019). Teaching pupils with SEN using inclusive techniques presents a challenge for teachers and learners in an inclusive setting (Zwane & Malale, 2018).

Results from studies have illustrated that teachers who are prepared to recognize the diversity of their students, honor each student's unique background, use data to consistently inform and differentiate their instruction, and redistribute services and resources adequately enough can help foster a sense of equity, hope, motivation, and, ultimately, engagement, among the students in the classroom (Lalas et al., 2019). Teachers are recognized as professionals who can make a large difference in the lives of their students by actively working in adopting a preventive perspective and changing the context of the classroom to sustain inclusive education (Sgaramella & Bortoluzzi, 2019). Inclusive pedagogy emanated from a study of the craft knowledge of teachers who were able to effectively support the learning of all children within their classrooms, including diverse learners, while avoiding stigmatization of difference (Brennan et al., 2019).

Legislation advocating inclusive education is common across the developed world, but its implementation continues to be met with various barriers (Brennan et al., 2019; Mugambi, 2017). Some of the common barriers to extending universal access to education to SWDs include a lack of teaching and learning materials, a rigid curriculum and general academic focus, and inaccessible physical environments (Opoku et al., 2019). In addition, despite a global shift towards inclusion, deficit-oriented constructions of disability and the normative assumptions around SWDs continue to permeate inclusive school settings (Phelan et al., 2019; Reeves et al., 2019). The inclusive pedagogical approach in action (IPAA) framework was developed as a support mechanism and tool to help teachers develop proper responses to individual differences in ways that do not marginalize the learner; however, empirical research shows that while the IPAA is a

valuable framework for supporting inclusive pedagogy, it must be amended to reflect the complex nature of educating learners with significant behavioral needs (Brennan et al., 2019).

Teachers are expected to accommodate the increasingly heterogeneous nature of their classrooms; however, they often feel ill-prepared to handle the responsibility and may be apprehensive towards the inclusion of SWDs in the general education classroom (Cate et al., 2018; Mugambi, 2017). A lack of technical knowledge and awareness within educational institutions designing the curricula for SWDs can lead to the implementation of inflexible practices that do not effectively cater to the needs, interests, and potentials of SWDs (Cheshire, 2019). Limited studies have investigated how general education teachers are affected by the presence of SWDs within their classrooms (Gilmour, 2018). Teachers have the responsibility of establishing a classroom routine that is sensitive to the students' individual needs, providing resources that reflect diversity, ensuring that all learners feel a sense of belonging, and using assessment methods that are equitable and are considerate of the learners' diversity (Mugambi, 2017).

Cate et al. (2018) studied the factors associated with the successful implementation of inclusive education, with particular focus on the teacher characteristics that may facilitate or hinder the proper inclusion of SWDs in the regular classroom. They focused on the teacher competencies and attitudes needed to accommodate SWDs in the regular classroom and investigated to what extent teachers' attitudes towards SWDs and the concept of inclusive education influences their teaching behaviors and actions towards SWDs. Cate et al. stated that teachers, aside from their knowledge of

pedagogical content, beliefs related to learning, self-regulation, and motivation, are necessary components of teacher competency in the blended classroom. These beliefs are similar to what Bandura (2001) described as efficacy. The teachers' belief in their ability to positively affect the learning of their students has been associated with improved overall student achievement (Cate et al., 2018; Saloviita, 2018).

Regarding teachers' attitudes, Cate et al. (2018) emphasized that teachers' attitudes towards their students and the concept of inclusive education can be both implicit and explicit. Teachers' attitudes towards the inclusion of SWDs in the regular classroom are a strong predictor of the success of inclusion efforts (Cate et al., 2018; Saloviita, 2018). Attitudinal barriers often translate to negative behaviors and can impact the children's self-confidence and sense of identity and foster feelings of neglect (Cheshire, 2019). Studies have found evidence of positive attitudes towards integration among teachers but concluded that most teachers rejected the idea of total inclusion in the regular classroom (Cate et al., 2018).

In some cases, general education teachers were accepting of SWDs in their classrooms but only under certain conditions, such as the presence of additional supports and as long as the SWDs did not exhibit disruptive behavior (Gilmour, 2018). Teachers' attitudes towards inclusive education are sometimes influenced by the nature and type of the students' special education needs, whereby the attitudes of teachers toward students with milder special education needs are often more positive than toward students with more complex SEN (Cate et al., 2018). Some implicit attitudes could also be identified among teachers attempting to participate in inclusive education such as negative

evaluation, lower ratings of student achievement, and lower writing achievement ratings of SWDs in comparison to their SWOD counterparts (Cate et al., 2018).

It is important to provide greater assistance to teachers who are transitioning from traditional classrooms to blended or inclusive classrooms because teachers are required to acquire knowledge of inclusion, its broader issues, and its diverse principles (Krischler et al., 2019; Zwane & Malale, 2018). Schools must focus on the environment they are providing for the children and the practices of the teachers rather than focusing on what an individual learner is capable or not capable of learning (Maciver et al., 2018, 2019). Teachers who have not undertaken the necessary training regarding the importance of inclusion may exhibit negative attitudes towards inclusion as a concept, which further manifests in negative attitudes towards SWDs (Zwane & Malale, 2018). Some other factors can negatively affect the experience of teachers in the inclusive classroom, such as lack of confidence when dealing with learners with special education needs, insufficient training to handle SWDs, lack of appropriate educational materials, and shortage of time to properly prepare (Pappas et al., 2018; Zwane & Malale, 2018).

In addition to the experience of teachers, SWDs also experience barriers in the inclusive education context. Students with SEN learning in regular classrooms also face challenges, such as negative perceptions from their peers and inclusive teachers, feelings of exclusion, encountering academic pressure due to having to follow a rigid curriculum, and lacking support from parents, all of which can directly or indirectly influence the students' self-concept (Zakaria, 2017). Reeves et al. (2019) performed a case study on the experiences of nine parents and nine school-aged children in inclusive education contexts

and found that, despite the positive intentions of promoting inclusion, current school-based structures and policies often unintentionally perpetuate negative discourse around disability. Furthermore, a qualitative study on the narratives of inclusion and exclusion among university students who were given disability accommodations showed that while students' experiences with the universities' efforts to develop classroom accommodations to meet their academic needs, they continued to experience stigma and social exclusion in damaging ways both in and outside the classroom (Maconi et al., 2019).

The commitment to inclusion has also greatly highlighted the importance of collaboration in the educational system (Ingen et al., 2018). Without proper implementation, resources support, or suitable guidance within the general education classroom, SWDs can experience academic failure (Nunes, 2018). It is therefore mandated by law that general education teachers and special education teachers must work together in a positive interdependence for instruction delivery (Ingen et al., 2018). According to Bingham (2019), inclusion can be defined as merely supporting SWDs within the general education classroom, and there are various ways to implement this support. Co-teaching is an approach that is expected to raise the prestige of special education by capitalizing on the shared skills and specializations between different groups to enhance the teaching quality provided to the learners (Hamdan et al., 2016).

Teachers' Perceptions of Co-Teaching in Practice

In the co-teaching model, SWDs and SWOD are situated in the same classroom and are given collaborative instruction by special education teachers and general education teachers for one or more content areas. In such models, the teachers share

instructional responsibilities like delivering instruction, managing the classroom, and designing the assessment of students (Chitiyo, 2017; Mozingo, 2017). The goals of co-teaching are to find a solution for crowded classes and classes in which students with special education needs study, increase the efficiency of the lessons provided, implement the constructivist approach to education as required, take better care of the inclusive students, and reengage students in the classroom. Co-teaching also aims to support students who encounter difficulties in their studies and ensure that students who learn more slowly can still learn the lessons completely (Turan & Bayar, 2017).

Co-teaching draws on the strengths of the general education teacher in curriculum and pacing as well as those of the special education teacher in differentiating instruction and adapting the curriculum to the individual needs of the students (Cook & McDuffie-Landrum, 2018). Although co-teaching can be traced back to the 1950s, it has grown in its popularity due to two major factors: (a) the growth of inclusive schooling leading to higher awareness about the needs of heterogeneous school populations and (b) the shift in the paradigm of school education from teacher-centered approaches to student-centered approaches (Krammer et al., 2018a, 2018b). Co-teaching can take different formats, such as parallel teaching, station teaching, alternative teaching, one-teach-one-assist, one-teach-one-observe, and team teaching, depending on the instructional needs of the students (Chitiyo, 2017; Cook & McDuffie-Landrum, 2018; Hurd & Weilbacher, 2017; Mozingo, 2017).

The aforementioned methods are commonly used to describe the instructional arrangements that are used within the classroom (Cook & McDuffie-Landrum, 2018).

Parallel teaching requires each instructor to simultaneously provide instruction to a smaller section of the class, thus lowering the teacher-to-student ratio (Harter & Jacobi, 2018). In this method, there is limited interaction between the two teachers, which allows the teachers to differentiate the instruction for the needs of the different learners; however, the work of one teacher is not readily informed by the work of the other (Ingen et al., 2018). Station teaching allows teachers to share equal responsibility in implementing the lessons by establishing stations through which the students rotate (Harter & Jacobi, 2018). This approach is different from parallel teaching because the students are taught by each teacher instead of just one teacher (Ingen et al., 2018).

Alternative teaching requires the teachers to provide additional instruction whenever necessary (Harter & Jacobi, 2018). In this model, one teacher instructs the whole class, while the corresponding teacher takes a small group of students to provide remediation or preteaching in order to develop necessary foundational knowledge (Ingen et al., 2018). One-teach-one-assist requires a lead teacher to deliver the lesson while the corresponding teacher observes the students and readily delivers remedial instruction for students who are visibly struggling (Harter & Jacobi, 2018; Ingen et al., 2018). One-teach-one-observe requires only one of the teachers to engage in the activity of instruction while the other participates as an active observer who, ideally, is gathering information about the classroom to improve future instruction (Ingen et al., 2018). Finally, in team teaching, the instructors equally share the planning, instruction, and assessment of all the students (Harter & Jacobi, 2018). In this model, the teachers work interdependently and simultaneously. This requires the teachers to practice active

communication in order to develop a common vision for their students (Ingen et al., 2018).

The models of cooperative teaching differ in the degree of cooperation, the level to which the cooperation is performed, and the extent of the cooperation itself (Krammer et al., 2018b; Mozingo, 2017). The impact of co-teaching can be maximized by considering the various models and determining which of the models are appropriate given the goals of a given lesson alongside the students' needs (Cook & McDuffie-Landrum, 2018). For instance, in a language arts classroom, teachers may decide to use station teaching to support students in planning and writing their research papers because it allows for small group instruction (Cook & McDuffie-Landrum, 2018). Instructors must also consider their convenience regarding planning together, their availability, time commitments, size of the classroom, and familiarity with the course content when selecting a model for the co-taught classroom (Harter & Jacobi, 2018).

Co-teaching's intuitive appeal for meeting the academic needs of SWDs has been greatly explored in the literature, with co-teaching showing improved outcomes for students in content areas such as reading, language arts, and mathematics as well as improved outcomes in homework completion and overall reading achievement (Chitiyo, 2017; Naegele et al., 2016). Studies have shown that co-teaching benefits students in regard to overall achievement, task engagement, and student participation (Naegele et al., 2016). It has also been suggested, however, that few co-teaching teams are implementing co-teaching in the way it was intended (Cook & McDuffie-Landrum, 2018). The research surrounding the responsibilities of special education teachers and general education

teachers regarding co-planning, co-instructing, and co-assessing students to provide effective co-teaching is limited (Brendle et al., 2017). Keiler (2018) stated that novel pedagogies in a student-centered classroom can only be effectively implemented if the teachers adequately understand their roles and responsibilities in the student-centered classroom.

Through a qualitative case study of two co-taught classrooms, Brendle et al. (2017) examined varying methods of implementation and attempted to gain insight into how general education and special education teachers perceive co-teaching. The researchers gathered data through interviews, classroom observations, and rating scales. An analysis of the collected descriptive data showed that while teachers often had prior experience in co-teaching classrooms, their knowledge on implementing co-teaching practices were minimal and required further and continuous training to effectively provide positive student learning experiences in the co-taught classroom. Kodkanon et al. (2018) studied the experiences of high school teachers with interdisciplinary team teaching by collecting participants' insights through focus groups, interviews, and direct observations. They found that the teachers' experiences highlighted the value of shared leadership and decision making and the need for supportive relationships between the teachers, which take their professional and personal issues into consideration. The authors highlighted the need for open forms of communication.

Teachers in co-taught classrooms can also view their roles from more traditional perspectives, with special education teachers taking on the more specialist role in adapting and modifying assignments and the general education teachers placing greater

focus in the content curriculum (Brendle et al., 2017). Studies show that while teachers were generally comfortable in their respective roles, they acknowledged the need for more in-depth information about co-teaching models that can further improve their instruction. Furthermore, they noted that a lack of knowledge in co-teaching models and strategies inhibited their capacity to streamline their co-planning, co-instructing, and co-assessing processes (Brendle et al., 2017). This is supported by Chitiyo's (2017) study, in which the researcher surveyed 77 teachers working within inclusive settings regarding their perceptions of the barriers that prevent their effective implementation of co-teaching. The author found that teachers often lacked the necessary skills to implement co-teaching, and co-teaching requires a lot of resources for its successful execution, which are not readily available to the teachers.

Research also focused on how team composition can affect the implementation of co-teaching. Krammer et al. (2018b) studied the ways of composing teaching teams and how these impact how teachers perceive collaboration. They studied the potential differences between teams composed by the school administration and self-selected teacher teams and how these differences influenced their perception of the attributes and characteristics that contributed to the effective implementation of cooperative teaching. The authors assumed that teachers in self-selected teams would show more positive ratings of job satisfaction, collective self-efficacy, shared responsibility, and enjoyment than teachers who were assigned into institutionally composed teams. The authors administered an online survey to 321 language arts teachers, and findings showed that teachers who selected their teams provided significantly more positive ratings in the

aforementioned area. The authors emphasized, however, that these do not necessarily lead to higher quality collaborative teaching.

Oh et al. (2017) studied the experience of preservice and general education teachers who were paired up with intern special education teachers in a short-term international co-teaching experience, with the goal of offering English language instruction to students in South Korea. The authors collected pre, during, and post data to investigate how the students experienced their co-teaching. The results showed that the key ingredients to successful partnership were open communication, willingness to accept both negative and positive feedback, willingness to learn from someone who may be perceived as having less teaching experience, frequent check-ins with one another, compatibility of personal characteristics, and mutual respect and trust. Oh et al. also highlighted that despite challenges, such as incompatible teaching goals, lack of co-planning, conflicting approaches to lesson planning, unequal roles, lack of trust and respect, and mismatched personalities, the co-teaching experiences still resulted in positive perceptions of co-teaching and increased the participants' skills regarding collaborative teaching.

Correa (2019) analyzed a midwestern school district that has committed itself to co-teaching for more than 10 years. Correa administered a survey to 120 co-teachers across three middle schools regarding their experiences with co-teaching, sharing responsibilities, co-teaching relationships, professional development, planning time, and administrative support. Seventeen teachers from across the three schools were also interviewed in small groups to further discuss the results of the surveys. The author found

that allocation and use of planning time were important to the perceived success of co-teaching. Co-teacher relationships were also important alongside the teachers' parity in their roles and responsibilities within the partnership. The author stated that in order to further increase the effectiveness of co-teaching within the school district, school administrators must regularly perform a needs assessment of the co-teaching practices in order to be able to design the professional development programs needed to ensure the teachers' needs are met. The author also emphasized the need for a co-teaching resource guide that clearly outlines the expectations for the commitments, roles, and responsibilities of the teacher.

Research has shown that inclusive classrooms where special education teachers and general education teachers co-instruct can yield improved learning among SWDs (Brendle et al., 2017). It has become an increasingly popular practice and has steadily received growing attention in the professional literature (Cook & McDuffie-Landrum, 2018). Harter and Jacobi (2018), however, highlighted that there continues to be limited empirical evidence aiming to understand whether co-teaching is an evidence-based practice. Furthermore, the considerable research that has been conducted on co-teaching often focuses on qualitatively exploring the perceptions of the parties involved and has not focused enough on determining whether there is a causal relationship between co-teaching and the improvement of actual student outcomes (Cook & McDuffie-Landrum, 2018). Cook and McDuffie-Landrum emphasized that if co-teaching is to be viewed as an educational setting rather than a mere intervention, it is important to shift the research

efforts to understanding the actual practices and strategies that can generate desired outcomes rather than simply examining the efficacy of the model.

Benefits and Challenges in the Co-Taught and Inclusive Classrooms

As the practice of co-teaching continues to grow in inclusive classrooms, more and more SWDs are attending general education classrooms (Al Nassir, 2017). There is evidence that having a special educator co-teaching with a general educator in the general classroom helps improve the academic and behavioral outcomes of SWDs within the general classroom, especially in comparison with those in special education classrooms (Al Nassir, 2017). Co-teaching is beneficial to students in many aspects because it allows educators to monitor behaviors more closely and students to have access to highly qualified content while still receiving their individualized educational assistance (Burks-Keeley & Brown, 2014). The effectiveness of co-teaching from the student perspective, however, is still largely under-researched (Keeley et al., 2017).

Co-teaching research has paid scant direct attention to the outcomes of SWDs, and the studies that have been conducted have presented varied results (Friend et al., 2010). According to Friend et al., some studies have found that SWDs in co-taught classes did perform better in measures like attendance and report card grades. Studies on the efficacy of co-teaching using record analysis, observation, and surveys also showed that SWDs improved their academic achievement in comparison to the year prior to the implementation of co-teaching (Al Nassir, 2017).

Improved student outcomes can be attributed to the different characteristics present in the co-taught classroom. Firstly, students gain from the diverse knowledge

base of the two teachers in the classroom. Moreover, students appreciate when instructors can examine concepts and theories from diverse standpoints and argue from distinct positions while in the classroom. The variations in the teaching methods, areas of studies, and perspectives of the instructors can contribute to the amplified interest of the students in the subject matter, which can further lead to greater class attendance and increased critical thinking among the students (Harter & Jacobi, 2018). Co-teaching in the fourth-grade classroom was also found to have a more positive effect than solo teaching, as measured by the students' achievement in mathematics. Through an analysis of performance of two fourth-grade classrooms that utilized co-teaching instruction versus solo teaching instruction, it was found that students increased their time on task engagement within the co-taught classroom versus students within the solo-taught classroom. Furthermore, several examples on the positive effects of co-teaching include increased instructional options and greater engagement (Naegele et al., 2016).

Alongside direct studies on the outcomes of students in co-taught classrooms, several researchers also studied how students perceived co-teaching as a vehicle to receive their special education. In a study on 346 students in secondary school, the researchers reported that the students often favored co-teaching, received better grades in co-taught classes, and would participate in co-taught classes again given the opportunity (Friend et al., 2010). The benefits of co-teaching from the perspective of students also included their exposure to diverse backgrounds and experiences, individualized instruction, and other positive results, which enhanced their learning experience (Harter & Jacobi, 2018).

According to Harter and Jacobi (2018), four themes emerged as major benefits of co-teaching from the perspective of students: (a) increased instructor perspectives, (b) variety of teaching styles, (c) increased communication skills, and (d) unique approach in comparison to the traditional style. The increased instructor perspectives in the classroom enhanced the discussion and classroom activities. Students also reported the benefits of communication within small group activities, which subsequently increased their confidence in answering questions in class, and provided the feeling of having their voices heard in the classroom.

Both general educators and special educators have also indicated that their SWDs exhibited behavioral improvements after experiencing co-teaching in the general classroom (Al Nassir, 2017). Students in the co-taught classroom have stated that the presence of two teachers helps deter their negative behavior. Students with emotional and behavioral disorders who have been traditionally served in more restrictive environments benefit from having two teachers who are available to monitor (Burks-Keeley & Brown, 2014). In addition, learning from two instructors with varied ways of examining theories and concepts can enhance the students' social skills and further contribute to a stronger classroom community (Harter & Jacobi, 2018).

Researchers have also highlighted that co-teaching may have benefits for SWOD (Al Nassir, 2017; Brown & Babo, 2017; Price, 2018). Brown and Babo (2017) noted that the research heavily focuses on the benefits of inclusion for students with special education needs; however, the diverse needs of students in most classrooms require researchers to also understand how inclusion practices influence students of all types.

Some of the major benefits of co-teaching for most students in the general classroom include improved academic performance, especially among those who have not been formally identified as eligible for special education. The author noted that the amount of time for instruction, individual attention, and supervision was improved by the presence of an additional teacher (Al Nassir, 2017).

Co-teaching also benefited SWOD by helping improve their social skills, which can be attributed to factors like increased feedbacking, directing instruction, and practice opportunities. Furthermore, Al Nassir (2017) noted that SWOD in the co-taught classrooms are able to think more inclusively and have cited their classrooms and school communities to feel more like an inclusive community. SWOD who are educated in an inclusive classroom have been found to be more tolerant of differences (Brown & Babo, 2017). Reduced student-teacher ratios also helped increase opportunities to monitor the progress of all the students, provide enrichment, allow re-teaching, and provide individual assistance (Al Nassir, 2017). Having two instructors facilitating the classroom provides an array of benefits for teachers and students alike. Much of the studies surrounding inclusive education and co-teaching have emphasized the model's ability to promote the access to and progress within the core academic curriculum for SWDs (Al Nassir, 2017). The co-teaching delivery model also helps reduce the stigma for SWDs (Al Nassir, 2017).

Burks-Keeley and Brown (2014) studied the benefits of the different co-teaching models from the perspective of both the students and teachers. Through a survey of 37 students, the authors found that students perceive the differences in their classroom

experience depending on the model of co-teaching used. Furthermore, this directly affects the way they feel about their confidence level and their learning within the classroom. The authors highlighted the need for further research to improve co-teaching and inclusive teaching practices by encouraging the implementation of models that students perceive as most effective to their learning. Friend et al. (2010) also noted that the future of co-teaching is dependent on increasing the quality and quantity of the research on the area and placing co-teaching within the larger context of reforming and improving schools.

Although the co-taught classroom should theoretically be the best possible environment for SWDs based on the combined knowledge, talent, and experience of the educators, there are also challenges for students in the co-taught classroom that may prevent this from being the case (Donovan, 2018; Keeley et al., 2017). According to Keeley et al., there are deterrents to the success of co-teaching, which can be differentiated into two categories: (a) structural and (b) perceived. Some of the structural deterrents for co-teachers include elements within the school system that are outside the educators' scope of control. For instance, lack of time in the school day to adequately co-plan, not being able to pair the best possible co-teaching teams together, and lack of opportunities for professional development are some examples of structural issues that may undeniably impact the success of co-teaching approaches. The authors, however, note that there are potential remedies to these structural issues, such as the use of various forms of communication technology and increasing access to professional development through widely available online facilities.

Chitiyo's (2017) study supports these findings. In his study on the teachers' perceptions of the barriers that may hinder their successful use of co-teaching, teachers often cited structural issues, such as lack of necessary resources and skills for successful implementation. Through a survey of 77 teachers, the author found that only 44% of the participants were able to learn co-teaching through university training, which means that more than half of the sample of the study had no official university training in co-teaching. The author thus highlighted the teachers' lack of professional preparation for co-teaching and performing other school-based practices. The author also highlighted the importance of time to plan instruction, classroom management, and planning and administering student evaluations. The lack of such structural support may lead to teachers becoming more likely to commit to using practices that are less demanding but also not grounded in the philosophies of inclusive education.

Hamdan et al. (2016) also noted that there are many challenges encountered before achieving co-teaching success. Time management is a priority in co-teaching, which poses many challenges. Non-systematic scheduling can be an issue, which can limit co-teachers from properly planning together. Teachers are required to allocate an appropriate time to discuss their teaching plans to ensure adequate implementation. The implementation of co-teaching also requires the approval of the administrator; therefore, the administrator must ensure that the approach can be carried out. A lack of adequate administrative support can also lead to the failure of co-teaching approaches. Financial provision is also crucial, as co-teaching would require the purchase and provision of specialized learning tools. Furthermore, fidelity is important to school professionals.

Teachers must understand the benefits of the model and be committed in implementing the model within the classroom. If teachers are unable to understand and practice specific styles of co-teaching well, the co-teaching approach may end up with unintended results.

Perceived issues, on the other hand, are the issues that cannot be easily remedied. Such issues include personality conflicts, lack of confidence in differentiation strategies or content, differences in teaching philosophies and teaching styles, unbalanced responsibilities and authority, and differences in grading. When these issues are present, co-teaching approaches can quickly become ineffective (Keeley et al., 2017). Chitiyo (2017) stated that some participants indicated that their co-teachers might not support the use of co-teaching. Because co-teaching as a practice requires collaboration between two teachers, if some are not in support of establishing the proper practices, the implementation will most likely fail. Some educators may also consider co-teaching as an invasion of their professional space and are thus not willing to share their instructional responsibilities. Moreover, some teachers may completely reject the idea of inclusion and thus may not welcome the ideas of collaboration geared towards catering to students who need extra attention and slower instructional paces. In addition, lack of confidence in their personal skills to implement co-teaching practices may also hinder educators from successfully implementing the model (Chapman, 2019; Chitiyo, 2017; Zwane & Malale, 2018).

Friend et al. (2010) stated that co-teaching often insignificantly affected the outcomes of SWDs as measured by high-stakes test scores. Furthermore, studies on the differences between achievement of SWDs in resource classes, general education classes

without co-teaching, and co-taught classes showed no significant differences across the settings, which they stated may be due to a lack of training and uneven implementation. According to Galevska and Pesic (2018), educators often have difficulty assessing the knowledge of their students accurately when it comes to students with SEN, especially within inclusive classrooms. They further added that without specialized recommendations and policies, teachers often apply individual assessment and adaptations to SWDs that are informal in nature.

Harter and Jacobi (2018) found that some of the drawbacks of co-teaching include the dismissal of the traditional approach and confusion about the course structure. Some students perceived that the co-teaching model was directly in contrast to traditional learning and teaching approaches of which the students were familiar. Some students quickly dismissed co-teaching as more chaotic in comparison to the traditional classroom and perceived co-taught classrooms as overwhelming. Some students also found the structure of co-taught classes confusing due to having to follow both teachers instead of one. Some students also claimed that the use of time within co-taught classrooms was more confusing than traditional classrooms.

Educators who oppose inclusion in the general education classroom also argue that SWOD who are educated with their disabled peers may imitate the undesirable behaviors exhibited by SWDs. Moreover, some of the opponents of inclusion in the classroom argue that SWOD may become bored by the pace of instruction when the educators adjust to SWDs who struggle to keep up with the pace of instruction (Brown & Babo, 2017). It has also been found that in most cases, inclusive educational practices do

not yield statistically significant differences regarding the performance of SWOD when placed in an inclusive setting (Brown & Babo, 2017).

Harter and Jacobi (2018) highlighted that while there are various studies on the positive benefits of co-teaching for students, there is simply not enough of it. The authors added that the limited empirical evidence prevents researchers from determining co-teaching as an evidence-based practice. While there has been an abundance of research from the perspective of the teacher, the research from the perspective of the students regarding their experiences in the co-taught classroom is limited (Keeley et al., 2017). Okyere et al. (2019) highlighted that further studies are necessary to explore the experiences of students with special education needs in order to facilitate a broader view of the issues and challenges they face within the co-taught classroom and how this affects their learning outcomes.

Mathematics Achievement Within Inclusive Classrooms

There are various studies that focus on how collaborative and inclusive practices influence the mathematics and overall achievement of students (Cobb, 2018; Schwartz et al., 2019; Szumski et al., 2017); however, the literature on mathematics achievement within the co-taught classroom is limited, and the literature that does exist provides varying results (Lochner et al., 2019). Because co-teaching has become the preferred practice for educating SWDs (Barron et al., 2019), it is important to understand the practice as it relates to student achievement. Based on prior studies, it is clear that the implementation of co-teaching is often not systemic; therefore, it is important to

understand how educational systems overcome this hurdle to maintain positive student outcomes while shifting to the co-teaching paradigm (Barron et al., 2019).

While teachers' classroom practices are clearly intended to improve student learning, the level of effectiveness of different practices vary. Effective teaching leads to improved student achievement based on outcomes that matter to the students' future success, and in order to judge the effectiveness of any teaching practice, it must be evaluated against student progress (Arends et al., 2017). There is still limited evidence around the outcomes and learning achievements of students within the inclusive setting. This lack of evidence makes it difficult to enact systemic changes that can help to improve the learning outcomes of SWOD. Most international achievement tests also often exclude SWDs, which reinforces attitudes of low expectations and that SWDs do not belong within a culture of achievement (Price, 2018).

Current policies that place greater accountability on educational institutions to ensure student academic achievement based on high stakes testing have had a great impact on the education of SWDs (Gerlach, 2017; Saylor, 2017). Societal changes can also influence educational institutions and their outcomes (Iqbal & Shams, 2018). Therefore, today's teachers are expected to meet the ever-growing range of demands of a wide array of abilities within the classroom. It is therefore important to understand how certain teaching models influence outcomes. Most studies on co-teaching, however, are focused more on practices than outcomes (Rexroat-Frazier, 2017). The majority of the data on the topic is qualitative and focuses more on how the general education teacher, special education teacher, students, or parents feel in relation to the co-teaching model,

rather than developing research that is specifically grounded in how student outcomes are influenced (Gerlach, 2017).

The variety of classroom practices teachers use when interacting with students is crucial to their understanding of mathematical concepts and overall performance in the subject (Arends et al., 2017). Arends et al. studied the teacher classroom practices and the subsequent mathematics performance of students in South African schools. The authors investigated the association between the two variables through the mathematics teacher questionnaire, which is administered as part of the Trends in International Mathematics and Science Study of 2011. The questionnaire was comprised of questions regarding classroom practices concerning teacher clarity, feedback, classroom discussion, problem solving, and collaboration, among others. The authors stated that there is a positive association between the teachers' high endorsement of the selected classroom practices and learner performance. Arends et al. also highlighted how collaboration between mathematics teachers can influence learner performance. They found that teachers observing each other's lessons positively affected learners' performance. They noted that, while teachers were often not keen on collaboration with their peers, the results showed that various teacher classroom practices affect learners' performance in mathematics; therefore, it is important to identify the mechanisms that support teachers in terms of the practices that have already been established as effective.

Cole et al. (2019) performed a longitudinal study to determine the impact of inclusion of the academic outcomes of students. They investigated the academic outcomes of a cohort of SWDs in the state of Indiana who were placed in low, mixed,

and high inclusion settings based on their Indiana State Test of Educational Progress ELA and math scores. Student data were collected from their third-grade scores in 2013 through their eighth-grade scores in 2018. The authors performed a comparative analysis of the students' academic outcomes between treatment and control group outcomes for students who were assigned as low inclusion, mixed inclusion, and high inclusion. They used propensity score matching to diminish the potential effects of structural bias as they created the comparison groups in order to improve the balance of performance distributions and primary disability type. Cole et al. found that SWDs who spent all their time within general education inclusive classrooms were able to perform significantly better in both their mathematics assessments and their reading assessments, more so than their peers who were placed in low inclusion classrooms or separate special education classrooms.

Iqbal and Shams (2018) studied how collaborative teaching affected students' mathematics scores in comparison to a traditional classroom. The author focused on the Pakistan setting and studied the effectiveness of collaborative teaching through an analysis of the students' resulting mathematics scores. The authors conducted the study on 118 public school eighth-grade students using the Solomon-Four-Group experimental design. The authors stated that they developed a collaborative mathematics teaching module in algebra and geometry that were validated by subject matter experts. The module was used to analyze the effectiveness of collaborative teaching in comparison to more traditional approaches. The study consisted of 20 lessons, and each lesson was comprised of 60 minutes. Student outcomes were measured using an achievement test in

mathematics. The authors found that collaborative teaching was more effective than traditional teaching in enhancing the achievement of the students in both algebra and geometry. The authors recommended future research on female students and different grade levels to further explore collaborative teaching in relation to math achievement.

Moeller and McLeod (2017) also supported the importance of fostering collaboration between general and special education teachers in improving the mathematics learning experience for students of all types. They stated that, in response to the need to improve preparations of teachers to teach high-quality mathematics to a wide range of students, Education Development Center (EDC) staff developers and researchers developed two sets of intensive professional development programs intended for teacher leaders. The Math for All and Addressing Accessibility in Mathematics programs were designed to help teachers provide SWDs and SWOD alike with access to significant mathematics content. While the programs serve different audiences, both programs reinforce the importance of fostering collaboration between general education teachers and special education teachers. Moeller and McLeod stated that the complementary areas of expertise of the teachers are both crucial to planning the mathematics lessons of the students to support their mathematics achievement. They also highlighted the importance of helping teachers have a clear understanding of the individual strengths and needs of students in mathematics.

Saylor (2017) also performed a causal-comparative study focused on determining whether there was a significant difference in the academic performance of SWDs in co-taught versus traditional classrooms. Saylor examined the effects of co-teaching on

SWDs in California by collecting data from three school districts representing 10 comprehensive high schools. The data were collected from their performance on the Smarter Balanced assessments. A total of 641 test results from the spring 2016 Smarter Balanced assessments of eleventh-grade SWDs within co-taught and traditional classrooms in mathematics and English were compared using independent sample *t*-test. The analysis of the data showed that there was a significant difference in the English test scores for students within the co-taught classroom; however, the author found no significant difference in the mathematics scores of the students within the co-taught classrooms. Saylor emphasized the importance of further research on the academic achievement of SWDs within various settings to identify potential variations depending on the instructional setting.

In a broader quasi-experimental study on student outcomes in various content areas, Lochner et al. (2019) studied the relationship between co-teaching and student cognitive engagement across eight rural secondary schools in West Virginia. The authors studied the differences in cognitive engagement in co-taught versus solo-taught classrooms. They stated that the rationale to study engagement was due to its crucial impact to achieving high student outcomes in end-of-unit assessments, final grade point averages, and scores in standardized tests. Four district personnel were trained on both co-teaching approaches and cognitive engagement strategies and were tasked to conduct random observations of a preplanned number of co-taught and solo-taught classes. The Instructional Practices Inventory (IPI) was used during the observations of fifth- through twelfth-grade classes in mathematics, science, social studies, and reading through one

whole school year. The engagement scores were than analyzed statistically. The results showed that students in co-taught classrooms were found to be more cognitively engaged than students in the solo-taught classrooms.

Summary and Conclusions

In this review of the literature, I showed that education is crucial for closing the opportunity gaps for SWDs. More and more SWDs are being mainstreamed in the public education system whenever possible as various legislations are passed in support for the education of SWDs. Inclusive education is continuing to grow in the United States, predicated on the assumption that every learner is important and must have equal access to effective and high-quality education. The planning and implementation of inclusive education spans sector planning, financing, data-gathering, and the professional development of teachers. It is important for teachers to be prepared to handle the responsibility of educating SWDs in the general education classroom as they are expected to accommodate increasingly heterogeneous classrooms.

This commitment to inclusion heightens the importance of collaboration in the educational system. The co-teaching model has emerged as a suitable model to address problems in inclusive classrooms. The model, however, can take different forms, and its implementation is often not systemic, leading to varied results. Furthermore, co-teaching as it relates to actual student outcomes remains largely under-researched, with most studies focusing on qualitatively investigating experiences of stakeholders and participants rather than quantitatively examining the effectiveness of the model. I seek to

bridge gaps in literature by focusing directly on how Algebra I achievement is influenced by co-teaching practices based on quantitative metrics of mathematics learning.

Chapter 3: Research Method

The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether these effects differed by gender. In Chapter 2, I provided an in-depth look at research underlying the study and established the gap in knowledge supporting the study. While co-teaching has emerged as a suitable approach to create a more inclusive classroom for all diverse learners, its implementation is often not systemic, thus leading to variations in terms of its effectiveness in mathematics achievement. Furthermore, there is insufficient evidence regarding how co-teaching practices influence the mathematics achievement of students based on gender differences despite prior studies showing the moderating effect of gender differences on mathematics achievement of students. In Chapter 3, I present the research methodology in greater depth. I begin the chapter with a discussion of the research setting. Second, the research approach and design are discussed. Third, the overall research methodology is discussed. This includes the population under study, archival data that were employed, research instrumentation and operationalization of constructs, and the data analysis plan. Next, threats to the validity of the study are discussed, followed by research ethics. I conclude the chapter with a summary.

Research Design and Rationale

The overall research design for the current study was a quantitative methodology. Quantitative research begins with specific hypotheses and involves statistical measures to analyze data such as students' scores on math exams, teaching approaches to math, and

gender differences (Creswell, 2013; Howitt & Cramer, 2011). Quantitative research involves addressing variables that can be quantified, and quantitative researchers use statistical techniques to connect these data together in meaningful ways (Brannen, 2017). Both quantified measurements and need for large sample sizes to create statistical power mean that the quantitative inquiry is close-ended in nature. Thus, quantitative researchers collect data that can easily be gathered and analyzed in large quantities (Brannen, 2017). The quantitative approach was well-suited for the current study. Issues in question can easily be measured via quantified student achievement scores, and I was concerned with empirically determining whether co-teaching classrooms create significantly better than non-co-teaching results with respect to inclusive classrooms.

By contrast, qualitative research involves understanding actions and phenomena via personal experiences using an inductive process in order to analyze data (Creswell, 2013; Howitt & Cramer, 2011). Qualitative research is open-ended and does not involve creating statistical results (Merriam & Tisdell, 2015). Accordingly, it cannot test relationships between variables as quantitative research can. Qualitative studies involve collecting in-depth and long-form data from a few participants rather than short-form data from many data points or participants. Archival data can exist in copious amounts, whereas qualitative data typically are gathered from a small group of participants. Thus, a quantitative approach was the best choice for this study.

Although an experimental research design is the strongest for drawing conclusions that indicate a causal relationship between two variables, it was not an option for this study. Experimental studies must be not only be controlled but also manipulated

and randomized. This requires that the researcher possess both significant material resources and executive power to manipulate variables and randomize participants into groups (Gass, 2015). This was not feasible in this study, where experimental manipulation would require assigning students at random to co-teaching and inclusive classroom instruction without co-teaching. When experimental designs are not appropriate, quasi-experimental or nonexperimental designs are appropriate (Johnson, 2001). Such designs result in limited ability to draw causal inferences but allow for broader strategies of data collection.

Causal comparative research cannot assure causality, but it affords a means through which to compare divergent conditions after the fact. Causal comparative research is also known as *ex post facto* research. The particular subtype of causal comparative research involves drawing upon existing archival data (Johnson, 2001). Causal comparative research was appropriate for the current study because it involved comparing two groups after points of divergence. Other nonexperimental designs such as descriptive and correlational research were not appropriate because I sought to do more than simply describe data or seek correlations between variables.

Methodology

Beyond the overall research approach and design, there were several key methodological aspects of the study. These include the population under study and archival data upon which the study was based and how variables were operationalized.

Population Selection

The population under study was SWDs in both co-teaching and non-co-teaching classrooms. All participants were in ninth grade Algebra I. This population of students in a math course was ideal because math is a subject with an empirically validated achievement gap between SWDs and SWODs. Algebra I was chosen as the math course due to its low reliance on prior knowledge of math concepts, mean all students are at the same level when entered the course (Givvin et al., 2019). The setting allowed me to focus on specific differences between results of co-teaching and non-co-teaching teaching approaches while controlling for the same grade level and subject. In the US in 2015, the percentage of eighth grade SWDs who scored below the basic level on mathematics was 68%, compared to 29% of SWODs (Bottge et al., 2018).

I adopted an *ex post facto* design with posttests only. A pretest posttest design was considered, but archival records lacked pretest data for algebra scores. Therefore, several covariates were included in order to help control for class-level differences. Ideally, co-teaching and non-co-teaching classrooms would be in the same school. Accordingly, data were drawn from a 3-year period at a single preidentified high school which made use of both co-teaching and non-co-teaching approaches. The school involved in the study was located in a rural region of southeastern Georgia. This specific geographic locale was chosen for accessibility reasons, meaning that the study involved using a convenience sample. Per a G*Power analysis, there was a minimum of 128 algebra scores from SWDs who attended either co-taught or non-co-taught classrooms. By drawing upon archival data, it was possible to exceed this minimum sample size.

Archival Data

Archival data represented the source of data collection for the study. The specific archival data under study was anonymized student records. In the following section, I will describe which specific points of data remained in these anonymized records. The collection of archival data proceeded as follows. First, a specific high school using both co-teaching and non-co-teaching approaches in a rural region of southeastern Georgia was contacted to request the participation approval and site authorization. Second, IRB 02-23-21-0749250 approval to conduct the study was obtained from the Walden University IRB. SWDs in ninth-grade algebra is a small subset of the student body at any school. Given the specific population of interest, the presumptive period from which data was drawn was 3 years, from 2016-2019.

Permission was sought from the school to collect the data. Based on the response to the initial inquiry to the school, permission needed to be sought from additional authorities, such as the school district's Research and Evaluation Department. These authorities were contacted in person, through phone calls, or by e-mail. Any accommodations requested by the school or district were carefully considered.

Once a school agreed to participate, I reached out to the data team and asked permission for access. I requested that the data be anonymous. The data were fully anonymous as I would never see students' names, only anonymized data. The specific student data was extracted from the records and put into a spreadsheet containing only the data necessary for the study, namely a student's gender, whether they were from a non-co-teaching or co-teaching class, and EOC scores. To protect the participants' anonymity,

the order of the data was not alphabetical when they were entered into the dataset. These data were collected from at least 3 years of students for either samples, or more if the minimum sample size was not met through the inclusion of 3 years of data. During the data collection, a careful review of co-teaching practices was carried out, to ensure they have remained relatively consistent across the study period. This involved reviewing, for example, curricula used for the different academic years, as well as including the covariates described below in an effort to minimize or control for between class differences. General school data of population percentages were drawn from the Georgia Department of Education's public database. This ensured that the socioeconomic and diversity percentages were the same or similar for the school for all 3 years. Though the process was primarily anecdotal, the results of this review will be included in Chapter 4 and discussed in Chapter 5. Furthermore, to partially control for this, the academic year itself was included as a covariate. The anonymized dataset was then exported into Statistical Package for the Social Sciences (SPSS) statistical analysis software in preparation for the data analysis.

Instrumentation and Operationalization of Constructs

As discussed in the preceding section, the primary instrument of data collection was anonymized student test data from the EOC exams. Barring clerical errors in the original recording of data or the transcription of those data, these records afforded a complete and accurate set of data regarding students' scores.

Gender

Gender is a binary variable. It was recorded as the student's biological gender. Given that binary analysis of gender underlies the research questions, students with complications regarding gender identity in school records were excluded from the dataset. These data were drawn from school records.

Type of Course

The type of course was a binary variable with a value of 0 if the student took Algebra I in a general education classroom that year or 1 if he or she took Algebra I in a co-teaching classroom that year. These data were drawn from school records.

EOC Exam Scores

EOC exam scores were used to operationalize the outcomes of the course, as they were more easily analyzed than categorical letter grades. Furthermore, EOC exams are designed as a comprehensive measure of course material comprehension. These exams are essentially final exams meant to cover the entirety of the course material, to the extent that a single exam can, and hence contain content from the entirety of the academic year they cover. Per the website of the Georgia Department of Education, the Algebra I EOC exam has a reliability value (Cronbach's alpha) between 0.90 and 0.92. No values are offered for reliability, but instead a thorough description regarding development and validation process of the EOC is provided.

Covariates

Key covariates were collected along with the other data. Covariates to be controlled included the academic year, which determined the way materials were taught, the class's teacher, and the classroom's average score to control for differences in class

and teacher effectiveness. Academic year was a simple categorical variable. The specific teacher or pair of teachers that a student had were operationalized as a simple pair of categorical variables for first and second teacher, allowing for the teachers to be controlled for both individually and jointly. The class average score on the EOC exam would seem to be a logical way of accounting for classroom-level effects, given that no other data maintained in school records offers any somewhat objective measure of the teacher's relative efficacy in teaching the subject matter. A more effective teacher should raise the class average given that the exams themselves are standardized at the state level. Both the second and third covariates discussed here are independent of academic year and can be used to compare different classes both within one year and across two or more years.

In addition, students' demographic information was collected in order to conduct a comparison between the different years of enrollment. Though the demographic controls did not factor directly into the analysis, they were used to contextualize the findings of the study. The demographics used included race/ethnicity and socioeconomic status, provided these were available in the school dataset. All covariate data were all drawn from student records.

Data Analysis Plan

Prior to answering the research questions, a descriptive analysis was carried out. The descriptive analysis examined the statistical properties of key variables, including the means, ranges, and medians. At this stage, the data was also cleaned, removing any incomplete datapoints. Then, inferential analyses was used to answer the research

questions. All data analyses in the current study were carried out using SPSS statistical analysis software. The current study sought to answer two research questions:

RQ1: Is there a significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching?

H_0*1:* There is no significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching.

H_A*1:* There is a significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching.

RQ2: Is there a significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching?

H_0*2:* There is no significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching.

H_A*2:* There is a significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching.

To answer these research questions, analysis of covariance (ANCOVA) was carried out. ANCOVA determines the extent, if any, to which a dependent variable

differs across different levels of an independent variable while controlling for known covariates (Ross & Willson, 2017). Covariates to be controlled for included the academic year and the type of classroom (co-taught or not) in which the students were placed. The principal assumption of ANCOVA is that of a normal distribution in the data being compared. Normal distribution was tested through the Shapiro-Wilk test. A larger *N* also helps achieve a normal distribution. Accordingly, normality was tested for the EOC scores. If the data were not normally distributed, then a non-parametric equivalent, the ANCOVA on ranks, was employed in place of the standard ANVOVA (Ross & Willson, 2017). The ANCOVA ranks determines if the medians of two populations are significantly different with no assumptions upon the underlying distributions save that the data be ranked (i.e., ordered relative to one another). A single ANCOVA was run to test both RQs. To answer RQ1, ANCOVA was used to compare EOC scores between male SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught or non-co-taught Algebra I classes. The null hypothesis was rejected if there was statistically significant variance in the dependent variable across levels of the independent variable.

On the other hand, to answer RQ2, ANCOVA was used to compare EOC scores between female SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught or non-co-taught Algebra I classes. Again, the null hypothesis was rejected if there was no significant difference in the dependent variable across levels of the independent variable. Since the RQs addressed issues of gender, the interaction of gender and disability was the crux of the analysis and determined if the RQs were answered differently.

Threats to Validity

Validity is a key component of research. In quantitative research, validity is divided into internal and external validity (Brannen, 2017). Internal validity reflects the degree of alignment of the study components. In this study, careful alignment between the research components helped to assure internal validity. The data collection instruments, being data in student records, were also all intrinsic values; only EOC scores were not a direct measure of the variable. Even then, EOC scores were an intrinsically numerical proxy of achievement. On the other hand, external validity relates to the extent to which the findings of the study can be generalized. This was assured through the power analysis, which created a large enough sample size to ensure the results were valid and representative of the population. There were still limits, however, to the generalization in that the results only necessarily applied to the school district and to similar populations of students.

There are, however, several threats to validity that had to be managed. Clerical error could have potentially introduced mistakes into the archival data. To help avoid errors, values were copied and pasted rather than re-typed. Another potential threat to validity is that the results may have only represented the individual school under study and not a wider population of students. This threat was inherent in the decision to focus on a single site study, but the results were contextualized in terms of where they were obtained so as to help ensure that future researchers or others seeking to make use of them are fully informed of this potential weakness. Issues of maturation did not represent a threat to validity in this study because it was posttest only, using historical data for the

end of course exams for each year of data. Instrumentation was not a threat to internal validity because the instruments used to collect data for the study were the same tests used for assessing student learning in a real-world situation. Students' history as a threat to internal validity was addressed through the inclusion of covariates.

One other threat to validity was individual teacher or pair of teacher effects. These could have potentially skewed the results in one way or another if some students had an especially good or bad teacher(s). Unfortunately, this would prove a difficult variable to measure from student data, although overall course averages for each instructor's class may have been examined as a covariate to determine if there were massive differences, but overall represent an analytically elusive variable and could be difficult to control for. This potential weakness, however, would be inherent in any study seeking to empirically compare the results of different classes. Another potential threat to validity was that test taking is an inherently stressful experience for most students, with or without disabilities. The EOC exams represent a measure which corresponds to how students are assessed in the real world, meaning that even if the results do not perfectly capture the difference in students' actual learning, they will capture results in terms of how that learning is functionally measured.

Ethical Procedures

Ethical research practices were adhered to throughout the study. All data collected for the study was fully anonymized and no personal identifying data was reported in the analysis or results. Anonymity was particularly important, as the study pertained to a twice-vulnerable population, that of SWDs who were vulnerable both as minors and for

having disabilities. All data collection was carried out through anonymous archival data. Thus, no risk was expected to the participants for the use of their data, and the students were not exposed to any potential harm. Data was securely stored in a password protected file on a flash drive kept in a locked desk drawer in my home office.

Because the current study involved archival data, direct informed consent from the participants was not collected. Other practices, however, were undertaken to support ethical research practice. Site authorization from the school at which data was collected was also obtained prior to any collection of data, along with the permission of any other relevant authorities such as the Research and Evaluation Department of the school district. IRB approval was sought prior to any data collection, and any changes mandated by the IRB were made. Any accommodations requested by the school, such as having a school administrative employee retrieve and anonymize the data rather than the researcher, were met so long as they did not require significant changes to the nature of the study.

Summary

The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether these effects differed by gender. In Chapter 3, I addressed methodological aspects of the current study in depth. For this study, I adopted a quantitative methodology and causal comparative or *ex post facto* research design consisting of a posttest only with one control and test group. The population was ninth grade algebra students with disabilities at a single high school in a rural region of

southeastern Georgia. Data were drawn from archival records consisting of anonymized student records over the course of 3 years. Variables of interest were students' disabilities, gender, whether they were enrolled Algebra I sections with either co-teaching or inclusive classroom instruction without co-teaching for a given year during the data collection period, and EOC exam scores. Data were analyzed using descriptive statistics and ANCOVA to test hypotheses. Ethical research practices were followed throughout the study. In Chapter 4, I present the analysis and results which were obtained through carrying out research methods as described in Chapter 3.

Chapter 4: Results

The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether these effects differed by gender. This quantitative study involved the use of a causal comparative or *ex post facto* research design consisting of a posttest only with one control and experimental group. Variables were EOC exam scores, gender, whether participants were enrolled in Algebra I sections with either co-teaching or inclusive classroom instruction without co-teaching for a given year during the 3-year data collection period, and academic year. To test research questions and hypotheses, data were analyzed using ANCOVA. The following research questions and hypotheses guided this study:

RQ1: Is there a significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching?

$H_0 1$: There is no significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching.

$H_A 1$: There is a significant difference in EOC scores for male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to male SWDs who receive instruction in inclusive classes without co-teaching.

RQ2: Is there a significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching?

$H_0$2: There is no significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching.

H_A2: There is a significant difference in EOC scores for female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching.

In this chapter, I present a discussion of results of quantitative analyses. Microsoft Excel and then SPSS were used for data analysis. Chapter 4 includes a discussion of data collection, including a summary of demographics of the sample. Then, descriptive statistics analysis, assumption testing, and ANCOVA are presented in the results section. I conclude the chapter with a summary of results.

Data Collection

Initially, the data collected included a total sample of 247 ninth grade Algebra I SWDs at a single high school in a rural region of southeastern Georgia. There were no discrepancies in the data collection from the plan presented in Chapter 3. Prior to the quantitative analysis, the initial dataset was first screened for missing data and presence of outlier data. The first investigation conducted involved presence of missing data. There were no instances of missing data in any datasets. I then investigated presence of outliers on the dataset (see Figure 1). A total of three EOC exam scores were considered outliers.

Outliers are data points outside the boxplot figure. Data of these three participants were removed from the final dataset, as outliers tend to skew results. Consequently, the final number of participants in this quantitative analysis was 244 ninth-grade Algebra I SWDs at a single high school in a rural region of southeastern Georgia.

Figure 1

Boxplot of Raw Dataset of EOC Scores (n = 244)

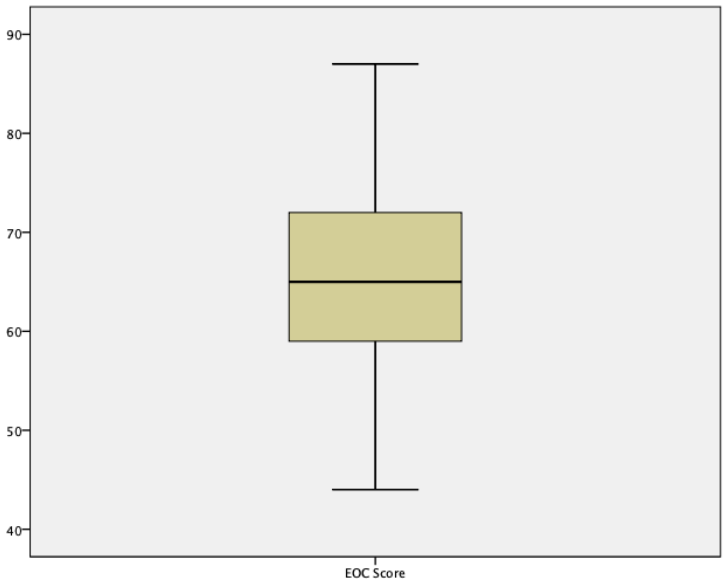


Table 1 includes a demographic breakdown of 244 ninth-grade Algebra I SWDs. EOC exam scores were from three different academic years.; 41% of EOC exam scores were from the 2017-2018 school year. There were 89 (36.5%) EOC exam scores from the 2016-2017 school year and 55 (22.5%) from the 2015-2016 school year. The majority (192; 78.7%) of SWDs were enrolled or received co-teaching Algebra I classes. In terms of gender, 69.7% were male.

Table 1

Frequency and Percentage Summaries of Demographics of Samples (n = 287)

	N	%
Grade Level		
9	244	100.0
SWDs/IEP		
Yes	244	100.0
Academic Year		
15-16	55	22.5
16-17	89	36.5
17-18	100	41.0
Instructional Model		
Inclusive Classes	52	21.3
Co-taught Algebra I	192	78.7
Gender		
Male	170	69.7
Female	74	30.3

Results

Descriptive Statistics of Dependent Variables

The dependent variable was students' EOC exam scores. This was measured using the mean scores as the percentage scores. Summaries of the raw EOC exam scores are summarized in Table 2. The mean raw EOC exam scores of the 244 ninth-grade

Algebra I SWDs was 66.05 (*SD* = 8.79). The EOC exam scores among the 244 samples ranged from 44 to 87.

Table 2

Descriptive Statistics Summaries of EOC Raw Score

Dependent Variable	*N*	Minimum	Maximum	*M*	*SD*
EOC Score	244	44	87	66.05	8.79

Test of Required Assumptions

ANCOVA with between-subjects factors (independent variables) of gender and co-taught Algebra I groupings after controlling the effects of the covariate of academic year was conducted to address the research questions of the study. This statistical analysis is a parametric test that requires certain assumptions prior to conducting the test. The different required assumptions of these tests included no presence of outliers, normality of the data of the dependent variable, or homogeneity of variance. Each of these assumptions was tested, and the results are presented in the following sections.

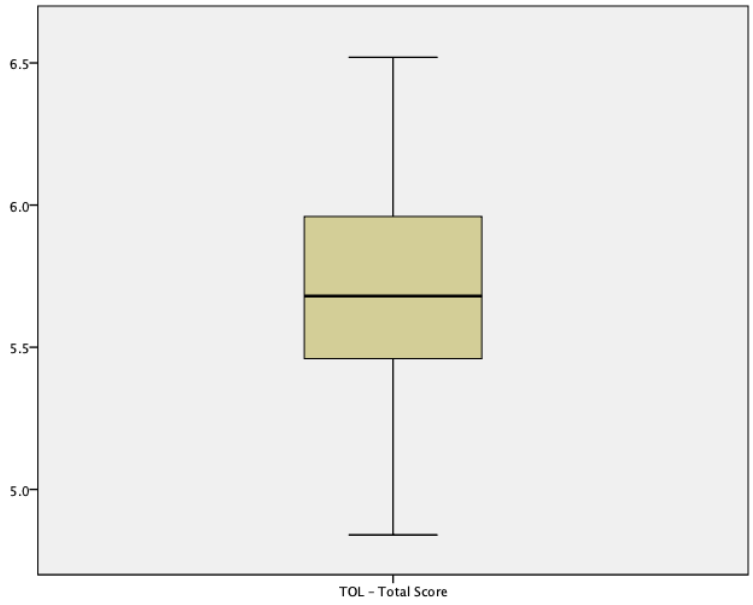
Outlier Investigation

The first required assumption states that there should be no presence of outliers in the dataset of the dependent variable. The investigation of the presence of outliers of the final dataset of students' EOC exam scores, after removal of outliers which included 244 ninth-grade Algebra I SWDs, was conducted through visual inspection of the boxplot. Figure 2 shows the boxplot of the final dataset of the dependent variable of students' EOC exam scores. Investigation of the boxplot of the final dataset showed that there was

no longer a presence of any outlier in the dataset of students' EOC exam scores. Thus, the no presence of outliers assumption was satisfied.

Figure 2

Boxplot of Final Dataset of EOC Scores (n = 244)



Normality

The second assumption tested the assumption of normality, which means that the data of the dependent variable should generally exhibit a normal distribution. Normality was tested using the Shapiro-Wilk test. Results of the Shapiro-Wilk test showed that the data of students' EOC exam scores (SW [243] = 0.99, p = 0.006) followed normality or exhibited a normal distribution. Normal distribution was based on the Shapiro-Wilk statistic having a p-value greater than the level of significance, set at 0.05, which was the case in the study's results. The assumption of normality was satisfied based on the results of the Shapiro-Wilk test.

Homogeneity of Variance

The third and final assumption was homogeneity of variance, which means that the variance of the dependent variable should be homogeneous or equal across the different categories of the independent variables. Levene's test was conducted to determine whether the variance of students' EOC exam scores were homogeneous across the different categories/groupings of each of the independent variables of gender and co-taught Algebra I groupings after controlling the effect of the covariate of academic year. The results of Levene's test showed that the variance of students' EOC exam scores (F[3, 240] = 1.41, p = 0.24) was homogeneous ($p > 0.05$) across the different categories of the independent variables of gender and co-taught Algebra I groupings. Homogeneity of variance was achieved because the p-value was greater than the level of significance value of 0.05. Thus, the results showed that the homogeneity of variance assumption was also satisfied.

Summary of Results of Assumption Testing

All three required assumptions were satisfied by the data. These included assumptions of no presence of outlier, normality, and homogeneity of variance. With these results, the ANCOVA was conducted to address the two research questions of the study.

Results of ANCOVA for Hypothesis Testing

An ANCOVA was conducted to address research questions which aimed aimed to determine whether the students' EOC exam scores were significantly different across gender (females versus male) and co-taught Algebra I groupings (SWDs enrolled in

Grade 9 Algebra I who receive instruction in co-taught Algebra I classes versus SWDs who receive instruction in inclusive classes without co-teaching) after controlling for the effects of the covariate of academic year. A level of significance of 0.05 was used in the ANCOVA. The ANCOVA results are shown in Table 3.

ANCOVA results of the between-subjects effects showed that the EOC exam scores ($F[1, 239] = 21.57$, $p < 0.001$, $\eta 2 = 0.08$) were significantly different between the two co-taught Algebra I groupings after controlling for the effect of academic year among the ninth-grade Algebra I SWDs. The mean comparison in Table 4 showed that the mean EOC exam scores among ninth-grade Algebra I SWDs who receive instruction in co-taught Algebra I classes ($M = 71.60$; $SD = 9.29$) were significantly lower as compared to mean EOC exam scores among ninth-grade Algebra I SWDs who receive instruction in inclusive classes without co-teaching ($M = 64.54$; $SD = 8.04$). This means that ninth-grade Algebra I SWDs who receive instruction in inclusive classes without co-teaching have better EOC exam scores than ninth-grade Algebra I SWDs who receive instruction in co-taught Algebra I classes. On the other hand, ANCOVA results of the between-subjects effects showed that there was no significant difference among EOC exam scores ($F[1, 239] = 0.92$, $p = 0.34$, $\eta 2 = 0.00$) between male and female ninth-grade Algebra I SWDs after controlling for the effect of academic year. Thus, both the null hypotheses for RQ_1 and RQ_2 were not rejected.

For the interaction effect of gender and co-taught Algebra I groupings, ANCOVA results showed that the interaction effect between gender and co-taught Algebra I groupings did not have a significant effect on the students' EOC exam scores ($F[1, 239]$

= 0.08, $p = 0.78$, $\eta 2 = 0.00$) after controlling for the effect of academic year among the ninth-grade Algebra I SWDs. This means that there was no significant difference in the EOC exam scores among the following groups: (a) male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes, (b) male SWDs who receive instruction in inclusive classes without co-teaching, (c) female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes, and (d) female SWDs who receive instruction in inclusive classes without co-teaching. There was insignificant difference since the *p*-value of the *F* statistic was greater than the level of significance value set at 0.05. Again, with these results, both the null hypotheses for RQ_1 and RQ_2 were not rejected.

Table 3

Results of ANCOVA of Significance of Difference of EOL Scores by Gender and Co-Taught Algebra I Groupings Controlling for Academic Year

Source	Type III Sum of Squares	df	Mean Square	F	*p*	Partial Eta Squared
Corrected Model	2220.64	4	555.16	8.01	0.00*	0.12
Intercept	118,457.78	1	118457.78	1708.81	0.00*	0.88
Academic year	32.47	1	32.47	0.47	0.49	0.00
Gender	63.62	1	63.62	0.92	0.34	0.00
Cotaught Algebra I	1,495.12	1	1495.12	21.57	0.00*	0.08
Gender * Cotaught Algebra I	5.25	1	5.25	0.08	0.78	0.00
Error	16,567.87	239	69.32			
Total	1,083,105.00	244				

Corrected Total	18,788.50	243

a. R Squared = 0.12 (Adjusted R Squared = 0.10)

Dependent Variable: EOC Score

*Significant difference at level of significance of 0.05

Table 4

Descriptive Statistics Summaries of EOL Scores by Gender and Co-Taught Algebra I Groupings

Gender	Instructional Model	*M*	*SD*	*N*
Male	Inclusive Classes	71.33	9.79	40
	Co-taught Algebra I	63.95	8.12	130
	Total (Both Inclusive Classes and Co-taught Algebra I)	65.69	9.07	170
Female	Inclusive Classes	72.50	7.69	12
	Co-taught Algebra I	65.77	7.80	62
	Total (Both Inclusive Classes and Co-taught Algebra I)	66.86	8.12	74
Total (Both Gender)	Inclusive Classes	71.60	9.29	52
	Co-taught Algebra I	64.54	8.04	192
	Total (Both Inclusive Classes and Co-taught Algebra I)	66.05	8.79	244

An independent sample *t*-test was conducted to determine whether the students' EOC exam scores were significantly different across gender (females versus male) only. A level of significance of 0.05 was also used in the independent sample *t*-test. The

independent sample *t*-test results are shown in Table 5. Similar to the results in the ANOCVA, the results of the independent sample *t*-test showed that there was no significant difference in the EOC exam scores ($t[242] = -0.96$, $p = 0.34$) between male and female ninth-grade Algebra I SWDs. This result showed that male and females' total EOC exam scores were not significantly different over the 3 academic years' data.

Table 5

Results of Independent Sample t-test of Significance of Difference of EOL Scores by Gender Only

Dependent Variable	*t*-test for Equality of Means						
	T	df	*p* (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
EOC Score	-0.96	242	0.34	-1.18	1.23	-3.59	1.24

Summary

The purpose of this quantitative study using a causal comparative or *ex post facto* research design consisting of a posttest only with control group and an experimental group was to determine the instructional effectiveness in co-teaching versus inclusive classrooms for SWDs using Algebra I EOC scores and whether these effects differed by gender. Descriptive statistics analysis and ANCOVA were conducted to address the research questions of this study.

Results of the ANCOVA showed that the EOC exam scores were significantly different between ninth-grade Algebra I SWDs who received instruction in inclusive

classes without co-teaching, as they had better EOC exam scores than those ninth-grade Algebra I SWDs who received instruction in co-taught Algebra I classes. For RQ_1, the results of the ANCOVA showed that there was no significant difference in the end of course scores for male SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught Algebra I classes as compared to male SWDs who received instruction in inclusive classes without co-teaching. For RQ_2, results of the ANCOVA showed that there was no significant difference in the end of course scores for female SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught Algebra I classes as compared to female SWDs who received instruction in inclusive classes without co-teaching.

In Chapter 5, I conclude the study. Implications of results of data analysis are discussed in detail in Chapter 5. Suggestions regarding how findings may be applied in organizational settings and a summary of recommendations for future research will also be discussed.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether these effects differed by gender. An ANCOVA was conducted in order to address research questions. An analysis was carried out in order to determine if EOC scores were significantly different in terms of gender (females versus male) and instruction in co-taught Algebra I classes versus inclusive classes without co-teaching after controlling for the effects of the covariate of academic year.

ANCOVA results of between-subjects effects showed that mean EOC exam scores were significantly different after controlling for the effect of academic year among ninth-grade Algebra I SWDs. Mean EOC exam score comparisons showed that ninth grade Algebra I SWDs who received instruction in co-taught Algebra I classes scored significantly lower compared to those who received instruction in inclusive classes without co-teaching. This finding indicates that ninth-grade Algebra I SWDs who received instruction in inclusive classes without co-teaching have better EOC exam scores than those who received instruction in co-taught Algebra I classes.

The interaction between gender and co-taught Algebra I groupings did not have a significant effect on students' EOC exam scores after controlling for the effect of academic year among ninth-grade Algebra I SWDs. This finding indicates that there was no significant difference in terms of EOC exam scores among the following groups: (a) male SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes, (b) male SWDs who receive instruction in inclusive classes without co-teaching,

(c) female SWDs enrolled in Grade 9 Algebra I who receive instruction in co-taught Algebra I classes, and (d) female SWDs who receive instruction in inclusive classes without co-teaching.

This chapter includes a further discussion of significance of results. An interpretation of findings is presented first, based on their relationship to literature presented in Chapter 2. Limitations of this study are then considered, as well as the extent to which they influenced results. Based on these limitations, I then offer recommendations for future research and practice. Implications of findings are then presented. I conclude this chapter with a summary and outline of key points.

Interpretation of the Findings

This section includes an interpretation of findings based on relevance to literature presented in Chapter 2. RQ1 was about whether there was a significant difference in terms of EOC scores for male SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught Algebra I classes compared to male SWDs who received instruction in inclusive classes without co-teaching. Results showed that EOC exam scores were significantly different between the two co-taught Algebra I groupings after controlling for the effect of academic year among Grade 9 Algebra I SWDs. This finding indicates that Grade 9 Algebra I SWDs who received instruction in inclusive classes without co-teaching have better EOC exam scores than those Grade 9 Algebra I SWDs who received instruction in co-taught Algebra I classes.

This finding supports the null hypothesis for RQ1. It was expected that instruction with co-teaching would elead to superior results. Research presented in Chapter 2

supports co-teaching as an instructional method for enhancing learning and development within changing contexts and settings. Specifically, co-teaching is an approach that is expected to raise the quality of special education by capitalizing on shared skills and specializations between different groups to enhance teaching quality provided to learners (Hamdan et al., 2016).

Additionally, research findings presented in Chapter 2 support the application of co-teaching to SWDs. With the co-teaching model, SWDs and SWODs are situated in the same classroom and are given collaborative instruction by special and general education teachers in one or more content areas. Teachers share instructional responsibilities such as delivering instruction, managing classrooms, and designing assessments of students (Chitiyo, 2017; Mozingo, 2017). It is unclear why SWDs did not benefit from co-teaching in this study. One potential reason may be that it led to their exclusion from the remainder of the class. Results indicate that the inclusion model appears to be more appropriate than co-teaching in the case of mathematics.

While co-teaching may offer more individualized education, it also requires that students be separated from their peers, and they are not able to engage in the general content of the class. Co-teaching draws on the strengths of the general education teacher in terms of curriculum and pacing as well as those of the special education teacher in terms of differentiating instruction and adapting the curriculum to individual needs of students (Cook & McDuffie-Landrum, 2018). In this study, the style of co-teaching that was implemented may not have been conducive to the specific learning needs of these particular SWDs.

Findings from this study suggest possible variances in terms of styles of co-teaching that exist as well as the necessity of ensuring that there is alignment between styles and learning needs of students. There have been various studies that focus on how collaborative and inclusive practices influence mathematics and overall achievement of students. Literature on mathematics achievement within the co-taught classrooms, however, is limited, and the literature that does exist presents varying results . In this particular study, findings contribute to previously existing literature by demonstrating that co-teaching may not be optimal in regards to the development of mathematical skills among SWDs.

Additionally, findings from this study may reflect that styles of co-teaching that were implemented did not involve considering variety and engagement with peers. Results suggest that the inclusion model might be a better than co-teaching setting for math instruction among SWDs. The variety of classroom practices teachers use when interacting with students is crucial to their understanding of mathematical concepts and overall performance in the subject. Implementation of co-teaching in this study may have prevented students from being able to take advantage of teaching methods that were already being provided by the primary instructor.

In classes that are already inclusive, SWDs may be able to adapt successfully to these environments without further being isolated or segregated from their peers. The implementation of co-teaching diminishes the effects of inclusiveness, due to the need of supplementary instruction which separates students from the majority. The fact that SWDs in inclusive classes who did not receive co-teaching scored higher than those in

inclusive classes who did receive co-teaching is noteworthy and has important implications for practice and research.

These findings contradict much of the literature presented in Chapter 2 that supported co-teaching for SWDs. Moeller and McLeod (2017) said expertise of teachers is crucial to planning mathematics lessons for students to support their mathematics achievement. They also highlighted the importance of helping teachers have a clear understanding of the individual strengths and needs of students in mathematics. In this study, however, the opposite appears to be true. Students who received co-teaching scored lower in mathematics scores. While further research may be needed in order to verify the validity and generalizability of these findings, it is necessary to consider that co-teaching may not, in fact, be optimal in every educational context and setting for SWDs (Chitiyo, 2017; Naegele et al., 2016).

Results from this study offer complexity to the body of literature that exists regarding co-teaching and its impacts. For example, studies presented in Chapter 2 that were conducted on the benefits of co-teaching have shown that co-teaching benefits students regarding overall achievement, task engagement, and student participation (Naegele et al., 2016). It has also been suggested, however, that few co-teaching teams implement co-teaching in the way it was intended (Cook & McDuffie-Landrum, 2018). The research related to the responsibilities of special education teachers and general education teachers regarding co-planning, co-instructing, and co-assessing students to provide effective co-teaching is limited (Brendle et al., 2017). Therefore, in this study, it is possible that the style and method of co-teaching that was implemented did not

specifically align with learners' needs or preferences. Additionally, mathematics may require social engagement with the majority of the class to a greater extent than previously perceived. Social engagement may be necessary to encourage mathematics skill development. Furthermore, it is also possible that the lack of effectiveness of co-teaching in this study may have been due to limitations on the part of the participants and instructors. This study is among the first to examine the effects of co-teaching on Algebra proficiency for SWDs, and further exploration is needed in order to understand if this trend is consistent with other student populations and with other mathematics co-teachers.

The second research question pertained to whether there was significant difference in EOC scores for female versus male SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught Algebra I classes as compared to SWDs who received instruction in inclusive classes without co-teaching. It was hypothesized that there would be a significant difference in the end of course scores between male and female SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught Algebra I classes as compared to female SWDs who receive instruction in inclusive classes without co-teaching. This hypothesis was based on prevailing literature suggesting that males outscore females in math content areas (Brendle et al., 2017). Results, however, showed that there was no significant difference between female and male students' EOC exam scores. There was still no significant difference after controlling for the effect of academic year among the ninth-grade Algebra I SWDs.

This finding appears to indicate that there was no significant difference in the EOC exam scores among the following groups: (a) male SWDs enrolled in Grade 9

Algebra I who received instruction in co-taught Algebra I classes, (b) male SWDs who received instruction in inclusive classes without co-teaching, (c) female SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught Algebra I classes, and (d) female SWDs who received instruction in inclusive classes without co-teaching. This study was among the first to evaluate gender differences in regard to co-teaching and its effect on algebra scores.

The literature presented in Chapter 2, however, did highlight the gap in the literature pertaining to gender and called for further research on this topic. Specifically, Iqbal and Shams (2018) recommended future research on female students and different grade levels to further explore collaborative teaching in relation to math achievement. The authors focused on the Pakistan setting and studied the effectiveness of collaborative teaching through an analysis of the students' resulting mathematics scores amongst 118 public school eighth-grade students using the Solomon-Four-Group experimental design. The authors stated that they developed a collaborative mathematics teaching module in algebra and geometry that were validated by subject matter experts. The module was used to analyze the effectiveness of collaborative teaching in comparison to more traditional approaches. The study consisted of 20 lessons, each lesson comprising 60 minutes. Student outcomes were measured using an achievement test in mathematics. The authors found that collaborative teaching was more effective than solo teaching in enhancing the achievement of the students in both algebra and geometry. Therefore, findings from this study help address the gap in the literature and reflect that gender does not appear to make a difference regarding the effectiveness of co-teaching. In this study, co-teaching

did not appear to significantly benefit either male or female SWDs regarding algebra more than general inclusion.

Results from this study suggest that inclusion, in the case of algebra, is sufficient to facilitate learning and that the addition of co-teaching may actually diminish the positive effects of inclusive classroom environments. This commitment to inclusion gives rise to the importance of social engagement in the educational system. This finding differs from the literature in Chapter 2, which showed that the co-teaching model has emerged as a suitable model in order to provide additional academic support in the inclusive classroom (Chitiyo, 2017; Lambert & Tan, 2017; Marita & Hord, 2016). The model, however, can take different forms and its implementation is often not applied consistently between educators, likely leading to varied results. This study was an example of such a case, as there was no significant advantage of co-teaching for participants in this study and the findings appeared to show that the use of this method hindered their performance. An inclusive classroom in which SWDs are integrated led to superior mathematics scores when compared to co-teaching, and this finding enriches the data that already exists on this subject that appears to show the opposite.

Co-teaching is a developing concept in education, and its implementation may not be fully mastered by practitioners. Furthermore, co-teaching as it relates to actual student outcomes remains to be largely under-researched, with most studies focusing on qualitatively investigating the experiences of the stakeholders and participants rather than quantitatively examining the effectiveness of the model. This study helped to bridge the gaps in the literature by focusing directly on how Algebra I achievement is influenced by

co-teaching practices based on quantitative metrics of mathematics learning. It is evident from these findings that co-teaching is not always optimal, and that further understanding is needed regarding its effective use and implementation.

Additionally, working with SWDs can lead to variance regarding outcomes, and potentially to a greater extent than working with students who do not have disabilities (Moeller & McLeod, 2017). Special education has long been characterized by collaboration, with groups of educators making decisions about the most appropriate educational avenues for SWDs and maintaining close working relationships with the students' parents (Friend et al., 2010). This collaboration is the intention, but research shows that very limited collaboration occurs (Friend et al., 2010). This lack of actual collaboration might help explain the insignificant results from the co-taught classrooms in this current study. The concept of co-teaching grew rapidly in response to the increasingly recognized need for general education and special education teachers to work in coordinated and constructive ways and the growing expectation for special education needs students to be educated in the same classrooms as their nondisabled peers (Cook & Friend, 1995). While collaboration may be beneficial for SWDs in the case of mathematics, however, a classroom that is already inclusive may not require the addition of co-teaching, as it results in a potential perception that SWDs are still being segregated in some way. Thus, SWDs might still benefit more substantially by just receiving regular instruction in the inclusive setting. Furthermore, co-teaching, when not implemented correctly, may result in misaligned and competing curricular goals and objectives (Cook & Friend, 1995).

Findings from this study appear to conflict with prior research showing that co-teaching is beneficial. For example, co-teaching in the fourth-grade classroom was found to have a more positive effect than inclusive settings, as measured by the students' achievement in mathematics. The results, however, support the benefits of the inclusion model for math instruction. The reason that the findings from this study conflict with this research may be partly due to limitations that were present in this research, which I discuss in the following section.

Limitations of the Study

Despite the lack of higher math scores with co-teaching in this current study, the findings offer a significant contribution to the understanding of co-teaching as an instructional method. There were, however, some limitations that were present and which warrant consideration. One limitation was that the results may only represent the individual school that is included in the study and not the wider population of students. Therefore, the generalizability of the data is limited by the focus on SWDs from a particular grade level and their Algebra I achievement within a single study site. Further research is needed to determine if co-teaching has positive effects in other settings and contexts. In this study, the aim was to ensure that the results of the study are contextualized properly in order for future researchers to be aware of this potential weakness.

Another potential limitation of this study was that an effort was made to empirically compare results of different groups as individual teacher effects. The results of this study may be skewed because teacher quality may have influenced results. There

was no measure taken of teacher quality. Teacher quality should be considered when discussing student outcomes (Brendle et al., 2017). As co-teaching has been demonstrated to be effective in other studies, the potential exists that the reason students did not benefit from this model in this study was at least partially due to teacher characteristics. The study may also have been limited by the adequacy of the administered tests in accurately measuring the instructional outcomes of algebra among the students. The potential always exists for standardized assessments to not truly reflect student learning and development. Additionally, the group size was somewhat small and this may have limited the extent to which findings can be generalize to the target population. Group size was not accounted for in the analysis, so it was no clear as to whether this impacted the statistical power in the analysis. In the following section, I discuss recommendations that can be made based on this research.

Recommendations

Based on the findings of this study, several recommendations can be made regarding research, practice, and policy. Findings from this study illustrate that there is a need to further explore the effects of co-teaching on mathematics scores for SWDs. As the findings of this study appear to conflict with previous research, consideration is needed in order to determine why this is the case and whether these findings are reliable. At the same time, the results provide support for the inclusion model of instruction in math for SWDs. Aspects of this study can also be used in order to improve practice regarding co-teaching. For example, findings suggest that co-teaching may hinder mathematics performance in SWDs and that this method may not be optimal relative to

the inclusive instructional setting. Finally, some policy implications can be made regarding this study. For example, it would be premature to recommend co-teaching as a special education policy for mathematics based on these findings. Further research is needed in order to determine the extent to which co-teaching is beneficial for mathematics performance. These findings appear to suggest that co-teaching can be an ineffective instructional model in at least one particular class, and this issue requires further investigation.

The current educational thinking is that co-teaching is the preferred instructional model for SWDs. In the case of algebra, however, the inclusion model may be favorable over co-teaching. In the case of mathematics, inclusion and adaptivity may be sufficient without the necessity to also implement co-teaching. At the systemic and policy level, sector planning, financing, data-gathering, and teacher training and support are some of the important aspects of systemic planning in order to provide further support for inclusion at different levels of education (Cheshire, 2019). Interventions using larger group sizes are also needed. In the following section, I discuss the implications that can be made based on these findings.

Implications

Although co-teaching was not found to significantly improve mathematics scores in SWDs relative to an inclusive instructional setting, several implications exist for these findings. Specifically, this study has both academic and practical significance. From an academic standpoint, these findings help to expand upon Cook and Friend's (1995) principles of co-teaching and the corresponding theory by testing the application of that

theory, thereby expanding the purview of the theory from a broad understanding of its co-teaching principles to the specific context of mathematics education for SWDs.

Additionally, this study helps to bridge a gap in the literature that was highlighted by several existing studies related to co-teaching (e.g., Chitiyo, 2017; Lambert & Tan, 2017; Marita & Hord, 2016; Spooner et al., 2019). In a review of interventions for improving math scores of SWDs, Spooner et al. (2019) called for more research on co-teaching as an approach, and this study helps fulfill that need. Additionally, Lambert and Tan highlighted a research gap in terms of research on teaching mathematics to SWDs as opposed to SWOD, which this study helps to fulfill. Finally, Chitiyo's (2017) study on the barriers to co-teaching implementation concluded with a call for more research on co-teaching in practice. This study fulfilled each of these gaps in the literature and adds to the discussion on whether co-teaching is always optimal. While there appear to be many advocates of this special education technique, it is not always optimal, which can be observed through the results of this study. When classrooms are already inclusive, SWDs may benefit more from just receiving general instruction that is tailored to the entire class. When co-teaching is included, SWDs may not benefit, which is indicated by the findings from this study.

In terms of instructional practice, this study helped to close the mathematics achievement gap for SWDs that has been identified by researchers like Elliott et al. (2017). The study by Jitendra et al. (2018) showed that interventions to improve mathematics scores do often help, but instructional methods and instructional time are key factors. Examining the co-teaching approach therefore offered insight into an

instructional practice's efficacy. While co-teaching has emerged as a suitable approach to address the different problems encountered in inclusive classrooms, its implementation is often not systemic, thus leading to variations in its effectiveness. This study helped address the gap in practice as it relates to actual student outcomes and showed that further development of co-teaching is still needed to be validated as a service delivery model for SWDs in the general education setting.

Although some researchers have advanced the notion that boys outscore girls in math-related content, the findings from this study do not support these claims (Lambert & Tan, 2017). Findings from this study help illustrate no significant differences in algebra test scores between the genders regardless of the inclusion or co-teaching settings. Future research should extend these findings by further exploring how differences in learning preferences amongst SWDs and instructional styles of teachers align within inclusive versus co-teaching methods. Further research should continue to evaluate potential differences or lack of differences between gender for Algebra I performances.

The results of this study contribute to social change by providing quantitative measured student outcomes of students in co-taught classrooms and inform decision makers on the co-teaching environment in meeting the needs of SWDs in Algebra I. Education professionals may want to use this research as a guide for designing a special education program that focuses on how to meet the needs of SWDs in Algebra I instructional settings. Finally, results from this study could also be used to further advance the current knowledge regarding the efficacy of co-teaching in Algebra I related to academic performance among SWDs. In the following section, I conclude this chapter.

Conclusion

The purpose of this quantitative study was to determine the instructional effectiveness of co-teaching versus inclusive classroom instruction for SWDs using Algebra I EOC scores and whether these effects differed by gender. Descriptive statistics analysis and ANCOVA were conducted to address the research questions of this study. This chapter contained a discussion of the findings as well as an interpretation of the results and an evaluation of their implications for practice, research, and theory.

Results of the ANCOVA showed that the EOC exam scores were significantly different between the two co-taught Algebra I groupings after controlling for academic year among the ninth-grade Algebra I SWDs. Specifically, ninth-grade Algebra I SWDs who received instruction in inclusive classes without co-teaching had better EOC exam scores than those ninth-grade Algebra I SWDs who received instruction in co-taught Algebra I classes. For RQ_1, results of the ANCOVA showed that there was no significant difference in the end of course scores for male SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught Algebra I classes as compared to male SWDs who received instruction in inclusive classes without co-teaching. For RQ_2, results of the ANCOVA showed that there was no significant difference in the end of course scores for female SWDs enrolled in Grade 9 Algebra I who received instruction in co-taught Algebra I classes as compared to female SWDs who received instruction in inclusive classes without co-teaching.

Findings from this study contribute to the literature related to co-teaching and illustrate gaps that still require attention. As educational institutions continue to be

expected to adapt to the various barriers that learners encounter in the process of learning, legislative mandates to support inclusive and co-teaching education continue to be introduced in the United States (Blazer, 2017; Bottge et al., 2018; Treviranus, 2018). As a response to these legislative mandates, more and more schools are including SWDs in the same classroom as SWOD (Cheshire, 2019; Hurd & Weilbacher, 2018). Comparisons, however, of academic achievement between the two groups continue to show significant gaps, particularly in mathematics (Bottge et al., 2018; Moeller & McLeod, 2017).

In classes that are already inclusive, SWDs may be able to adapt successfully to these environments without further being isolated or segregated from their peers in resource classroom settings. The implementation of co-teaching essentially diminishes the effect of inclusivity, as it requires that students are still separated from the majority in some way so that they can receive supplementary instruction. The fact that SWDs in inclusive settings who did not receive co-teaching scored higher than those in inclusive settings who did receive co-teaching is noteworthy and has important implications for practice and research.

Future research is needed, which expands on these findings in order to determine their generalizability to other contexts and settings. Additionally, a need exists to generate understanding as to whether teacher characteristics can influence outcomes related to students' test scores in algebra. Further research is also needed in order to determine whether styles of co-teaching significantly affect algebra test scores among SWDs.

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Appendix A: Data Use Agreement

DATA USE AGREEMENT

This Data Use Agreement ("Agreement"), effective as of 2/11/2021, is entered into by and between Valeree Williams and East Coweta High School. The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in research in accord with the HIPAA and FERPA Regulations.

1. Definitions. Unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the "HIPAA Regulations" codified at Title 45 parts 160 through 164 of the United States Code of Federal Regulations, as amended from time to time.

2. Preparation of the LDS. Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable HIPAA or FERPA Regulations

Data Fields in the LDS. **No direct identifiers such as names may be included in the Limited Data Set (LDS).** The researcher will also not name the organization in the doctoral project report that is published in Proquest. In preparing the LDS, Data Provider or designee shall include the **data fields specified as follows**, which are the minimum necessary to accomplish the research: EOCT Algebra 1 scores, gender, and course length type.

3. Responsibilities of Data Recipient. Data Recipient agrees to:

   a. Use or disclose the LDS only as permitted by this Agreement or as required by law;

   b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;

   c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;

   d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or disclosure of the LDS that apply to Data Recipient under this Agreement; and

   e. Not use the information in the LDS to identify or contact the individuals who are data subjects.

4. Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS for its research activities only.

5. Term and Termination.

   a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.

   b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.

   c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.

   d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

   e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.

6. Miscellaneous.

   a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.

   b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.

   c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.

   d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

DATA PROVIDER

Signed: Stephen Allen

Print Name: Stephen Allen

Print Title: Principal

DATA RECIPIENT

Signed: Valeree Williams

Print Name: Valeree Williams

Print Title: Teacher

Appendix B: NIH Certificate of Completion

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Valeree Williams** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 12/18/2017.

Certification Number: 2582353