

**ACHEIVEMENT OF ONLINE SCHOOL STUDENTS WITH  
SPECIFIC LEARNING DISABILITIES: A FOCUS ON KNOWLEDGE, PEDAGOGY,  
AND PREPARATION OF ONLINE GENERAL AND SPECIAL EDUCATION  
TEACHERS.**

by  
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A dissertation submitted to Johns Hopkins University in conformity with the requirements for  
the degree of Doctor of Education

Baltimore, Maryland

April 2023

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## **Abstract**

Diverse learners attending online K-12 schools deserve high quality and accessible educational programs. This research explores factors that influence the academic achievement of students with Specific Learning Disabilities attending online schools. The first chapter of this dissertation deeply analyzes existing research of factors that contribute to students' educational progress. Students, teachers and families' technological knowledge and skills, curriculum design, teacher preparation, and teacher collaboration were amongst some, not all, of the factors explored. A study of the literature indicated online teachers needed training and development related to meeting the needs of students with Specific Learning Disabilities. Therefore, a needs assessment was conducted, as described in chapter two, that studied the perceptions of online general and special education middle school teachers across nine public charter schools seeking to understand their pre-service training, in-service training and ongoing professional development related to teaching students with Specific Learning Disabilities in online schools. Teachers indicated a lack of preparation during pre-service training, in-service training, new teacher training, and ongoing professional development. When asked about their beliefs regarding teacher collaboration, 97% of study participants agreed collaboration amongst general and special educators informs instructional practices, yet a small percentage of teachers indicated such collaboration is a part of their current teaching methods. Chapter three explores intervention literature targeting teacher training. There is scarce literature that explicitly targets online teachers' pedagogy with a focus on educational outcomes of students with Specific Learning Disabilities. Considering all learning environments, research indicates teacher collaboration as a beneficial pedagogical practice enhancing teachers' knowledge, practices, and student learning. The final chapter of this dissertation proposes an intervention encompassing professional

development and implementation support aiming to enhance collaboration amongst online general and special education teachers and distally improve student outcomes.

*Keywords:* K-12 online schools, Specific Learning Disabilities (SLD), teacher training, teacher collaboration, special education, general education

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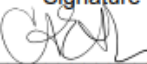
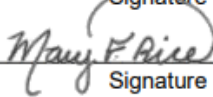
Doctor of Education Program  
**Dissertation Approval Form**

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Date : 3-13-23

Dissertation Title: **Academic Achievement of Students with Specific Learning Disabilities Attending Fully Online Schools**

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## **Acknowledgements**

My doctoral journey, including the completion of this dissertation, was possible with the support system God Blessed me with along the way. I want to express sincere gratitude to our everlasting Father, Son, and Holy Spirit. His magnificence is how I achieved earning this distinguished degree. It is with Him and through Him that my rough days were made bright and purposeful and that my weaknesses turned into strength. Thanks to Him for loving me unconditionally, molding me, and having mercy on me constantly. To Him, I give all the glory.

At Johns Hopkins University, I would like to express sincere gratitude to my advisor Dr. Chadia Abras for your unwavering support. Your advisement and leadership of my dissertation committee has positively influenced my doctoral endeavor and my overall well-being. Thank you for choosing to spend your precious time with me. To my dissertation committee members, Dr. Christine Eith and Dr. May Rice, thank you for showering me with wisdom, genuine care, and empowerment. You both have had a lasting impact on my professional and personal perspectives. Additionally, I would like to thank Dr. Yolanda Abel for being the first face of Hopkins that contributed to my sense of belonging. From the bottom of my heart, thank you. Dearest Dr. Carey Borkoski, your influence on my doctoral journey and personal life is profound. You influenced my doctoral journey likely more than you know. Your support early on in this program significantly influenced my sense of belonging. To Dr. Laura Flores Shaw, thank you for investing in our connectedness beyond the classroom. You spent time meeting with me in-person, taking walks with me on the phone, and provided critical feedback during my studies of the mind, brain, and teaching. Our connection has positively influenced my sense of belonging. To Dr. Sharon Mistretta, I have immense gratitude for you. I am blessed to have experienced you as your student and as your course teaching assistant. Thank you for valuing personal and professional connections and investing a significant amount of time and effort into

developing and inspiring people. To my colleagues at Johns Hopkins University, thank you for your love and support over the years. Dr. Vicky Garafola, thank you for your friendship and for the beautiful painting you designed for me during a critical time in my life. Dr. Mary Fran Park, thank you for your smiling face, support, and friendship. Dr. Chanda Turner, I still remember the morning I spent in a hotel restroom meeting with you in Zoom while my kids were asleep. I was in critical need of an oral comps prep session and companionship, and you were there for me. It was that meeting that played a vital role in my forward movement during that season of my life. I appreciate you! To my girl Cam Marshall, thank you for your friendship, love, and encouragement. You consistently reached out to me and kept our cross-country connection strong throughout the years. To Dr. Dang Huynh and Ying Ma, thank you for your words of encouragement and support over the years. To my dearest friend, Robert Washington, there is not enough space here to express my sincere gratitude for our friendship. From Japan to California, we merged our families, work, and doctoral endeavors! I deeply value the hundreds of hours we've spent laughing, encouraging, inspiring, celebrating, and challenging one another. I look forward to a lifetime of friendship.

To my family, where do I begin and end with describing my sincere appreciation for each one of you. To my children, Trinity and Lonnie, my love for you both sustains my human heart. Precious time with you both was sacrificed throughout this program, yet you are both so forgiving and have loved me unconditionally. You have celebrated each milestone with me. You have been with me through the ups and the downs that we lived through over the course of this program, and I am sincerely thankful for your place in my life. I am Blessed God has allowed me to live on Earth with you both as my children. My love for you both will never fade. Next, I'd like to acknowledge my dad, Chico, who left to be with our heavenly father during my third year

in this program. His impact on my life overall has influenced my resilience, the way I organize and attend to tasks, and how I raise my children. I will forever reflect on our best times together. I love you, endlessly. To my mother, Suheir, thank you for supporting me through my toughest life challenges, wearing your heart on your sleeve, and for making everyone laugh. To my oldest brother, Anthony, you had a lasting effect on my life in unintentional ways. I hope your future is filled with joy. To my sister, Joslynn, thank you for inspiring unconditional love. To my baby brother, Charles, thank you for loving me, looking up to me, and making me laugh until I cry – literally. You are such a bright spot in my life. My mind is constantly reflecting and dreaming of circumstances where we can reside in the same state and raise our children near each other. I love you so much. To my sister, Reyna, thank you for spending time with me on Marco Polo, for constantly showering me with positive affirmation, and for simply loving me. To my dear cousin, Abdul, my gratitude for you runs deep. The time you spent with me throughout my childhood has had profound effects on my life. Thank you for loving me, encouraging me, and celebrating with me. To my childhood best friend, Rachel, thank you for your love, support, and encouragement over the years. Thank you also for being with me through my most challenging and rewarding life experiences. Thank you for spending countless hours in Zoom with me just to provide companionship during my many days of studying. I look forward to a lifetime with you. To my sweet Christina, my best memories with you involve love and laughter. Thank you also for being with me through my most challenging and rewarding life experiences. Thank you for valuing my love for God and striving to walk in His ways with me. To Kimberly and Ryan Tillman, as my mind was racing on the eve of my dissertation defense exam, you both stayed up late to pray with me aiding me to a good night's rest - a memory that will rest in my mind forever. Thank you for your unwavering love and friendship. The partnership God has ordained

amongst us is more amazing than my mind could have imagined. Serving alongside you both is truly a dream come true. I look forward to a lifetime of friendship and service! To Leah and Anthony Epperly, thank you for welcoming me into your home and fostering a sense of belonging for me at Turning Point Church. Anthony, thank you for your prayers and words of wisdom, especially as I prepared for my oral comprehension exam. Your words and presence have had a lasting impact. You reminded me of Paul and encouraged me to forget what is behind me, reach for what is in front of me, and push through to finish the race that Christ designed for me. Thank you, Friend. To Turning Point Church, I could write on and on about the effects our Church has had on my life throughout this program. Thank you for entrusting me to serve, praying for me, and loving me. May God endlessly Bless our church and school. May we reach people across nations as we aim to serve His Kingdom.



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## **Chapter 1**

### **Achievement of Online School Students with**

#### **Specific Learning Disabilities**

Students with disabilities (SWD) comprise learners with a specific learning disability, autism spectrum disorder, intellectual or cognitive impairment, developmental delays, or other impairments that may hinder their learning or functioning (Grimsby, 2019). This study will concentrate on Students with Specific Learning Disabilities (SWSLD); however, much of the literature and law related to special education addresses all children with disabilities therefore it is critical we consider information relating to SWD in general as well as information specifically related to SWSLD.

Students with Specific Learning Disabilities comprise the largest group (38.64%) of all recognized categories of SWD within the population of students in the United States (U.S.) (Kim et al., 2019). Since the passage of Education for All Handicapped Children Act (EAHA) of 1975, the identification of SWSLD has increased by 100% (Kranzler et al., 2019). The definition of learning disability under the Individuals with Disabilities Education Act (IDEA) reflects a difference between the student's intelligence quotient (IQ) and achievement; however, this has been reconsidered for reasons due to evidence showing IQ-discrepant and low-achieving groups overlap and these characteristics alone make it difficult to differentiate cognitive versus behavioral characteristics (Kranzler et al., 2019). The reauthorization of IDEA in 2004 included changes in how SWSLD were identified, and therefore, defined. The addition of two alternate approaches, including response-to-intervention (RTI) and patterns of strengths and weaknesses (PSW), have shifted the basis of defining specific learning disabilities from below average IQ to weakness in certain cognitive areas leading to unaccountable academic underachievement

(Kranzler et al., 2019). At present, SWSLD are defined as students who do not meet state or national standards for specific cognitive areas such as reading, writing, and mathematics (Beasley & Beck, 2017; Grigorenko et al., 2020; Öğülmüş et al., 2021).

Difficulty in any of the three cognitive areas despite instruction denotes a specific learning disability (Kohli et al., 2018). It is noted that the number of SWSLD has decreased by about 12% over the past decade (Lopuch, 2018; Soares et al., 2018) due to improvements in instructional strategies and special education programming (Soares et al., 2018). Therefore, employing varying methodologies in educational and behavioral interventions for SWSLD allows educators to select the most appropriate and customized strategies for improving SWSLD achievement (Soares et al., 2018).

Student achievement has been defined in various ways within literature depending on educational goals (Ballafkih & Van Middelkoop, 2019). A prevalent, but narrow, definition of student achievement is the ability to display knowledge through standardized assessments. With the growing recognition of multiple intelligences (Gardner & Hatch, 1989), a broader definition of student achievement has emerged, recognizing personal growth, socio-emotional skills, behavioral improvements, and other forms of goal attainment (Ballafkih & Van Middelkoop, 2019). While educational goals may vary on an individual level, the general underachievement of SWD in these areas raises the concern of whether their educational needs are being met and how they can achieve their maximum potential (Hott et al., 2020). Huberman et al. (2012) have previously reported an increase in the academic performance of students with special needs after the introduction of inclusion, collaborations between general and special education teachers, professional development, and use of explicit instruction, which implies that high achievement among SWD is possible given proper supports throughout their education experiences. Further

evidence on achievement of SWD was found when teachers provided multimedia resources to students, resulting in increased science scores for SWD (VanUitert, et al., 2020). This finding implies improved achievement in the SWD population is also possible through the proper use of technological supports (VanUitert et al., 2020). Despite these developments, SWD continue to achieve significantly lower scores than their non-disabled peers, with national reports showing significant gaps in literacy achievement, among others, between SWD and their non-disabled peers (Lopuch, 2018).

Student achievement continues to be a popular indicator of the achievement gap between SWD and their non-disabled peers; however, most studies continue to use the narrow definition of student achievement relying heavily on standardized assessments (Ballafkih & Van Middelkoop, 2019). Standardized assessments are a common form of measuring academic progress in some states, primarily in the areas of English Language Arts (ELA) and mathematics (Goldman & Gilmour, 2021). Based on results from a meta-analysis of 23 studies examining the reading achievement of SWD and students without disabilities, Gilmour et al. (2019) highlighted the academic achievement gap as prevalent and, in some cases, the performance of SWD was 1.17 standard deviations below their non-disabled peers, which translates into three years' worth of reading growth. This gap raised an issue of whether SWD have appropriate access to the general curriculum and whether they receive proper accommodations for their special needs (Gilmour et al., 2019).

Despite the provision allowing SWD to take standardized tests according to accommodations listed in their Individual Education Plan (IEP), and with limitations to accommodations applicable to state-level assessments, schools across the U.S. have reported a significant discrepancy gap in performance between SWD and their non-disabled peers (National



Center for Education Statistics [NCES], 2017). In two states that represent the East and West coasts, gaps regarding the standard proficiency were reported as recent as 2019 extending up to 35% between SWD and students without disabilities (California Department of Education, 2019; New York State Education Department, 2019). In 2013, the National Assessment of Educational Progress (NAEP) reported reading and math performance outcomes of eighth graders across the nation. Only 18% of students without disabilities scored below the basic standard of proficiency in reading compared to an overwhelming 60% of SWD (National Center for Education Statistics [NCES], 2017). Overall, only 68.2% of students with disabilities in the United States graduated from public high schools during the school year 2018-2019, compared to the total graduation rate of 85.8% (National Center for Education Statistics [NCES], 2019). Like the graduation rate of SWD, SWSLD have a graduation rate of 69% (Cavendish et al., 2020).

Achievement gaps in the kindergarten-12<sup>th</sup> grade (K-12) system may have an impact on postsecondary or long-term life outcomes (Madani, 2019). Gaps were found between SWD and their non-disabled peers in terms of graduation from K-12 systems, postsecondary education, careers, economic stability, and community engagement (Davis & Garfield, 2021). Only 21% of working-age individuals with disabilities were employed compared to 59% of their non-disabled peers (Carlson et al., 2019). More specifically, 54% of working-age individuals with specific learning disabilities were employed, which is still less than the rate of individuals without disability (Davis & Garfield, 2021). The gap in household incomes reported by Carlson et al. (2019) also represent a significant disparity in economic stability between SWD and their non-disabled peers (see Table 1.1). Although previous perspectives regarding SWD were focused on employment after K-12 education and independent living, there has been a rising expectation surrounding postsecondary education for SWD (Carlson et al., 2019; Davis & Garfield, 2021). A

report from the National Longitudinal Transition Study 2 (NLTS2) indicated that college completion rates largely varied between SWD (41%) and their non-disabled peers (52%) (Davis & Garfield, 2021). Considering how noninstitutionalized adults with disabilities comprised a quarter (25.7%) of the U. S. population (Okoro et al., 2018), their poor life outcomes represent a considerable grim perspective for the students and their support and for society. If gaps between individuals with and without disabilities remain unaddressed, this sizeable part of the population may continue to live poorly and may not be able to contribute their potential to society. Reports displaying specific disabilities are limited as most researchers to date have only reported life outcomes of individuals with disabilities in general - some of these percentages are displayed in Table 1.1.

**Table 1.1**

*Life Outcomes*

	Individuals with disabilities						non-disabled
	learning disability	speech/ language impairment	intellectual disability	emotional disturbance	autism spectrum disorder	multiple disabilities	
College Completion	40.9%	43.8%	44.2%	35.1%	38.8%	42.1%	52%
Employment Rate				21%			59%
Income ≤ 15,000 USD				34%			15%

*Note.* Source (Carlson et al., 2019; Davis & Garfield, 2021; Lightfoot et al., 2018; Newman et al., 2011)

The gaps in life outcomes between individuals with disabilities, particularly learning disabilities, and their non-disabled peers may stem from the achievement gap when they were students (Carlson et al., 2019). While multiple factors are associated with the achievement gap between SWSLD and their non-disabled peers, four key areas, in association with each other, frequently appeared in existing literature as possible elements for SWSLD achievement. First,

the history of special education and teacher preparation, including significant legislations and policies, comprised key events that have shaped how SWSLD were educated historically, and is thus reflective of SWSLD student achievement (Blanton et al., 2018; Drawdy et al., 2014; Kim et al., 2019; Schneider, 2018). Second, the way general and special education teachers are prepared, trained, and licensed may also be a vital factor for how SWSLD are educated, and thereby also reflective of SWSLD student achievement (Boyd et al., 2009; Bruno et al., 2018; Byrd & Alexander, 2020; Gilmour, 2020; Park et al., 2018; Stockard, 2020; Young, 2018). Third, school factors, such as the online school system, curricula, and other supporting elements of special education may influence SWSLD education, and in turn, student achievement (Alvarado-Alcantar & Keeley, 2020; Couvillon et al., 2018; Crouse et al., 2016, 2018; Fitzpatrick et al., 2020; Khumalo et al., 2020; Mishra & Koehler, 2006; Tony, 2019). Fourth, the proximate relationships around SWSLD, including their teachers, peers, family, and other professionals, may also play a role in their education and post-secondary outcomes (Carlson et al., 2019; Crouse et al., 2016, 2018; Holm et al., 2020; Hott et al., 2020; Kang & Martin, 2018; Glover, 2019; Park et al., 2018; Tahir et al., 2019). Factors related to individual student characteristics and learning goals cannot be ignored; however, the ideal educational system is one wherein all students benefit from the established system as much as possible (Hott et al., 2020). Understanding these factors may help practitioners and policymakers to reach this ideal. These factors and how they relate to one another will be discussed in more detail in the literature review section.

Next to individual student characteristics, teachers' knowledge and practices were purported to be the largest influence in student achievement and is another potential factor related to SWSLD achievement (Park et al., 2018; Slanda & Little, 2020). Park et al.'s (2018)

systematic review of evidence indicated that positive teacher-student interactions, responsive teacher feedback, and provision of instructional and emotional support were related to the achievements of SWD. Teacher preparation, particularly in evidence-based strategies for teaching SWSLD, is important (Slanda & Little, 2020). Additionally, the relationship and communications between teachers and parents are important in keeping parents updated on their children's educational progress and establishing strategies for parents to support and encourage their child's educational experiences (Aktan, 2020; Crouse et al., 2016, 2018; Kyzar et al., 2019).

Legislation and policies over the years have shaped how SWD have been taught, and in turn, affected the outcome of their achievement. The purpose of educational policies is to improve the system of education in terms of access, quality, equity, efficiency, relevance, and cost (Madani, 2019). The *Brown v. Board of Education* case of 1954 became the precedent for legislative actions toward the aforementioned purpose (Cornett & Knackstedt, 2020). Subsequently, the Elementary and Secondary Education Act (ESEA) of 1965 was enacted, which not only provided more federal funds to improve access to and quality of education, but also led to further legislations involving education for SWSLD (Marion et al., 2020; U.S. Department of Education, 2015). The PL94-142, also known as The Education for All Handicapped Children Act (EAHCA) or Education of the Handicapped Act (EHA) of 1975, has affected the educational placement of SWSLD, and “won most SWDs access to schools” (Gilmour et al., 2019, p. 330). The PL94-142 was later reauthorized as IDEA in 1990, which focused on educational outcomes for SWD and provided greater access to free and appropriate public education (FAPE) (Gilmour et al., 2019; Hott et al., 2020; IDEA, 2004; Kim et al., 2019). These reauthorizations and other legislations are discussed further in the literature review, forming the history of special education, which is a potential factor for SWD achievement.

Teachers are the main instructors who directly serve to educate SWSLD (Park et al., 2018). How teachers are prepared, evaluated, and licensed may thus influence SWSLD education (Mishra & Koehler, 2006). Licensure for special education teachers differs by state, with 45 states currently offering standalone licensure for special education that does not require teacher candidates to be general educators (Sindelar et al., 2019). Preparation for special education teachers and for general education teachers differs in such states. In general, teacher preparation may involve content or/and pedagogical knowledge and skills development (Mishra & Koehler, 2006), with special education teacher preparation often involving more pedagogical knowledge, while general education teacher preparation involving more content knowledge (Crouse et al., 2016; Sheppard & Wieman, 2020). Furthermore, teachers continue to be unprepared to teach SWD in online settings (Archambault, 2011; Crouse et al., 2016; Dawley et al., 2010; Mishra & Koehler, 2006; Rice & Deschaine, 2020; Zweig et al., 2015). These aspects of teacher preparation serve as potential factors for SWD achievement.

Differences in terms of content knowledge and pedagogy are present not just in teacher preparation but also in curricula. As curricula are designed primarily for general education students without consideration for the needs and skills of students in special education, the placement of SWD within varying school systems represent another potential factor for their level of achievement (Crouse et al., 2016, 2018; Glover, 2019). Contemporary views on special education promote the principle of least restrictive environment (LRE), which is described as “the maximum extent possible a student can be educated with their general education peers” (Willis et al., 2020, p. 331). Although the concept of LRE and the practice of mainstreaming began with the enactment of the EHA in 1975, only students with mild disabilities were placed in general education, while students with moderate to severe disabilities continued to be educated in

segregated classrooms well into the turn of the 21st century (Harkins, 2012). In 2015, it was reported that 68% of SWSLDs were taught in the general education classrooms, which was a 57% increase from 1989 where only 11% of SWSLD were taught inside of general education classrooms (Gottfried et al., 2019). Furthermore, around 95% of SWD spent at least a portion of their school time within the general education setting (McCormack et al., 2018). Students with disabilities placed in the LRE spend more time being taught by general education teachers, who may not be prepared to meet their individual needs (Gottfried & Kirksey, 2020; McCormack et al., 2018). At the same time, SWD in the LRE have more access to the core curriculum, which may involve more content knowledge (Barrett et al., 2020). This placement gives SWD in LRE more opportunities to learn content that appears in state assessments, which reflects their academic achievement (Barrett et al., 2020).

The introduction of the online school system has brought additional challenges to SWSLD as these schools and educational leaders adjust to the new system where support to meet their diverse needs are not being fully executed (Alvarado-Alcantar & Keeley, 2020; Soria, 2020). In this study, the term *online school* is used to refer to K-12 online learning programs offered by an education-based organization that awards credits toward graduation or grade-level promotion where students physically attend school from home or a domestic or public location through a web-based platform (Beasley & Beck, 2017; Rice et al., 2015a). Teachers in online schools have an additional role of teaching SWD how to navigate the online school system and become familiar with instructional delivery models specific to the online setting (Alvarado-Alcantar & Keeley, 2020). Online charter schools are public schools of choice that often advertise offering an innovative and personalized learning experience for all enrolled students. However, existing research targeting the academic performance of students with disabilities

attending online charter schools highlights the shortcomings of student outcomes as opposed to the celebration of achieving the universal benefits intended, such as the adequate education progress for all and equitable accessibility for diverse learners (Ahn & McEachin, 2017; Carnahan & Fulton, 2013; Deshler et al., 2014; Rice & Deschaine, 2020).

Considering the achievement gap and poorer life outcomes of SWSLD, factors across several areas should be considered, including the history of special education and teacher preparation, teacher preparation and training at present, school factors including the online setting, and proximate relationships of the student such as teachers and families. The various legislations and events throughout history have shaped the way teachers are prepared and licensed, as well as how students are educated. The resulting educational system and teaching strategies are then utilized for the education and desired achievement of SWSLD. These factors serve as systems that could influence SWSLD achievement as discussed in the literature review section. This chapter serves as an introduction to the topic and problem of practice, as well as a review of the relevant literature to guide the rest of the study. The chapter proceeds with the following sections related to the problem of practice (POP): (a) program of practice statement; (b) theoretical and conceptual frames that ground the POP; (c) literature review that guides the POP; and (d) summary.

### **Problem of Practice**

Students with specific learning disabilities continue to be underserved in school settings, both online and in brick-and-mortar, as evidenced by the academic achievement gap between SWSLD and their non-disabled peers (Ahn & McEachin, 2017; California Department of Education, 2019; Carnahan & Fulton, 2013; Gilmour et al., 2019; Gulosino & Miron, 2017; Hott et al., 2020; Miron, 2016; Moore et al., 2018; New York State Education Department, 2019;

Soria, 2020). This problem is extended into their postsecondary education as there continues to be evidence of a difference in outcomes when comparing SWD to their non-disabled peers in attending college and gaining successful employment (Carlson et al., 2019; Davis & Garfield, 2021). While this study focuses on SWSLD, it is critical we consider information relating to SWD in general considering SWD is inclusive of SWSLD. Furthermore, there is limited research focusing on SWSLD compared to SWD.

As indicated by legislations since the ESEA, the goal for education has been to provide full educational opportunities to enhance each student's outcomes (Marion et al., 2020). Although individual goals of SWD may differ from those of their non-disabled peers, their education must meet the meaningful benefit standard to help SWD maximize their potential (Couvillon et al., 2018). The meaningful benefit standard should be adjusted based on students' individual potential and needs as indicated in the IEP to ensure significant learning rather than the bare minimum (Couvillon et al., 2018). This concept, alongside the gaps between individuals with and without disabilities, represent the issue of whether SWD are receiving Free and Appropriate Public Education (FAPE) and how their education, and subsequently their achievement, can be improved.

Little is known about the achievement and outcomes of SWSLD in virtual or online schools (Beasley & Beck, 2017; Rice & Dykman, 2018). From the scant available data, online schools, largely, have not improved the outcomes for SWSLD; rather, some evidence reports the problem as being exacerbated in the online school setting. Given the scarce empirical evidence related to students in special education attending online schools, it is important to consider information related to brick-and-mortar school settings. Regardless of school setting, there is also a dearth of evidence regarding the influence of teacher preparation and certification on the



achievement and outcomes of SWSLD (Gilmour, 2020). Lack of training for general and special educators has been observed in various studies (Crouse et al., 2018; Johnson, 2020; Oyarzun et al., 2021; Peterson-Ahmad et al., 2018). Limitations in the preparation and ongoing training of teachers to teach students in online school settings, and to teach SWSLD, compounds the issue of meeting the needs of SWSLD.

### **Theoretical and Conceptual Frames**

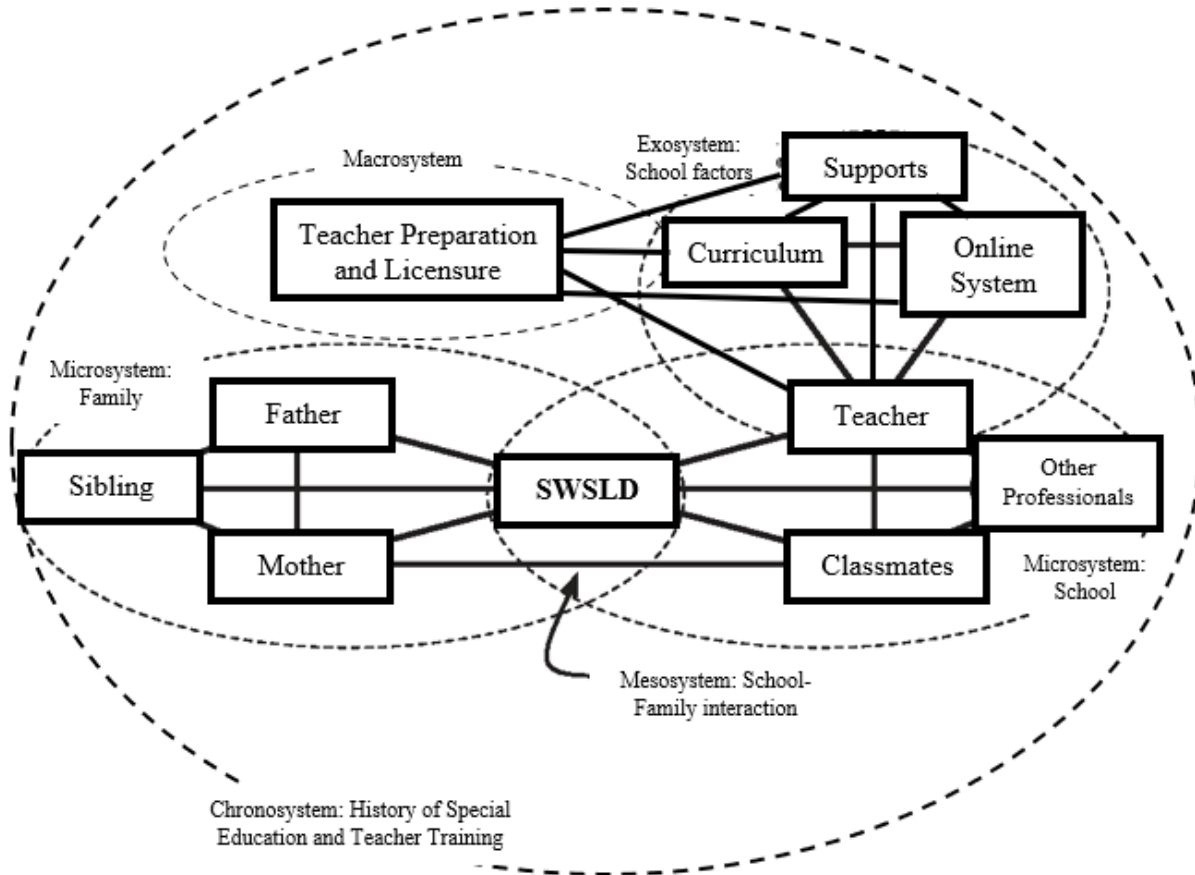
To ground the POP in a systems approach, the Networked Ecological Systems Theory (NEST), based on Bronfenbrenner's (1994) Ecological Systems Theory (EST), is used to describe the interconnections between environments and individuals and how these connections, within and across various systems, influence individuals' development (Neal & Neal, 2013). The essence of the NEST framework is to organize the connections between various environmental contexts and pave the way to describe the influence of social contexts on the developing person (Neal & Neal, 2013). Heterogeneity and intersectionality of various contextual factors that influence students' learning constitute the main tenets of EST, which means that different types of factors surrounding the individual interact with each other and with the central individual to influence their learning (Scholes, 2019). Bronfenbrenner (1994) theorized that a person's environment influenced their growth. The environment consists of five systems: *chronosystem*, *macrosystem*, *exosystem*, *mesosystem*, and *microsystem*. In Bronfenbrenner's EST, these systems were purported to be nested, with each system comprising a layer in concentric circles, however, Neal and Neal (2013) argued that a networked model more aptly described the complex and overlapping connections between the systems. For instance, in the nested EST, the family microsystem is portrayed as a subset of a larger exosystem around the central individual,

however, in the NEST model, the family microsystem is not necessarily part of exosystem such as the curriculum or the school system (Neal & Neal, 2013).

In this study, the developing persons are students with specific learning disabilities (SWSLD), attending online schools. People, events, or circumstances interact within each system and the actions within the system may then influence SWSLD achievement. The framework is illustrated in Figure 1.1 below. The dotted lines are the systems that include the settings, interactions, and patterns in the environment around the central individual. Within the dotted lines, each rectangle represents a factor, that are connected by bold lines portraying the interactions between these factors that influence SWSLD learning and achievement. Although the bold lines portraying the interactions are bidirectional, it is important to note that the ultimate destination is the central rectangle portraying the individual under study, which in this case are SWSLD. Further details regarding each factor within the framework are discussed in the literature review.

**Figure 1.1**

*Networked Ecological Systems Conceptual Frame for SWSLD*



It should be recognized that the theoretical frameworks (EST and NEST) used to guide the development of the above conceptual frame for SWSLD should not be generalized to apply to all SWSLD. For example, entities that comprise the microsystem for a SWSLD may not include the traditional influences, such as mother and father, rather it might be in-home service provider or just the father that influences the student within that system.

The chronosystem involves changes in social patterns over time that alter the design of ecological systems surrounding the individual, thus potentially impacting their development (Bronfenbrenner, 1994). In the EST framework, the factor of time is understood as changes not

only in the individual but also in their surrounding environment as well as the dynamic relationship between the individual's changes and the environmental changes such as changes in the school setting, evolving curriculum, evolving family dynamics and peer relationships (Olechowska, 2020). Although not included in Bronfenbrenner's original theory, he later added the chronosystem as he noted that individuals developed as they aged and that certain events influenced this development (Crawford, 2020). An example would be how the 9/11 attacks in the United States may have affected those who were born before and after the event regarding their understanding of terrorism and safety (Crawford, 2020). For the present study, the history of special education and teacher preparation, as well as the advent of online schools represent factors or patterns of the chronosystem that may be influential for SWSLD (Blanton et al., 2018; Kim et al., 2019). For example, the timing of the enactment of federal policies such as EAHCA, now IDEA, has had a positive influence on students' educational experiences overtime (Kim et al., 2019). Significant occurrences within special education and teacher preparation, such as the introduction and subsequent reduction of segregation, also influenced the development of SWSLD (Kim et al., 2019). As major and minor events occur around an individual, these may influence their development, including how they perform in school.

The macrosystem involves overarching social patterns including cultural beliefs, customs, bodies of knowledge, opportunity structures, or norms, among others, which are embedded into the various systems (Bronfenbrenner, 1994). These macrosystem factors are distant from the individual yet still influence their development through their interactions with the other systems (Neal & Neal, 2013). As an example of a macrosystem factor, educational leaders around the world have attempted to increase the quantity and/or quality of literacy in their curricula and assessment, which in turn, influenced students' learning and achievement

(Scholes, 2019). The content of teacher preparation programs, as a macrosystem factor, can shape future teachers' knowledge and practices in teaching SWSLD in terms of implementing the curriculum, and using necessary supports in their classrooms (Byrd & Alexander, 2020; Stockard, 2020).

The exosystem involves interactions between two or more settings wherein at least one does not comprise the central individual (Bronfenbrenner, 1994; Neal & Neal, 2013). This system comprises structures and operations that the individual indirectly interacts with through the microsystem (Bronfenbrenner, 1994; Scholes, 2019). Bronfenbrenner (1994) indicates three relationships within the exosystem that have been prevalent in child development research, which include the parents' workplace, family social networks, and neighborhood or community contexts. For instance, extended hours spent by a parent in the workplace could mean that they spend less time with their children (Crawford, 2020). In this scenario, although the child was not directly connected with the parent's workplace, they were still affected by it (Crawford, 2020). Other examples include local government initiatives or policies and local community structures (Scholes, 2019).

For the present study, the exosystem includes the Online School System (OLS), curricula, and other school factors that may influence the education and achievement of SWSLD (Fitzpatrick et al., 2020; Glover, 2019; Khumalo et al., 2020; Tonks et al., 2020). Neal and Neal (2013) indicated that although the student did not directly participate in the design of school factors in the exosystem, these factors influence the student's education and school experiences, including achievement. For instance, students may have difficulty adjusting the OLS, which may then reflect on their achievement (Khumalo et al., 2020; Soria, 2020). Notably, studies involving both the exosystem and macrosystem are relatively scarce compared to those involving the

microsystem and mesosystem (Neal & Neal, 2013). Although these systems are not directly connected with the central individual, they may still influence the individual through the microsystem.

The mesosystem involves interactions and processes that occurred between two or more settings involving the central individual in the microsystem (Bronfenbrenner, 1994; Scholes, 2019). Within this system, entities from the microsystem may either work with or against each other, and the results of such dynamics can affect the development of the individual (Crawford, 2020). Relationships within the mesosystem occur in two or more settings involving the central individual (Bronfenbrenner, 1994). A simple example of a mesosystem is the relationship between a student's home and school. Communications between parents and teachers comprise a mesosystem that could influence the student's education and achievement (Bronfenbrenner, 1994). Such relationships may not exactly include the central individual; however, these relationships work through the microsystem directly connected to the individual (Crawford, 2020).

Finally, the microsystem involves structures, activities, and relationships that the central individual directly experiences within their immediate environment (Bronfenbrenner, 1994). The microsystem involves the individual's direct interactions and experiences such as those that take place in school, with their families, and in their immediate neighborhood (Scholes, 2019). Although entities within the microsystem all directly influence the central individual, the extent to which each relationship influences that individual varies depending on their content and structure within the microsystem (Bronfenbrenner, 1994). For example, a family member who closely interacts with the individual may hold more influence than a classmate with whom the individual barely interacts. The relationships within the microsystem may also be either social or

symbolic such as the individual's personality or direct and regular interactions with the individual (Crawford, 2020). Regardless, interactions within the microsystem are vital toward the central individual's development (Crawford, 2020). The relationships between SWSLD, their teachers, peers, families, and other professionals or groups with whom they interact form the microsystems and mesosystems for the present study (Aktan, 2020; Carlson et al., 2019; Glover, 2019). These individuals or groups represent factors that directly interact with the SWSLD and with each other. The results of these interactions may then influence SWSLD achievement.

The NEST has received little attention in published journal articles, with only a few references in dissertations. In a dissertation regarding co-teaching English language learners with disabilities, Gonzalez (2017) emphasized the importance of collaborations between entities within the student's microsystem in relation to their achievement. More specifically, collaboration that was built on trust between co-teachers influenced teacher efficacy and reflection, which in turn reflected on improvements in students' English language assessments (Gonzalez, 2017). Although there is a dearth of published research regarding NEST, many researchers have utilized the more foundational EST in various studies regarding SWD (Greenboim-Zimchoni, 2020; Khumalo et al., 2020). In a case study of an individual with a learning disability, Greenboim-Zimchoni (2020) found the participant's childhood experiences influenced interactions amongst his peers. The participant illustrated through drawings how he/she always fell toward God during difficult experiences involving friends, teachers, and parents in school and at home. These findings represent the interrelationships between the macrosystem of religion, exosystem of social structures, and microsystems of his direct relationships. In another qualitative study, Khumalo et al. (2020) present the challenges of online schooling for SWD in terms of disconnecting the students from various systems such as lack of

human touch in their microsystem and poor pedagogy in their exosystems. These studies highlight the utility of the EST for understanding the interconnected factors that influence student development, learning, and achievement.

Overall, the framework for this study represents a complex web of various systems. Within and between these systems, teachers have multiple roles in promoting student achievement by maximizing the developments and innovations in education, curricula and support systems, and their relationships with the students, families, and other professionals. Learning about the networked relationships between and among entities in each system can provide a deeper understanding of factors that contribute to the academic achievement of SWSLD. The potential factors are discussed in the following literature review with consideration to the NEST.

### **Literature Review**

The following review of relevant literature is intended to provide a deeper understanding of the most salient factors impacting the academic achievement of SWD, with a focus on SWSLD, in the online educational setting. Factors representing the systems of the EST include chronological changes in education, teacher education and training, school factors including the online school system, and the proximate relationships of students. These factors are presented as themes in this section from the outermost NEST layer, the chronosystem, to the innermost layers, meso- and microsystem. It should be noted, most of the literature referenced in this section involve the brick-and-mortar setting due to the limited empirical evidence regarding the performance of SWSLD in the online setting.



## **History of Special Education and Teacher Preparation**

The history of special education and teacher preparation are factors representative of the chronosystem and pertinent to the present study and are presented in the subsequent sections. The chronosystem involves changes in social patterns over time that alter the design of ecological systems surrounding SWD and potentially impacting their development over time (Bronfenbrenner, 1994). Key events and periods in history have shaped the way SWSLD are educated at present, and thus represent potential factors for their achievement. Understanding the history of teacher education can allow for a deeper understanding of how far the field has come in improving the preparation of our teachers, the challenges that have been overcome, and the implications of the future of special education and teacher preparation. Accordingly, the potential factors for SWSLD achievement in this section include legislations, policies, and practices that took place in history, particularly within the United States.

Warren (1985) asserted that there is no true beginning to the history of teacher education. Nonetheless, other researchers have purported that special education in the United States may have emerged from the education of blind and deaf students during the 1800s (Kim et al., 2019), to residential institutions, to specialized institutions, to integrated support units, and finally to inclusive education (Blanton et al., 2018; Young, 2018). The Connecticut Asylum for the Education of Deaf and Dumb Persons, the Perkins Institution for the Blind, and the National Deaf Mute College were some of the notable institutions opened in the early 1800s, setting the foundation for special education (Kim et al., 2019). By the mid-1800s, there were an estimated seven million children attending school, however, teacher education had not yet been institutionalized (Warren, 1985). During these times, teacher preparation was almost nonexistent as no standards were set for hiring teachers (Schneider, 2018). The high demand for teachers

seemed to outweigh the focus on formally structured preparation and qualifications, which may have reflected on student achievement as a whole and impacted SWSLD achievement at that time. The establishment of institutions for special education, as well as the inadequacies of teacher education, serve as potential factors for SWSLD achievement.

In the 19<sup>th</sup> century, teaching was not considered a career nor did the title hold any prestige (Warren, 1985). Academic achievement was measured by how much information students could emulate and recite. Before pathways to certification were established, teachers were inducted with various backgrounds and qualification characteristics, and formal procedures were determined by the school (Warren, 1985). This lack of certification standards and formal procedures meant that employers relied on the most basic criteria for hiring teachers (Schneider, 2018). Aspiring teachers could simply rely on connections and influence to get the job. It was not until the dawn of the Civil War when teacher training programs became prevalent, but only with the goals of providing teachers with subject matter familiarity and knowledge regarding the recitation methods (Schneider, 2018). Such events have paved the way for teacher education and training, and thus serve as factors for SWSLD achievement.

Normal schools, as they were referred to at that time, for teachers came into existence in the 1860s, however, graduation from these schools was not a requirement for teaching (Schneider, 2018). Normal schools mostly took the form of private academies. These private academies benefited from training their students to teach using their specific principles and hiring them upon graduation. The upsurge of students being taught in public schools shortly after engendered the need for more professional training for teachers. This necessity brought on the establishment of different types of teacher training, normal departments within urban high schools, and the first teachers' colleges (Schneider, 2018). Although teacher education programs

became more prevalent, several states still did not require a four-year college degree for teaching (Shaughnessy & Code, 2015). Several states began requiring written examinations in various subjects such as reading and arithmetic to obtain certificates for teaching (Schneider, 2018). This eventual requirement of certification reflects the increasing value given to the field of education, thereby representing another factor for SWSLD achievement (Schneider, 2018).

The 20th century saw more developments in the field of education, and particularly special education. The *Brown v. Board of Education* case of 1954 served as a gateway for ending discrimination in education in terms of race, however, it was nearly two decades before children with disabilities could receive the same attention (Cornett & Knackstedt, 2020). The ESEA was enacted in 1965 as part of President Lyndon Johnson's War on Poverty, and provided federal funding to support education for all, focusing on children experiencing poverty (U. S. Department of Education, 2015). This initial effort focused on inputs for educational opportunities, thereby providing funds for schools with more students from low-income families (Marion et al., 2020). Although the literature does not report on the actual effects of this law on student achievement, it denotes an important step for recognizing the achievement gaps and the need for federal action to address them. During this period, teacher preparation programs were still lacking in terms of providing practical training and lesson plan preparation (Schneider, 2018). The licensure for general education teachers began in the 1920s and by 1954, the National Council for the Accreditation of Teacher Education (NCATE) was established to unify teacher preparation programs. The 1950s thus saw changes in teacher preparation by focusing on content-specific pedagogy, student language and culture, and the science of learning (Schneider, 2018), however, these changes still excluded special education teacher preparation. These

developments in special education law and teacher education serve as potential factors for lower SWSLD achievement.

The *Pennsylvania Association for Retarded Citizens v. Commonwealth of Pennsylvania* case of 1971, commonly known as PARC, and the *Mills v. Board of Education of the District of Columbia* case of 1972, commonly known as Mills, were pivotal cases for furthering the movement of full educational opportunities to include children with disabilities (Cornett & Knackstedt, 2020). The concept of FAPE, which involves the rights of children with special needs to receive education and other related services, was critical during this period (Couvillon et al., 2018). The PARC case involved 13 students with intellectual disability (ID), then considered uneducable, whose parents protested the state of Pennsylvania violated their rights by denying their children a free public education (Vishwanath, 2019). The court eventually ruled in favor of the plaintiffs and indicated that Pennsylvania's educational restriction was unconstitutional. The PARC served as a step to ensure that all children, regardless of disability status, were provided an opportunity to receive free public education.

Less than a year after PARC, seven students who were classified as having behavioral challenges were also denied education, leading to the Mills decision. The court also ruled in favor of the plaintiffs and ensured that all students were provided with free public education regardless of their disability status and ability to pay for the cost. Although these two cases were critical in providing free education for SWD, they did not specify what such education entailed (Vishwanath, 2019). Consequently, students who fell behind their peers in general standardized education, including students with cognitive, behavioral, physical, and sensory disabilities were segregated into special classes, which may or may not be appropriate for them (Kim et al., 2019). Inappropriate segregation may have negative achievement repercussions for SWD. These cases

have engendered changes in the field of special education, and thus serve as factors for SWSLD achievement.

During the 1970s and 1980s, preparation programs specifically for special education teachers emerged with the principle of teaching SWD in segregated classrooms (Drawdy et al., 2014), however, a debate soon arose on whether SWD should be placed in general education settings (Blanton et al., 2018). The EAHCA of 1975, or PL94-142, served as the first federal legislation to require the provision of FAPE to SWD (Kim et al., 2019). This legislation encouraged the placement of SWD in general education classrooms but did not immediately have the desired impact of inclusion of SWD alongside non-disabled peers (Gilmour, 2020; Kleinhammer-Tramill, 2003). General education teachers were still not considered as responsible for the achievement of SWD (Gilmour, 2020), rather, SWD were given an IEP that dictated their specialized instruction, and in turn impacted their achievement (Gilmour et al., 2019). Under the EAHCA, special education teachers provided interventions for SWD while the general education teacher mainly focused on educational content (Cornett & Knackstedt, 2020). Notably, this arrangement also led to attempts to increase collaboration between general education and special education teachers (Blanton et al., 2018; Drawdy et al., 2014). Such collaboration was reflected in some teacher preparation programs, beginning with the Dean's Grants Projects, which supported general teacher preparation that included working with SWD (Blanton et al., 2018; Drawdy et al., 2014). The EAHCA thus represents another significant factor that influenced SWD achievement through their placement in general education.

Another pivotal point in special education was the case of *Board of Education v. Rowley* in 1982, commonly known as Rowley (Couvillon et al., 2018; Henry & Johnson, 2018; Vishwanath, 2019). Before the Rowley case, previous rulings and legislations have failed to

specify what was meant by FAPE (Henry & Johnson, 2018). The need for further specifications was brought to attention when Amy Rowley, a kindergarten student with hearing impairment, was given an IEP that did not include the services of a sign language interpreter, which her parents requested (Couvillon et al., 2018). The parents thus filed suit, arguing that the denial of this service violated Amy Rowley's right to FAPE as she would not be on equal grounds as her non-disabled classmates (Couvillon et al., 2018). Although Rowley displayed above average performance in her class, her parents argued that she was not meeting her true potential (Vishwanath, 2019). The Supreme Court eventually ruled in favor of the school district, promoting the concept of the "basic floor of opportunity" for students (Couvillon et al., 2018, p. 291). This case led to the development of a two-part test to determine whether school districts provided FAPE with the criteria of (a) adhering to all procedural requirements dictated by the law and (b) developing a reasonable IEP that allowed students to receive educational benefit (Couvillon et al., 2018). Since the school district had provided enough support to allow Rowley to perform well, they satisfied the basic floor of opportunity for FAPE (Vishwanath, 2019). With this clarification of FAPE, the Rowley case represents a key event and factor that influenced the education and achievement of SWD.

The gap between general and special education remained wide even until the 1990s (Blanton et al., 2018; Gilmour et al., 2019). The PL101-476 or IDEA was first enacted in 1990 as a reauthorization of the EHA (Kim et al., 2019). The IDEA of 1990 promoted the LRE and included students with autism and traumatic brain injury. Transition-related services were also promoted in the IDEA of 1990 (Kim et al., 2019). The IDEA was later reauthorized in 1997 and then in 2004 to give a greater focus on student outcomes, particularly in the postsecondary level (Gilmour et al., 2019; Hott et al., 2020). Notably, the 2004 reauthorization of IDEA mandated

the transition planning for SWD to begin only at age 16, although several states maintained the previous requirement at age 14 or even earlier (Davis & Garfield, 2021). The IDEA and its subsequent reauthorizations are thus key events that have had positive influences on SWD education, ensuring equitable educational experiences for students with disabilities when their academic performance is determined to be adversely impacted by their disabilities.

During the 1990s, the use of technology in education was emphasized with projects such as Preparing Tomorrow's Teachers to Use Technology (PT3) (Blanton et al., 2018). The PT3 was allocated as much as 300 million USD from the federal government to increase efforts on the production of technologically literate teachers (Knezek et al., 2019). Guidelines for technology used were also published by the Association for Educational Communications and Technology during this time to encourage technological literacy in teacher preparation programs. These efforts emphasized the need for the integration of technology into teaching experiences (Knezek et al., 2019). Blanton et al. (2018) noted, however, that these technologies were allocated separately to general education and special education teachers without acknowledging some of these technologies can be used to support all students across settings. This left little room for collaboration between the two departments and technological tools were often viewed as optional tools to enhance teacher work in traditional school settings (Rice & Deschaine, 2020). Nonetheless, the introduction of technology could negatively or positively influence the achievement of SWSLD and therefore technologies are a factor related to the outcomes of SWSLD.

At the turn of the century, in 2001, the No Child Left Behind (NCLB) Act was implemented to emphasize schools' accountability in terms of student achievement (Gilmour et al., 2019; U.S. Department of Education, 2015). The aim of the NCLB was to identify and

address achievement gaps between students based on their subgroups such as race and economic status (Gilmour et al., 2019). Schools were then required to send 95% of students in each subgroup to join and perform well in state assessments to receive funding (Gilmour et al., 2019). The NCLB also mandated the use of evidence-based practices by teachers to improve student achievement (Heckaman et al., 2018). During this period, standardized assessments were mandated to hold schools accountable for student outcomes, however, SWD were mostly exempted from such assessments (Blanton et al., 2018; Gilmour et al., 2019). It was not until 2004 that special education teachers were required to have a level of content knowledge like general education teachers (Blanton et al., 2018). This development on accountability for students and teachers was critical to the evolution of SWD education and achievement.

The continued advancement of special education was interrupted by the teacher shortage in the 2000s (Peyton et al., 2020). During this time, certified special education teachers in the United States reached an estimated 340,000. The shortage of such qualified special education teachers was considered a setback in the education of SWD (Peyton et al., 2020). To compensate for the shortage of special education teachers, new graduate schools of education (nGSEs) were established in the 2000s (Carney, 2021; Cochran-Smith et al., 2020). These schools of education were defined as independent graduate schools that were not based in universities but were authorized by some states to award education degrees (Carney, 2021). Additionally, fully online teacher preparation programs were also established for a wider reach of teacher candidates. Fully online nGSEs involved a balance between the push to be innovative and the pull to be legitimate (Carney, 2021). The establishment of nGSEs, especially in fully online settings, have facilitated the training of more diverse and larger number of special education teachers, however, the literature lacks evidence on preparing teachers to teach SWSLD in an online setting.



Following the developments in special education and teacher training during the 2000s, the 2010s involved further legislation and policies to improve the field. The Every Student Succeeds Act (ESSA) of 2015 took the place of the NCLB and placed increasing importance on flexibility in terms of assessment structures and accountability goals, among others, to meet the needs of individual students (Slanda & Little, 2020). The main provisions of the ESSA included: promoting equity through critical protections for disadvantaged students; implementing high academic standards for all students in preparation for postsecondary education and careers; providing annual statewide assessments that would help to inform teachers, students, families, and the community regarding the high standards; supporting local innovations such as evidence-based and place-based interventions created by local leaders and teachers; sustaining and expanding historic investments toward high-quality preschools and; maintaining the expectations of accountability and action from low-performing schools (U. S. Department of Education, 2015). According to ESSA, alternative assessments should only be given to students who had significant cognitive disabilities, comprising around one percent of the student population (Gottfried et al., 2019). The ESSA also mandated the standard use of multi-tier system of supports (MTSS), otherwise known as response to intervention (RTI), which changed the way students were evaluated to be considered a SWD (Slanda & Little, 2020; U.S. Department of Education, 2015). Such changes in assessment and interventions for SWSLD were intended to have a positive impact on student achievement.

Recently, the case of *Andrew F. v. Douglas County School District*, commonly referred to as Andrew F., has brought about changes in terms of the standards for SWD achievement (Couvillon et al., 2018; Sayeski et al., 2019). Andrew was a fourth-grade student with autism and attention deficit hyperactivity disorder in the Douglas County School District (Couvillon et al.,

2018). His parents filed suit against the district, arguing that Andrew was not progressing both academically and functionally. The case was brought to the Supreme Court, which then held that an IEP must be reasonably planned to ensure appropriate progress to meet the requirements set by IDEA (Couvillon et al., 2018). As a result, the Andrew F. case has overtaken the Rowley case and created a new standard for FAPE that requires evidence of measurable progress (Sayeski et al., 2019). The Andrew F. case was monumental in emphasizing the need for each student to have an opportunity to meet challenging goals according to his or her individual level and potential (Couvillon et al., 2018; Sayeski et al., 2019). As such, this case also represents an important factor related to student achievement.

These legislations, policies, and other key events have shaped the history and present state of special education. Changes in laws from the ESEA to the ESSA have shown how schools and teachers have become more accountable for the achievement of SWD (Marion et al., 2020; Slanda & Little, 2020; U. S. Department of Education, 2015). Similarly, changes in how general and special education teachers were prepared have also shown the increase in collaboration and intersection between the two fields, which influenced how SWD were taught and assessed, thereby influencing their achievement as well (Blanton et al., 2018; Gilmour et al., 2019). Throughout history, these developments represent milestones that have shaped special education and teacher preparation. The state of teacher preparation programs and the various aspects related to the field are discussed in the following section.

### **Teacher Education and Training**

In this section, factors within the macrosystem of teacher preparation programs, which may indirectly affect SWSLD achievement, are covered. These factors include the knowledge and strategies taught in programs as well as the barriers for both general and special education

teacher preparation programs. Evidence directly connecting teacher training with student achievement is also presented in this section. As of this writing, both general education teachers and special education teachers are responsible for teaching SWD in the LRE (Byrd & Alexander, 2020). The concept of inclusion, which was “defined as serving students with various levels of abilities or disabilities in the general education classroom with in-class support” (Byrd & Alexander, 2020, p.73), is rampant within the present era. This concept means that all teachers, both general and special education teachers, are expected to be regularly trained and prepared to work with students with special needs (Byrd & Alexander, 2020). The concept of being prepared as a teacher has been described as possessing knowledge and skills regarding students’ needs and the tools necessary to fulfill those needs and improve student achievement (Grimsby, 2019). Both general and special education teacher preparation programs are covered in this section.

### ***Knowledge and Strategies Taught in Teacher Preparation***

The knowledge and strategies taught in teacher preparation programs are key factors that can determine how general and special education teacher candidates work with their future students, which could then influence SWSLD achievement. One of the foundational strategies taught in teacher preparation is identifying students who have special needs (Kranzler et al., 2019; Lopuch, 2018; Maki et al., 2020). Teachers are taught to use alternative approaches to evaluating students’ needs, such as the RTI and PSW (Kranzler et al., 2019; Lopuch, 2018; Maki et al., 2020). The RTI involves the use of tiered assessments designed to improve student achievement (Lopuch, 2018). Tier 1 involves the general curriculum for all students. Tier 2 involves evidence-based interventions and progress monitoring for struggling students. Tier 3 involves more intensive interventions for students with no significant progress (Lopuch, 2018). The PSW involves analyzing students’ cognitive patterns to determine their strengths and

weaknesses using either the discrepancy-consistency method, the concordance-discordance method, and the dual-discrepancy-consistency method (Kranzler et al., 2019). The basis for all three methods is to watch out for unexpected underachievement or weaknesses in at least one cognitive area (Kranzler et al., 2019). Notably, researchers have pointed to the disadvantages of RTI such as poor or late prediction of students with special needs (Kranzler et al., 2019; Lopuch, 2018; Maki et al., 2020). Inaccurate or late identification of SWSLD would mean that intervention would be late or lacking as well, which could exacerbate the SWSLDs' underachievement (Miciak & Fletcher, 2020). Based on the negative effects of poor or late identification, training and education regarding SWSLD is a potential factor for student achievement.

Despite the increased focus on inclusion, major distinctions remain between how general and special education teachers are prepared (Gilmour, 2020). Special education teacher candidates are prepared to teach a broad range of content and pedagogy (Gilmour, 2020), while general education teacher candidates have insufficient special education courses and experiences (Connor & Cavendish, 2020; McCormack et al., 2018). Although recent efforts have been made to improve collaboration and co-teaching between general and special education teachers, there is still a dearth of evidence on preparing teacher candidates for such collaboration (Ricci & Fingon, 2018). Furthermore, dual-certified teachers with both special and general education training remain scant (Gilmour, 2020). Certification for special education requires participation in certain teacher preparation programs, whether undergraduate, postgraduate, or alternative pathways (Young, 2018). Special education teacher preparation programs are guided by the Council for Exceptional Children (CEC) standards, highlighting the need to prepare teachers to teach various students across grade levels and subject matters (Bruno et al., 2018). These

standards include professional learning, deep understanding of each student's individual needs and development, knowledge of curricular and subject matter content, proper use of assessments, implementation of effective instruction, promotion of socio-emotional as well as behavioral growth, and professional collaboration (Bruno et al., 2018). These standards dictate the general areas tackled within special education teacher preparation programs, which notably lack specific content areas. These gaps in special education teacher preparation can translate into poor practices for future teachers, which then serves as another potential factor related to the achievement of SWSLD.

As aforementioned, general education teacher preparation programs tend to focus on content knowledge rather than pedagogy (Crouse et al., 2016; Sheppard & Wieman, 2020). Most general education teacher preparation programs only require one course of special education for teacher candidates (McCormack et al., 2018). This single course often involves general information regarding common disabilities, the history of special education, a general idea of explicit instruction and formative instructional practices, and identification of SWD (McCormack et al., 2018). The knowledge and strategies provided in general education teacher preparation programs have been cited as inadequate for meeting the pedagogical needs of SWD (Byrd & Alexander, 2020; Grimsby, 2019; Kang & Martin, 2018; Öğülmüş et al., 2021). Furthermore, the separation of general and special education teacher preparation has been a concern for the increasing number of SWD in general education classrooms. These inadequacies, during the present era of inclusion, could negatively impact SWD achievement.

### ***Teacher Shortages and Alternative Pathways***

Teacher preparation programs were established to produce knowledgeable and skillful teachers for diverse classrooms. Despite increasing attention given to special education over the

years, there continues to be a shortage of special education teachers in the United States (More & Rodgers, 2020; Peyton et al., 2020). An estimated 300,000 special education teachers are needed per year due to increased student enrollment, teacher attrition, and increased class sizes (More & Rodgers, 2020). Peyton et al. (2020) purported that special education teachers still received less favor compared to other careers with similar educational requirements due to the low salary. As such, fewer individuals are enticed to enroll in special education teacher preparation programs (Peyton et al., 2020). Castro et al. (2018) reported a ten percent decline in enrollment rates for teacher preparation programs overall from 2004 to 2012 in the United States, including both special and general education programs. The decline was especially significant in certain states such as California, with a 53% decline from 2008 to 2012. They further noted that schools experiencing teacher shortages displayed lower student achievement (Castro et al., 2018). Kotok and Knight (2020) likewise found that students from schools experiencing teacher shortages scored significantly lower in mathematics and science than those from schools that were well staffed. Considering these findings, teacher shortages may be a potential factor for student achievement.

Alternative teacher preparation (ATP) programs, alternative pathways, or alternative route programs were created to solve the problem of teacher shortages (More & Rodgers, 2020). Alternative pathways to teacher certification are referred to as programs that deviate from the *traditional pathway* to certification including programs that have reduced or altered standards for achieving certification and often enroll non-certified candidates with a non-education bachelor's degree leading them to eligibility for obtaining a teaching certificate (More & Rodgers, 2020). These programs are often shorter and center on field-based training wherein teacher candidates start to teach immediately upon entering the program (Bruno et al., 2018). The focus on field-

based training allowed teacher candidates to have hands-on experiences where they may apply their learning directly in the classroom (Whitford et al., 2018). Notably, the field of special education, which has more shortages, tends to have more teachers from ATP programs (Whitford et al., 2018). It may thus be vital for ATP programs to contain more knowledge and skills regarding working with SWSLD and SWD in general (Whitford et al., 2018).

Bruno et al. (2018) conducted a survey regarding perceptions of traditional and alternate routes of special education teacher preparation, including items measuring route undertaken, overall satisfaction with program, most useful course within the program, and the Council for Exceptional Children's (CEC) preparation standards. The sample comprised 465 pre- and inservice K-12 special education teachers from both public and private schools across the United States. Bruno et al. (2018) found no significant difference between traditional and alternate routes in terms of skill preparation for teachers to meet professional standards. In a meta-analysis of 12 quantitative studies, Whitford et al. (2018) found that students whose teachers took alternative pathways performed significantly better in English, science, and mathematics. Teach for America, an alternative pathway program for teachers, was especially noted as a significant factor for improving science and mathematics achievement (Whitford et al., 2018). In a descriptive study of smaller scale, Marder et al. (2020) found that ninth-grade students in Texas who had teachers from traditional certification programs performed significantly better in Algebra I than those who had teachers from alternative certification programs. Although the evidence comparing alternative to traditional pathways is still inconsistent, such pathways present an opportunity for inservice teachers, allowing them to learn from their own classes while undertaking their education, and presenting a plausible solution to teacher shortages (More & Rodgers, 2020; Whitford et al., 2018). Alternative pathways represent a viable option for

aspiring teachers to take without repercussions on student outcomes, and as a potential factor indirectly influencing student achievement by reducing teacher shortages (More & Rodgers, 2020). Unfortunately, not all teachers are aware of such opportunities or how they could benefit from these opportunities (Peterson-Ahmad et al., 2018).

### ***Barriers in Teacher Preparation Programs***

Whether traditional or alternative pathways are taken, teacher candidates may encounter several barriers within their preparation programs. The dearth of research supporting a single model for designing teacher preparation programs, particularly for online learning and for teaching SWD, is one such major barrier (Crouse et al., 2016, 2018). Although state and national standards exist for traditional brick-and-mortar educational settings, such standards may not be appropriate nor applicable to the online setting (Crouse et al., 2016, 2018). The lack of a single model for teacher preparation programs across states means that colleges and universities are mostly following the structure dictated by their state which presents a challenge for teachers to transfer skills across the states. Grimsby (2019) conducted semi-structured interviews, focus group discussions, a video-elicited interview, and observations with three teachers from a school district in Midwestern United States, and found that several programs, particularly in general education teacher preparation programs, were without preparatory methods courses for teaching SWD. These inconsistencies and deficiencies in preparation may influence the achievement of the teacher candidates' future students (Grimsby, 2019). To establish a clear model for teaching SWD in an online setting, more research and empirical evidence are needed.

**Scarcity of Key Topics.** A scarcity of key topics and areas in existing teacher preparation programs were also cited in the literature, including classroom management and family partnership skills (Kyzar et al., 2019; Peterson-Ahmad et al., 2018). Peterson-Ahmad et



al. (2018) conducted a mixed methods study to examine 164 preservice teachers' perspectives and experiences regarding professional development for special education. Classroom management, which is an essential skill for diverse classes, was found to be insufficient in both general and special education teacher preparation programs (Peterson-Ahmad et al., 2018). Classroom management has previously been linked to student achievement in middle school English and mathematics (Herman et al., 2020). Based on a quantitative survey study of 113 faculty members who taught special education teacher preparation programs across the United States, family partnership, which was recognized as important in research and policies such as IDEA and ESSA, was also found to be lacking in such programs, with educators expressing dissatisfaction with the minimal time and content dedicated to family partnership in their programs (Kyzar et al., 2019). There has been evidence highlighting the importance of family support for improving student performance, and in turn, achievement, which will be discussed in the section on proximate relationships (Glover, 2019; Lightfoot et al., 2018). Such gaps in teacher preparation programs represent significant barriers that may influence student achievement once they graduate and begin to teach (Kyzar et al., 2019; Peterson-Ahmad et al., 2018).

Teachers have also indicated the scarcity of preparation in the supporting elements and processes of school systems including the use of universal design for learning (UDL) and technology (Crouse et al., 2018; Estes et al., 2020; Johnson, 2020; Lightfoot et al., 2018; Oyarzun et al., 2021). The use of UDL and technology to support SWD learning was mandated by the U. S. Congress in 2016 (Estes et al., 2020). Kennette and Wilson (2019) collated evidence supporting the use of multiple means of representation and multiple means of action and expression, which are key tenets of UDL, related to improving student achievement. Lightfoot et

al. (2018) and Oyarzun et al. (2021) found that teachers and teacher educators were unfamiliar with the concept and principles of UDL. Lightfoot et al. (2018) conducted a scoping review of 44 articles examining perspectives and experiences of SWSLD, while Oyarzun et al. (2021) interviewed seven online teachers. Both Lightfoot et al. (2018) and Oyarzun et al. (2021) noted a significant inadequacy of UDL knowledge. Furthermore, Moore et al. (2018), who conducted a qualitative study on six faculty from public and private higher education institutions across the United States, noted that there was little evidence regarding how UDL is taught in teacher preparation programs. Failure to meet the 2016 mandate reflects poorly on such teacher preparation programs, and may carry on to the teacher candidates' practice, and in turn, their students' achievement (Lightfoot et al., 2018; Oyarzun et al., 2021).

**Technological Knowledge and Awareness.** In terms of technology, the emergence of K-12 online education represents another significant barrier in teacher preparation programs, which may influence SWD achievement as both teachers and SWD struggle to adjust to this new setup (Tonks et al., 2020). In Crouse et al.'s (2018) study, participants, who were online teachers, were unaware of assistive technologies aside from the usual technological supports used for general education such as PowerPoint and videos. Such assistive technologies have been found to improve students' academic performance in Tony's (2019) systematic review. Furthermore, the participants reported having little to no preparation for online teaching, and most of them were unaware of online teaching standards such as International Association for K-12 Online Learning Standards (Crouse et al., 2018). Unfortunately, the COVID-19 pandemic necessitated a sudden shift to the online setting, with repercussions on both SWD and teachers who may have been unprepared for such a shift (Jenkins & Walker, 2021; Khumalo et al., 2020; Putman & Walsh, 2021). In Jenkins and Walker's (2021) mixed methods study involving 111 stakeholders from

schools and school districts in Virginia, parents and teachers alike reported that they received no guidance on using technology, which led to students receiving inadequate special education services, such as speech therapy. The lack of or inadequate technological preparation in teacher preparation programs thus serves as a barrier, especially considering how quickly technological trends develop and become obsolete (Mishra & Koehler, 2006; Tony, 2019). Overall, these barriers serve as potential weaknesses of the teachers trained in these programs, which may influence achievement of their future students as discussed in the following subsection.

### ***Influence Toward Student Achievement***

Student achievement has been associated with teachers' appropriate training (Stockard, 2020). The evidence in this subsection is presented to display direct connections between teacher training or certification and student achievement. In Stockard's (2020) series of studies, they found students whose teachers had more training, those who had more time to rehearse lessons, and those who applied regular and consistent schedules all displayed higher achievement. More specifically, Gilmour (2020) has indicated that SWSLD benefited more from teachers with both general and special education certification. In their study, Gilmour (2020) measured academic achievement using end-of-grade assessments. Results revealed that SWSLD who were taught by dual-certified teachers had higher scores in English Language Arts compared to students who were taught by a general education-certified teacher. Dual certification is recommended to ensure that teachers were prepared with both content knowledge and pedagogical skills (Gilmour, 2020).

Practical knowledge and experience were particularly cited as beneficial for student achievement, especially in math and English Language Arts (Boyd et al., 2009; Park et al., 2018). Boyd et al. (2009) indicated that practical experiences during teacher preparation

provided teacher candidates with opportunities to practice what they learned in their own lessons. They found that teachers who made use of such opportunities during their preparation programs saw better student outcomes during their first year of teaching (Boyd et al., 2009). In another study, May et al. (2018) investigated the results of a pilot implementation of a service-based learning model used in secondary programming for SWD as part of a special education teacher preparation course with 42 preservice teachers. They found that preservice teachers who had preservice teaching experiences were able to produce higher quality lesson plans and transition plans (May et al., 2018). In addition to these opportunities, program coherence and support from supervisors was also purported to improve teacher readiness to teach SWSLD, thereby promoting their achievement (Gottfried & Kirksey, 2020).

The different types of knowledge and strategies taught in teacher preparation programs influence how teacher candidates can serve SWSLD in their future practice (Byrd & Alexander, 2020; Kang & Martin, 2018). For instance, Byrd and Alexander (2020) conducted a phenomenological study with 20 special education teachers to examine the skills and knowledge that special education teachers believed general education teachers would need to provide inclusive education for SWD. They found that the core knowledge of assessment and data-driven education, the key dispositions of being understanding and having compassion, the essential skills of adaptation of the curriculum and assignments, as well as communication with students' parents and other professionals, to be crucial in general education teacher preparation programs (Byrd & Alexander, 2020). Kang and Martin (2018) conducted a mixed methods study with 11 preservice teachers who had participated in a government-mandated course regarding special education in South Korea. Based on their results, the preservice teachers learned about identifying SWD's interests, learning abilities, and diverse characteristics, which they were able

to utilize in preparing the IEP and interacting with the students (Kang & Martin, 2018).

Considering the empirical evidence displaying the potential effects of teacher preparation on student achievement, the barriers discussed in this section hold some value in teacher preparation programs. Teacher educators and program designers should consider these aspects in redesigning programs especially considering the relatively novel online school systems, which is discussed as another potential factor in the following section.

### **School Factors**

In this section, the school factors within the exosystem are discussed. These factors include the online school system, the curriculum, and other supporting elements of special education. These functions within each system may also indirectly influence SWSLD achievement through their teachers.

#### ***Online School System***

Presently, the online school system is prevalent in the United States (Beasley & Beck, 2017). Beasley and Beck (2017) reported that 25 states had online charter schools and 21 states had state-run online schools, encompassing around 400,000 full-time online education students and around 2.25 million taking at least one online class at the K-12 levels. As mentioned, SWD constantly lag behind their non-disabled peers in terms of K-12 education and post-secondary life outcomes, including graduation rates and employment (Davis & Garfield, 2021; Lightfoot et al., 2018; Newman et al., 2011). However, as of this writing, there is no evidence in the literature regarding life outcome rates of SWD in online school settings. The present study will be used to provide more information to fill this gap.

Online instruction was purported to be substantially different from face-to-face instruction and would require teachers to explore new ways to engage their students (Khumalo et

al., 2020). Mishra and Koehler (2006) expanded Shulman's (1986) Pedagogical Content Knowledge (PCK) framework to include technological knowledge and how it relates to the other two aspects in their Technological Pedagogical Content Knowledge (TPCK) framework. As indicated in the TPCK framework, deep knowledge regarding the complex associations between technology, pedagogy, and content is necessary for teachers to deliver high quality context-specific content to students (Mishra & Koehler, 2006). Such complex instruction may increase the quality of learning, especially for SWSLD who may rely on their other senses to learn (Mishra & Koehler, 2006). These frameworks in addition to the integration of standards for online instructors (e.g., iNACOL) could guide teachers' educational practices, and in turn, improve student achievement.

Before the onset of the COVID-19 pandemic, online schools represented an option for SWD and their parents who sought alternative education that could meet the needs of the SWD where traditional schools have failed (Fitzpatrick et al., 2020). Although evidence on the difference in achievement between SWD attending online schools and those in brick-and-mortar schools are still lacking, researchers have indicated other benefits that may indirectly influence achievement (Fitzpatrick et al., 2020; Rice & Dykman, 2018). For instance, SWD and their parents alike have expressed satisfaction in terms of successful learning in the online setting (Rice & Dykman, 2018). Parents have also stated that online settings were beneficial in terms of promoting autonomy and providing a safe space for the SWD to practice their social skills (Fitzpatrick et al., 2020). The option of online schooling thus serves as a potential factor for SWD achievement.

It should be noted that the online school system also comes with disadvantages. Some researchers have indicated that the online setup may not be appropriate for the individual needs

for SWD and may negatively reflect their achievement (Fitzpatrick et al., 2020; Jenkins & Walker, 2021; Khumalo et al., 2020; Soria, 2020; Ziadat, 2021). In Soria's (2020) study, only 54% of SWSLD were able to adapt to the online setting, which was lower than the 67% of their non-disabled peers. Some students with physical limitations struggled with the increased virtual tasks. Students with disabilities also struggled with increased disruptions within their home environment, lack of quiet spaces to study, and long online lectures. These struggles with online education have led to increased reports of stress, anxiety, and depression in SWD as well (Soria, 2020). Ziadat (2021), further noted that online education could further aggravate SWSLD's social isolation and increase their dependency on gadgets, which may then lead to lower academic achievement. Considering these advantages and disadvantages, the use of online school systems may be a nuanced factor in SWSLD education and achievement and must be approached with care and thoughtful design.

### ***Curriculum and Supporting Elements of Special Education***

The curriculum and other supporting elements of special education, such as the IEP and assistive technology, serve as potential factors that teachers may utilize to influence SWSLD achievement. The curriculum serves as the overall guideline for teachers to use in their lessons (Glover, 2019). Although a well-designed curriculum could translate into high quality lessons, this is rarely under the teacher's control (Crouse et al., 2016, 2018; Glover, 2019). The issue of instructional freedom has served as a barrier for teachers even in traditional brick-and-mortar settings (Leko et al., 2018). The curriculum and lesson plans were often pre-made, and teachers simply had to adhere to them (Crouse et al., 2016, 2018; Glover, 2019). Some teachers from Crouse et al.'s (2016, 2018) qualitative studies involving interviews with six teachers described the curriculum as a script that they had to follow strictly, which gave them little instructional

freedom to practice what they have learned in preparation programs. It is important to note the participants taught different grade levels in various states, which meant that the case of having the curriculum as a script was not isolated to a single location. Furthermore, in Leko et al.'s (2018) study, the limitations on instructional freedom meant that the teachers engaged in 45% less word study, 19% less vocabulary, and 50% less comprehension instructions than teachers with more instructional freedom. Such limitations could leave teachers saddled with ineffective or obsolete curricula, which could then impact student achievement.

Another important supporting element is the Individual Education Program (IEP). In Hott et al.'s (2020) study, a lack of specialized instruction in the IEPs of students with mathematics learning disability was purported to have contributed to low outcomes and increased needs for basic calculation skills. The development of SWD's IEP should ideally include a collaboration of all professionals involved with the student's development as well as the parents/guardians (Couvillon et al., 2018). The case of Andrew F. has been used to demonstrate the need for collaboration as the SWD's family and other team members should agree on reasonable goals and measures for the SWD's IEP (Sayeski et al., 2019). In fact, family participation was cited as a key principle of IDEA (Kyzar et al., 2019). Although there is scant evidence directly connecting family participation in IEP to student achievement, the findings in Hott et al.'s (2020) study highlight the importance of a well-designed IEP, which parents, as close microsystems of the child, could contribute to.

The use of assistive technology was purported to support SWD achievement; however, it also largely depends upon the teachers' evaluations and administrative support (Alvarado-Alcantar & Keeley, 2020; Tony, 2019). In their study involving senior high school SWSLD, Alvarado-Alcantar and Keeley (2020) found that reading content materials in the online setting



without assistive technology was a major issue that reduced the SWSLD access to education. The participants indicated that read-out-loud assistive technology would have been helpful for their lessons (Alvarado-Alcantar & Keeley, 2020). Availability and proper use of assistive technology may thus be a factor used to influence student learning, and in turn, their achievement.

Assessment is another vital factor under the school systems that could influence SWD achievement (Beasley & Beck, 2017; Grigorenko et al., 2020). Continuous formative, diagnostic and summative assessments are deemed necessary to practice differentiation and determine SWD's learning profiles, readiness, skills, interests, and levels of understanding (Beasley & Beck, 2017). Teachers should also use assessment data to shape their interventions (Grigorenko et al., 2020). Unfortunately, the hectic schedule of teachers often means that they have little to no time to consistently assess SWSLD and monitor their progress (Kranzler et al., 2019). This was especially true in online classes with large enrollments (Keeseey, 2020) or multi-level special education classes (Young, 2018). As a tool for understanding students, modifying interventions, and serving as a direct measure of student achievement, assessments may indeed be a significant factor for SWSLD achievement.

Overall, school factors which are not directly related to the student may still hold value over their learning and achievement. The online school system, the curriculum, and other supporting elements of special education represent factors within the exosystem which may indirectly influence SWSLD achievement through the way they are implemented and adapted by teachers. The following section is a more microscopic look at the proximate relationships around the SWSLD, which are potential factors that may influence their achievement.

## **Proximate Relationships**

As part of the microsystem of SWSLD, teachers play a large role in student development and achievement (Glover, 2019). Some SWD have indicated that support from their teachers is vital for their learning (Connor & Cavendish, 2020; Lightfoot et al., 2018). Supportive instructors were described as those who provided individualized instruction, built rapport with students, listened attentively to their problems, demonstrated knowledge regarding students' disabilities and possible accommodations, and were accessible and available (Connor & Cavendish, 2020; Lightfoot et al., 2018). Aside from these traits, teachers' expectations, knowledge, skills, and collaboration with others may also serve as factors for SWSLD achievement.

Teachers' expectations and classroom management skills are critical in terms of shaping their interactions with SWD, and subsequently, with student achievement (Carlson et al., 2019; Kang & Martin, 2018; Park et al., 2018). Based on interobserver data showing improvements for SWD, teacher candidates who relied on evidence-based strategies and implemented them with fidelity were able to positively influence students' learning, particularly in the technical field of special education (Heckaman et al., 2018). Furthermore, teachers' practice of classroom management techniques such as spending more time orienting SWD or following clear and precise routines and plans was related to improvements in certain areas of student achievement such as reading (Park et al., 2018). Alternatively, teachers who lacked knowledge and awareness of disabilities were less supportive and made less efforts to meet the needs of SWD (Lightfoot et al., 2018; Olechowska, 2020; Sheppard & Wieman, 2020). For instance, general education teachers in Olechowska's (2020) study mostly relied on support teachers to provide pedagogical assistance to meet the needs of SWD.

Collaboration between teachers, as well as with other professionals was cited to be beneficial toward SWD in terms of finding innovative strategies and consistent updating and planning (Carlson et al., 2019; Crouse et al., 2018; Davis & Garfield, 2021; Tahir et al., 2019). Collaboration was deemed especially helpful in transition planning as other professionals could contribute toward suggesting agencies that could meet SWDs' needs (Carlson et al., 2019; Davis & Garfield, 2021). Unfortunately, teachers have neither time nor opportunities for such collaboration (Crouse et al., 2018; Grimsby, 2019). As a potential factor for student achievement and postsecondary outcomes, more attention should be given to collaboration between professionals to ensure that the students receive the accommodations they need.

Interactions with non-disabled peers also represents a microsystem factor for the development of SWD (Crouse et al., 2016, 2018; Holm et al., 2020). Some SWD may have more gratifying experiences in self-contained classes with peers sharing similar characteristics rather than inclusive classes where they may compare themselves to non-disabled classmates (Holm et al., 2020). In their study on eight-grade students receiving special education supports, Holm et al. (2020) found that students receiving special education support in general classrooms felt significantly less enjoyment and pride, and more anger, anxiety, shame, and hopelessness compared with their peers in self-contained classrooms. Furthermore, the classroom-level experiences for students with disabilities were considerably related to unpleasant emotions such as anxiety, boredom, and hopelessness in general classrooms with higher proportions of students receiving special education support. Holm et al. (2020) asserted that students with special education program support may compare themselves to their classmates in the general classroom setting, thus eliciting negative emotions. At the same time, teachers recognized the need to

provide SWD with opportunities to work with their non-disabled peers (Crouse et al., 2016, 2018).

Communication with SWD's families was deemed important to ensure that the families are continuously updated with the student's progress and informed about ways that they could support the student from home (Aktan, 2020; Glover, 2019; Kyzar et al., 2019). Parent involvement was particularly cited as a key factor for student achievement as parents typically provide invaluable input regarding the SWD (Hott et al., 2020; Tahir et al., 2019). Unfortunately, parents of SWSLD may face several challenges including insufficient knowledge regarding effective strategies for supporting SWSLD, the emotional burden of caring for SWSLD, and the financial strain of providing for SWSLD (Ziadat, 2021). Teachers have indicated that dysfunctional families represent a great hurdle for student outcomes (Young, 2018). Some researchers have also indicated that a lack of support could lead to greater independence and personal strength for some SWD (Avnet et al., 2019; Lightfoot et al., 2018). Familial involvement may thus be a nuanced factor for SWSLD achievement.

The possible influence of teachers, families, and peers, as well as their interactions with each other, represents the microsystem and mesosystem that could either enhance or disrupt SWSLD achievement directly. Together with the exosystems, macrosystems, and chronosystems previously discussed, these systems and their interconnections represent the possible ways that teachers and their preparation may influence student achievement. Overall, the overlaps and intersections between these systems, such as how teacher preparation programs could enhance teachers' support for their students, display the networked Ecological Systems (EST) that guides the present study.

## Summary

Possible factors that may influence the achievement of SWSLD have been described in the literature review and led to the stated Problem of Practice (POP). Factors within the chronosystem were discussed to show how historical events, legislation, and policies regarding special education play a role in how SWSLD are educated and assessed, which in turn may influence student achievement. The development of teacher certification has allowed more rigorous training for aspiring teachers, which affected their teaching styles, and in turn, the performance of their students (Schneider, 2018). Cases such as PARC, Mills, and Rowley were crucial in advancing FAPE, allowing more educational opportunities and greater achievement for SWD (Cornett & Knackstedt, 2020). Reauthorizations of IDEA (1990, 1997, 2004) and the NCLB (2001) as well as ESSA (2015) allowed even more equitable educational opportunities for SWD, thereby improving their academic performance (Kim et al., 2019). The introduction of technology in education was a precedent for the use of assistive technology and online education, which are also factors in the exosystem that influence student achievement (Blanton et al., 2018; Knezek et al., 2019). Another factor was the advent of nGSEs, which led to a more diverse and larger number of special education teachers who were responsible for SWD achievement (Carney, 2021).

Teacher education and training served as factors of the macrosystem that may influence SWSLD achievement through the knowledge and experiences used to prepare their teachers. Student identification strategies were used to promote early and appropriate intervention for SWD (Lopuch, 2018). In contrast, the gap between special and general education teacher preparation led to poor practices in managing SWD, which could influence student achievement (Bruno et al., 2018). Teacher shortages in the United States were also deemed a potential factor

as they directly influenced student achievement (Castro et al., 2018; Kotok & Knight, 2020). As a solution to teacher shortages, ATP were established, and researchers have linked these programs to science and mathematics achievement (Marder et al., 2020; Whitford et al., 2018). The scarcity of key topics, such as classroom management (Peterson-Ahmad et al., 2018), family partnership (Kyzar et al., 2019), UDL (Lightfoot et al., 2018; Oyarzun et al., 2021), and technology (Crouse et al., 2018) in teacher preparation programs were deemed as potential barriers that negatively influenced SWD achievement.

School factors, including the online school system and supporting elements of special education, represented the exosystem, which may indirectly influence student achievement through the way that teachers implemented them. The online setting was considered a safe space for SWD's social skills, which may be part of their individual goals (Fitzpatrick et al., 2020). Contrastingly, the adjustment needed for online education was considered a barrier for some SWSLD (Soria, 2020). Limitations on teachers' instructional freedom translated into fewer evidence-based practices, which could influence student achievement (Leko et al., 2018). Proper use of assistive technology was cited as another potential factor for SWD achievement as such devices helped the students learn (Alvarado-Alcantar & Keeley, 2020). Lack of time for assessment was yet another factor that prevented monitoring of student progress and using data to shape interventions, which in turn, could negatively influence SWD achievement (Keesey, 2020; Kranzler et al., 2019).

Teachers, peers, and families represented the microsystem, while their interactions represented the mesosystem, both of which could influence SWSLD achievement through their support or lack thereof. Teachers who used evidence-based strategies and classroom management techniques were found to be related to improvements in student learning

(Heckaman et al., 2018; Park et al., 2018). Collaboration between teachers and with other professionals also positively influenced student achievement (Carlson et al., 2019; Crouse et al., 2018; Davis & Garfield, 2021; Tahir et al., 2019). Parent and family involvement in SWD education were found to positively influence SWD achievement as well (Aktan, 2020; Glover, 2019; Kyzar et al., 2019). The interplay of these factors and their influence on SWSLD achievement could serve as bases for reducing underserved SWSLD in education.

In online schooling, it is crucial that teachers have technological knowledge and skills to effectively teach all students (Archambault, 2011; Koehler, 2006; Koehler & Mishra, 2009; Smith et al., 2016). Modifying and accommodating the needs of SWSLD are essential practices of all teachers. Online teachers' knowledge, practices, and attributing sources may be contributing to the low academic performance and life outcomes SWSLD in nine online schools on the West coast of the United States. State evaluative processes have identified SWD as a population in need of administrative attention related to programmatic efforts for improving student outcomes. A needs assessment that analyzes the technological knowledge, practices and preparedness of online teachers has the potential to aid in program improvement strategies.

## **Chapter 2**

### **Empirical Examination of the Factors and Underlying Causes**

After completing preservice programs, online teachers are not equipped with technological knowledge and pedagogy to teach students with disabilities online (Archambault, 2011; Crouse et al., 2018; Mishra & Koehler, 2006). Teachers report receiving consultation from administrators (Rice, 2017). Technological skills infused with pedagogy are crucial for teaching in K-12 online learning environments, especially for the benefit of diverse learners (Archambault, 2011; Black et al., 2009; DiPietro et al., 2008; Mishra & Koehler, 2006). General and special education teachers are accountable to adapt their curriculum, instructional strategies, and assessments to effectively teach students with disabilities. Students with Specific Learning Disabilities (SWSLD) spend the most time in general education learning environments, when compared to other students with disabilities. Traditionally, international classification guidance has led educators around the world to identify SWSLD using an ability-achievement discrepancy model where assessment and performance data indicate the absence of a cognitive impairment (ability) and presence of poor academic performance (achievement) (Buttner & Hasselhorn, 2011; Cottrell & Barnett, 2017; NCIS, 2017). However, existing gaps in performance can be closed or narrowed. Therefore, it is important that future research studies focus on examining the technological knowledge, practices, and preparation of online teachers. Teachers remain one of the primary connections to students and when considering how to improve academic outcomes for SWSLD, their knowledge, practices, and preparation are vitally important.

### **Description of Context**

This needs assessment is situated across 13 online middle schools. These schools are public independent study charter schools that are supervised by local traditional public-school



districts. Students are welcome to enroll at any time during the school year and once enrollment is approved, they are assigned a start date that falls within an open-enrollment window. Like in traditional school settings, attendance is a crucial part of schooling. Students are required to attend a specified number of *live* sessions. Live sessions are classes that take place at a scheduled time in an online learning platform where a teacher(s) and students participate. Time spent by students outside of live class sessions must be tracked on a *work log* and submitted by their respective learning coach/adult-student to count toward attendance. Physical attendance is not required unless the state mandates it, such as for annual state-wide assessments. Jake Online Schools (JOS - pseudonym) were established in 2002. The current Head of Schools (HOS) has served in this role for 11 years. The administrative structure of the middle schools includes: one HOS, which is the same for the elementary and high schools; 10 directors, three of whom are special education directors, who support school levels kindergarten through 12<sup>th</sup> grade; three principals; one special education program specialist; nine lead teacher leaders; four instructional coaches; and about 136 full-time teachers. Many teachers are members of the first ever virtual education union in the state of California.

All names referred to in this needs assessment, including school names, are fictitious to protect the anonymity, autonomy and privacy of respondents, school staff, and families affiliated with these online middle schools. Furthermore, middle school teachers who chose to participate in the survey used in this needs assessment, volunteered to do so and their names were not revealed to the researcher.

The current state of education in the Spring of 2020 is worth noting. In the latter half of 2019, there was an outbreak of a coronavirus in Wuhan, China, which was later named COVID-19. Shortly thereafter, the virus spread to the United States, with the first case identified on

January 21, 2020. In March of 2020, the United States declared the spread of COVID-19 a pandemic (Centers for Disease Control and Prevention, 2020). This pandemic impacted people across the world in a variety of ways, with one way being noteworthy with respect to this research. For the first time in U.S. history, schools across the nation, higher education institutions and K-12 institutions alike, closed their doors to prevent the spread of the virus, forcing students to be without access to traditional ways of schooling in brick-and-mortar settings. This pandemic created challenges for SWSLD students attending online schools: Siblings who usually attend a brick-and-mortar school are now sharing their space during the day, parents may be financially struggling from being laid off, or may be facing some other economic impact due to the pandemic. During the nationwide school closure, many online teachers had to deal with teaching and taking care of their children who typically would have been attending school in a brick-and-mortar setting.

### **Background and Statement of Existing Gaps**

Students with disabilities under-perform academically when compared to their same-aged non-disabled peers attending brick-and-mortar and online school environments (Ahn & McEachin, 2017; Carnahan & Fulton, 2013; Deshler et al., 2014; Gulosino & Miron, 2017). Brick-and-mortar and online classrooms typically serve as a primary space for students to engage in curricular academic experiences. Evidence suggests that online teachers lack preparation to teach in K-12 online environments, thus lacking knowledge and practices needed to teach students with disabilities (Crouse et al., 2016).

Thirty-six percent of teachers at a Midwestern virtual school identified accommodating different learners as an area of need for professional development (Black et al., 2009). The following year, in 2010, evidence from another study suggested that almost two-thirds of

participating teachers identified *meeting the needs of student with disabilities in the online classroom* as the highest area of need for further training (Dawley et al., 2010). An analysis of professional development (PD) offerings from the California Department of Education, sought to discover resources that mentioned *online, blended, or digital learning environments* and only a few of the resources found on the state website used these terms and none of them mentioned students with disabilities (Rice & Ortiz, 2016). Like national trends, several K-12 online schools in California lack the technological knowledge, practices, and preparation essential to improving academic outcomes for students with SLD.

A review of the literature revealed a dearth of empirical research on evidence-based technological pedagogical practices related to teaching students with disabilities in an online setting and none of these studies focused on students with SLD, even though this population of students most often spends most of each school day in general education. SWSLD are among the largest population of students with disabilities that participate in general education. More research studying online teachers' knowledge and pedagogical practices is needed to better understand best practices and improve academic outcomes for students with disabilities (Crouse et al., 2016; Crouse et al., 2017; DiPietro et al., 2008; Vasquez & Serianni, 2012).

### **Technological Pedagogical Knowledge – TPACK Framework**

In 2006, the technological pedagogical content knowledge (TPACK) framework encouraged the integration of technology into methods of teaching and considering how learning is impacted by the infusion of technology. Shulman (1986) describes pedagogical content knowledge as teaching methods and practices applicable to teaching a specific content area. This research will use Koehler and Mishra's (2006) expanded framework with respect to Shulman's (1986) foundation of pedagogical content knowledge. When studying a population of general

and special education teachers that explicitly teach online, and given that content knowledge will vary across teachers, it seems appropriate to first focus on learning more about their knowledge of technological pedagogy for teaching students with learning disabilities. The aim of this needs assessment is to explore available data on the knowledge, practices, and preparation of online teachers to teach students with learning disabilities and are therefore disabled by their learning environment.

### **Methodology**

Engaging in a quantitative study design provides the opportunity to gain an understanding of factors that may be contributing to students' academic performance. General and special education teachers' technological pedagogical knowledge and practices were examined as well as the experiences and preparation that informed their knowledge and practices were considered. These three constructs were measured using a survey that intended to measure the technological pedagogical knowledge, sources of knowledge, and practices of online special and general education middle school teachers. Including demographic items on the survey allowed the researcher to analyze differences between participants. The survey data is intended to reveal information about the current constructs through teachers' perception. Analyzing survey data in this needs assessment includes analysis of descriptive statistics (Lochmiller & Lester, 2017), testing assumptions of equal variance and conducting a *t*-test analysis to compare mean scores based on teachers' years of experience. Testing assumptions of equal variance will be done conducting the Levene's test which tests whether the variances of two samples are approximately equal. Acceptance of the null hypothesis would indicate there is no significant difference in the average responses from respondents based on their years of teaching experience. Rejection of the null hypothesis and acceptance of the alternative hypothesis would indicate there is a significant

difference in responses based on teachers' years of experience. Furthermore, failure to reject the null hypothesis allows the researcher to assume equal variance and supports and therefore meets the assumptions of conducting a *t*-test analysis, which is a form of inferential statistics. The *t*-test is used to examine the differences between the knowledge, sources of knowledge, and practices of teachers with two or less years of experience compared to that of teachers with three or more years of experience as well as potential differences between general and special educators. The null hypothesis assumes that the average score of responses from teachers with less than three years of online teaching experience is like the average response of teachers with three or more years of online teaching experience. The alternative hypothesis would assume there is a difference in the average scores when comparing these two groups. Regarding the analysis of general educator responses compared to special educator responses, the null hypothesis would assume no significant difference while the alternative hypothesis would assume a significant difference.

### **Description of Population**

The population of interest includes teachers, both general and special education who teach in online schools. The researcher has access to middle school teachers that work across nine online schools, regionally located across the state of California. Middle school years are crucial in a child's educational experience leading into the high school transition and young adult years. There are approximately 115 online middle school general education teachers and 22 special education teachers, with three of the special education teachers being contractors (not employed by our schools). Teachers who are not employed by any of our nine online schools will not be invited to participate in this study. There is a range in years of online teaching experiences and variance in pre-training experience among this population. Teachers have formal

education ranging from bachelors to doctoral studies. There are male and female educators included in this population.

### **Participants and Sampling**

All online full-time middle school teachers included in this needs assessment are full-time employees of Jake Online Schools and are credentialed by the state of California.

Participants were emailed inviting their voluntary participation in the study. The description included an informed consent letter (Lochmiller & Lester, 2017), a description explaining their participation will be anonymous, the purpose of the study, and the time frame for which the survey would be accessible to them (Appendix, A). The researcher had access to teachers assigned to grades K-12, however, the researcher was aware the middle school population of teachers experienced a higher level of staff and student turnover when compared to that of the elementary and high school levels. Furthermore, middle-school age students are at a critical stage in development therefore determining the needs of these teachers' as it relates to teaching SWSLD in online schools has the potential to inform an intervention that aims to improve academic outcomes for middle school-aged students attending online schools.

Purposeful sampling involves the researcher intentionally selecting a specific individual or group of individuals to invite as participants (Lochmiller & Lester, 2017). It is also known as a form of nonprobability sampling because this form of sampling is based on the research aim, availability of participants, and the subjective judgement of the researcher (Pettus-Davis, 2011). Although the researcher had access to teachers in elementary, middle, and high school, the researcher chose to study middle school teachers due to the likelihood teachers at the various school levels may have differing experiences. Focusing only on grades 6-8 allows the researcher to learn the needs of this group of teachers. It is possible that findings from this needs assessment

analysis may be applicable to the needs of elementary and high school teachers working at Jake Online Schools. The potential opportunity to generalize results is described by Palinkas et al. (2015) as an element of the purposeful criterion sample strategy.

## **Instrumentation**

### **Survey Instrument**

For this needs assessment, the researcher amended an instrument (Appendix B) originally created by Crouse et al. (2016). The original survey was created to study teachers' knowledge, practices, and sources of knowledge. The researcher also required the collection of demographic data about the participants in addition to learning about their current knowledge, practices, and the source of their knowledge (preparation) – the experiences that they attribute to their current practices. Surveys have been referenced as being an effective measure for analyzing teachers' pedagogical practices (Desimone & Le Floch, 2004). This needs assessment includes the adoption and amendment of the amended survey. Dr. Rice expressed her support of this tool being adopted and amended for this needs assessment. Amendments made to the survey consider the work of Archambault (2011), Mishra and Koehler (2006), Rice (2017), as well as unique information about the population under study. The survey instrument used in this needs assessment uses the constructs studied by Rice et al. (2016) as the foundation for the constructs studied herein which include the study of online teachers' knowledge, practices, and sources of knowledge. Amending this survey involved amendment of the original constructs studied to infuse the idea of technological pedagogical knowledge as put forth by Mishra and Koehler (2006). Mishra and Koehler (2006) present a framework integrating technology among the relationships of content knowledge and pedagogical knowledge. Technological pedagogical knowledge involves the existence of various technologies used in teaching and learning

environments (Mishra & Koehler, 2006). Archambault (2011) described the results from a K-12 survey that studied online teachers across the nation analyzing their preparedness as it relates to the domains of Mishra and Koehler's (2006) TPACK framework. Overall, teachers indicated a lack of preparedness in the areas of technological pedagogical knowledge, technological content knowledge, and technological pedagogical content knowledge. This study will focus on technological pedagogical knowledge.

### **Cognitive Interviews**

Cognitive interviews were conducted as part of the survey amendment process to improve validity and reliability. The two cognitive interviews conducted allowed the researcher to consider teachers' perception of the survey items and improve those items after feedback.

### ***Cognitive Interview Analysis***

Considering that the original validated instrument was modified to fit the needs of the study, additional steps were needed to establish reliability and validity of the modified instrument. To establish some validity, cognitive interviews were conducted with two teachers. Cognitive interviews are a qualitative method used to deeply analyze survey instruments in effort to improve validity and reliability of the study tool (Desimone & Le Floch, 2004). Desimone and Le Floch (2004) describe participants' interpretation of survey questions as a matter relevant to validity and reliability, urging researchers to consider cognitive interviews as a method for attempting to improve survey instruments before study implementation. Attempts to improve the validity of a survey will have the potential to yield higher quality data.

To improve the survey tool used in this needs assessment, the researcher conducted two cognitive interviews with teachers like those that would be included in the study population: (a) a special education teacher and (b) a general education teacher. The special education teacher



identifies as a female and the general education teacher as a male. Jan (pseudonym), the special education teacher, is in her first-year teaching online and has brick-and-mortar teaching experience. Joey (pseudonym), the general education teacher, is in his fifth-year teaching online and worked in the advertisement industry before moving to education. Both teachers are currently upper-level elementary teachers at Jake Online Schools. JOS is a K-12 online school that provides full-time public charter school experience with a combination of synchronous and asynchronous curricular activities.

These teachers were recommended by the middle school director, and they willingly accepted the opportunity to participate in these cognitive interviews. These teachers are not part of the middle school population that were studied in the needs assessment and have taught middle-school age previously. At the time of the cognitive interview, Jan served as a mild-moderate special education teacher in the elementary department. Jan and Joey interpreted the demographic sections of the survey as being clear and concise. They were both able to find an answer choice suitable to them with respect to each demographic survey item.

Jan and the researcher spent about 30 minutes reviewing and discussing the survey items. Jan's feedback can be described as analyzing each survey item for its clarity, with a goal to lessen ambiguity. For example, Jan expressed that one teacher may interpret a reference to *student assessment data* (survey items 2 and 8) as only applying to school-wide assessments and not teacher-created assessments which could impact how the teacher responds on the Likert scale. Further, she encouraged teacher collaboration to specify collaboration between which groups of teachers. Lastly, Jan recommended replacing the term *course materials* to *class materials* (survey items 1 and 7) especially when considering special education teacher

participants as it is likely they relate differently to their involvement with class materials versus course materials as the latter term could potentially refer to a general education course.

Joey and the researcher spent about one hour reviewing and discussing the survey. Joey's feedback involved him answering each survey item, using the Likert scale provided, and describing aloud how he believes his colleagues would respond if presented with this survey. Joey helped the researcher understand how teachers may emotionally respond to some of the survey items that explicitly ask them to rate their level of agreement with respect to practices that are closely aligned to their job description. Such items include questions pertaining to knowledge and practice of modifying online course materials and using student assessment data to meet the needs of students with learning disabilities. He went on to describe these specific survey items (survey items 1-2, 7-8) as clear and concise. As our discussion continued, Joey stopped to clarify if a particular item on the survey pertained to students with learning disabilities or all students with disabilities. He concluded with the recommendation for the researcher to emphasize, at the start of the survey, that questions are intended to inquire about teaching SWSLD. This way, participants are reminded the survey items are intended to measure their perception specifically as it relates to SWSLD as opposed to students with any disability. Each cognitive interview was valuable and contributed to the improvement of this survey tool resulting in the revision of 11 survey items, which included items 1, 2, 5-8, 11, and 16-19.

### **Research Questions for the Needs Assessment**

Through the needs assessment, the researcher aimed to answer the following research questions:

- What technological pedagogical knowledge do teachers have related to teaching students with SLD in an online school environment?

- What technological pedagogical practices do general and special education teachers use to teach students with SLD in an online school environment?
- What sources do teachers report as contributing to their current knowledge and practices teaching students with SLD in an online school environment?
- Is there a significant difference between the pedagogical technological preparation, knowledge and skills of teachers based on years of experiencing teaching online and teaching credential?

### **Definition of Terms**

1. **Online schools** – Adopting the definition used by Beasley and Beck (2017) to define cyber schools. “...refers to K-12 online learning programs offered fully online by an educational organization where students can earn credit toward graduation or promotion to the next grade level...usually use a combination of asynchronous and synchronous instructional methods” (p. 551). Rice et al. (2015a) adds to the description of online schools by explaining that students of online schools do their coursework from a home, domestic space, or public place where internet is accessible.
2. **Students with Specific Learning Disabilities** – Buttner and Hasselhorn (2011) describe children with specific learning disabilities as having significantly lower performance than their same-aged peers in reading, writing and/or math that is unexplainable by external factors nor by their learning potential. Assessment and performance data indicate a discrepancy between ability and achievement (Cottrell & Barnett, 2017).
3. **Students with disabilities** – Child with a disability means a child evaluated in accordance with §§300.304 through 300.311 as having an intellectual disability, a hearing impairment (including deafness), a speech or language impairment, a visual impairment

(including blindness), a serious emotional disturbance (referred to in this part as “emotional disturbance”), an orthopedic impairment, autism, traumatic brain injury, and other health impairments, a specific learning disability, deaf-blindness, or multiple disabilities, and who, by reason thereof, needs special education and related services (United States Department of Education, 2018).

Table 2.1 Created by the researcher to display each construct analyzed in this needs assessment.

**Table 2.1**

*Contributing Factors to Academic Progress*

Construct	Operational Definition	Indicator
Technological pedagogical knowledge.	The understanding, and therefore knowledge of, teaching and technology (Koehler & Mishra, 2009).	Amended Survey protocol - (Crouse et al., 2016). See Appendix B.  TPACK framework – (Mishra & Koehler, 2006)
Technological pedagogical practices used by general and special educators to teach students with learning disabilities in an online school environment.	Instructional practices or strategies used to teach. In this study, we are only seeking to measure practices that are used to teach students with learning disabilities (Crouse et al., 2016; Koehler & Mishra, 2009).	Amended Survey protocol – (Crouse et al., 2016). See Appendix B.  TPACK framework – (Mishra & Koehler, 2006)
Source(s) of general and special educators’ knowledge and practices for teaching students with learning disabilities in an online setting.	Contexts/experiences identified as the source of knowledge for teaching students with learning disabilities (Crouse et al., 2016).	Amended Survey protocol - (Crouse et al., 2016). See Appendix B.  TPACK framework (Mishra & K 2006).

## Data Collection Methods

The survey was sent to teachers via email on June 10, 2020, and remained open through June 18<sup>th</sup>, 2020. Teachers received a total of three email messages regarding the survey, (a) introduction to study and invitation to participate, (b) expression of gratitude for those who completed the survey and reminder of time left in the study window to complete the survey, and (c) reminder on the final day of the study which was also the teachers' last day of school before summer break. The researcher collected survey data through Qualtrics.

## Data Analysis

The sample under analysis includes 67 online middle school teachers. One of the 67 respondents did not answer all questions. Respondents were presented with six demographic questions and 22 Likert scale questions. On the Likert scale “1” indicates the respondent strongly disagrees with the statement and “5” indicates the respondent strongly agrees. Table 2.7 includes a description of the sample based on years of online teaching experience. The sample is further described in the Findings and Discussion section.

**Table 2.2**

*Middle School Online Teachers' Average Scores*

Group	<i>N</i>	<i>M</i>	<i>SD</i>	Min	Max
>3 yrs. exp.	28	3.0924	.74238	1	6
<3 yrs. exp.	39	3.3083	.69891	1	6
Total	67	2.79	1.354	1	6

## *Levene's Test for Equality Variance*

The Levene's test of equal variance was conducted to test assumptions of equal variance using the two samples, (a) teachers with less than three years of online teaching experience and (b) teachers with three or more years of online teaching experience. The null hypothesis states

there is no significant difference in responses from teachers based on their years of online teaching experience. The  $p$  value (.510) indicates no significant difference in responses between the two samples and therefore the null hypothesis is accepted, and equal variance is assumed.

Table 2.3 presents the results of Levene's test.

**Table 2.3**

*Levene's Test Results*

Test	Value	Significance
Levene's Test	.440	.510

Note \*  $p > .05$

***Independent Samples t-Test***

The researcher conducted an independent samples  $t$ -test. Sixty-seven online middle school teachers were asked how many years of online teaching experience they had. An independent samples  $t$ -test (see Table 2.4) resulted in a significance value of .227 which indicates there is no significant difference in the mean scores of teachers with less than three years of online teaching experience ( $M = 3.0924$ ,  $SD = .74$ ) compared to teachers with three or more years of online teaching experience ( $M = 3.3093$ ,  $SD = .70$ ). Therefore, the null hypothesis is accepted, and the researcher assumes the average responses among these two sample groups are similar and not significantly different.

**Table 2.4**

*Independent Samples t-Test*

Group	$N$	$M$	$SD$	$t$	$df$	Sig (2-tailed)
>3 yrs. exp.	28	3.0924	.74238	-1.221	65	.227
<3 yrs. exp.	39	3.3093	.69891			

Note. \*  $p > .05$

The researcher further opted to run a *t*-test comparing the 12 identified special education teachers in the samples to the 55 identified general education teachers (One respondent was not included because this item was left unanswered on the survey). The researcher found equal variance among the distribution, however, there is a significant difference between the average responses (.031). This indicates a difference in responses of general education teachers compared to special education teachers as it relates to the respondent’s preparation, knowledge, and skills regarding teaching SWSLD. The outcomes of the *t*-test can be found in Table 2.5.

**Table 2.5**

*Independent Samples t-Test*

Group	<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	Sig (2-tailed)
GE Teachers	55	3.1300	.73251	-2.201	64	.031
SE Teachers	12	3.6420	.52744			

Note. \*  $p > .05$

**Findings and Discussion**

One hundred thirty online middle school teachers were invited to participate in the electronic survey and of those invited 67 teachers consented to and completed the survey. When considering teacher credentials, it should be assumed that all participants hold a credential with the state of California, relevant to their position at the school, because this is a requirement of employment with JOS to serve in a full-time teaching role. Fifty-five respondents were general educators and 12 were special educators. Out of 55 general education credentialed teachers, two of them also held an administrative credential. Out of the special educators in the sample, two of them held general and special education credentials and two others held three types of credentials - special education, general education, and administrative. Most respondents (N=52) earned their credentials through a degree from a university, which is one of the pathways described on

California’s Commission on Teaching Credential website. Eleven teachers earned their credentials through a university or college internship program and two others through a school district internship program. The remaining two respondents earned their credentials through a private school experience (N=1) and the other (N=1) through a Peace Corps program. Table 2.6 highlights the demographic information collected from the respondents.

**Table 2.6**

*Participant Demographic Information*

<i>Participant Demographic Information</i>	<i>67</i>
<b>Total # of Participants</b>	67
<b>Gender</b>	
Male	3
Female	63
Non-Binary	0
<b>Type of Teacher</b>	
General Education	55
Special Education	12
<b>Path to Earning California Teaching Credential</b>	
Credentialed by a degree program	52
Credentialed by a college/university internship program	11
Credentialed by a district internship program	2
Credentialed by private school experience	1
Credentialed through Peace Corps experience	1
<b>Yrs. of Exp. Teaching in Online Schools</b>	
0-1 Years of experience	16
1-2 Years of experience	12
3-5 Years of experience	17
6-10 Years of experience	15
11-15 Years of experience	6
16+ Years of experience	1
<b>Yrs. of Exp. Teaching in Brick-&amp; -Mortar Schools</b>	
0-1 Years of experience	11
1-2 Years of experience	13
3-5 Years of experience	15
6-10 Years of experience	16
11-15 Years of experience	7
16+ Years of experience	5



The sample overwhelmingly included female participants, with only three respondents identifying as male and 63 identifying as female. One respondent did not indicate themselves male or female, the question was left unanswered. It should be noted that binary was an option to select related to this survey item. The entire middle school teaching population, inclusive of those who did not participate in the survey, is primarily comprised of female educators and this sample is also representative of that population.

When measuring teachers' knowledge and their practices related to meeting the needs of students with SLD in an online school environment, survey results indicate most teachers believe they know how to modify class materials (75%) and use student assessment data (73.2%) to make such modifications. Additionally, most respondents indicated they perform such activities routinely as part of their pedagogical practices. While most teachers indicated they use student assessment data to modify class materials, 25% of teachers were either unsure or disagreed that they had the knowledge necessary to modify class materials and use student assessment data to inform their instruction (26.3%) to meet the needs of SWSLD. Thirty-one percent of teachers indicated that modifying class materials and using student assessment data was a common practice for them, while 22.4% indicated that was not part of their pedagogical practices for meeting the needs of SWSLD.

When measuring teachers' knowledge related specifically to UDL, survey results indicate that only 40.3% of teachers have knowledge of UDL principals and 31.3% know how to access UDL tools. This indicates that the majority of these online middle school teachers were either unsure of their knowledge or had no knowledge of UDL principles nor did they know where to access tools related to UDL that could potentially inform their instruction. When measuring teachers' practices related to the use of UDL, we found similar results. About 32.9% of teachers

indicated they do not use UDL principles within their online synchronous sessions and 31.4% indicated they do not use UDL principles when assigning asynchronous assignments. About 29% (N=20) of teachers indicated they were unsure as to whether they utilized UDL principles in their synchronous sessions which could be related to lack of knowledge. About 37% (N=25) were certain they did not use such tools in their synchronous sessions with students. Overall, this leaves 67.2% of respondents potentially not utilizing UDL principles to increase accessibility for students during live class sessions. The results are nearly identical regarding the potential lack of use when assigning asynchronous materials to students, 31.3% (N=21) were unsure and 37.3% (N=25) did not utilize UDL related to asynchronous assignments. See Table 2.7 for a detailed overview of the needs related to UDL.

**Table 2.7***Teachers' Knowledge, Practices and Sources of Knowledge (N=67)*

	Strongly Disagree (1)	Disagree (2)	Unsure (3)	Agree (4)	Strongly Agree (5)
I have <i>knowledge</i> of the UDL principles.	13.4%	26.9%	19.4%	25.4%	14.9%
I <i>know</i> how to access UDL tools.	16.4%	32.8%	19.4%	16.4%	14.9%
I <i>utilize</i> principles of UDL within my online synchronous classroom.	16.4%	20.9%	29.9%	25.4%	7.5%
I <i>utilize</i> principles of UDL when assigning asynchronous assignments.	16.4%	20.9%	31.3%	25.4%	6%
I <i>utilize</i> principles of UDL in my online teachings.	17.9%	20.9%	28.4%	25.4%	7.5%
I am proficient in my abilities to implement instructional activities to meet the needs of students with SLD in an online school environment.	1.5%	14.9%	13.4%	46.3%	23.9%
My teacher preparation program prepared me to teach students with SLD in an online school environment.	11.9%	41.8%	14.9%	23%	7.5%
The in-service trainings I received during my first year as an online teacher, in my current placement, prepared me to teach students with SLD in an online school environment.	20.9%	40.3%	17.9	19.4%	1.5%
The ongoing professional development I received, thus far, in my current placement has prepared me to teach students with SLD in an online school environment.	14.9%	44.8%	14.9%	19.4%	6%
I know that teacher collaboration, between general and special education, can inform my instructional practices for meetings the needs of SWSLD in an online school environment.	1.49%	0%	1.49%	23.88%	73.13%

Results shown above indicate in all areas, except one, more than 50% of respondents were unsure, disagreed, or strongly disagreed with the statements attempting to measure their pedagogical technological preparation, knowledge, and skills as it relates to teaching SWSLD online. An overwhelming number of respondents indicate they were either unsure, disagreed, or strongly disagreed on whether they received preservice preparation (69.5%), in-service training (79.1%) and online professional development (74.6%) related to teaching SWSLD in online school environments. It is evident respondents lacked training in these areas and there is a

potential such lack of training impacts their current knowledge and skills as it relates to effectively teaching SWSLD in online schools. Evidence from the needs assessment indicates there is a significant difference in the knowledge, skills, and preparation of special education teachers compared to general education teachers ( $p$ -value = .031). While significant difference is indicated, it is essential to consider the sample size of the special education teachers ( $N=12$ ) when considering generalizing those data. This sample may not be representative of the whole special education teacher population; however, it is representative of the school population when considering the middle school's total staff population. Furthermore, both samples, general and special education teachers, indicate a need for additional development to effectively meet the needs of SWLD. Therefore, an intervention attempting to improve their knowledge and skills is warranted.

### **Conclusion**

This needs assessment provided an opportunity to investigate factors related to the academic achievement of SWSLD that were most salient to this problem of practice. Numerous factors impact the achievement of SWSLD. In online schooling, it is necessary that teachers have technological knowledge and skills to effectively teach all students, including SWSLD (Archambault, 2011; Koehler, 2006; Koehler & Mishra, 2009; Smith et al., 2016). The findings from this needs assessment support an intervention that aims to improve online middle school teachers' knowledge and skills related to teaching SWSLD in an online school.

Collaboration between teachers has been proven to positively influence student achievement (Carlson et al., 2019; Crouse et al., 2018; Davis & Garfield, 2021; Tahir et al., 2019). Nearly all participants (97.01%) agree they know teacher collaboration, between general and special education, can inform their instructional practices for meeting the needs of SWSLD

in an online school environment, yet many of them are not practicing collaboration. Improving teachers' knowledge and skills has the potential of impacting students' academic progress. Co-teaching is a potential improvement strategy that may be used to improve the knowledge and skills of online middle school teachers in meeting the needs of SWSLD.

## Chapter 3

### **Technological Knowledge and Pedagogy of Online Middle School Teachers**

A needs assessment was conducted to study the technological pedagogical preparation, knowledge, and practices of online middle school teachers as it relates to teaching Students with Specific Learning Disabilities (SWSLD). The survey findings indicated that teachers were not prepared in their preservice programs to teach SWSLD in online school settings (69.5%), nor had they received in-service training (79.1%), and ongoing professional development (74.4%) to improve their knowledge and practice specifically related to teaching SWSLD. Most teachers identified a lack of knowledge and pedagogical practices related to Universal Design for Learning (UDL) (67.2%) which is an educational framework intended to guide educators in developing flexible learning environment materials accessible to all learners. While nearly all participants (97.01%) identified collaboration between special and general educators as an optimal method to inform their instructional practices for meeting the needs of SWSLD, only 28.36% indicated utilizing collaboration in this way was a part of their practice.

The online middle school teachers recently under study were active teachers and no longer in the preservice (preparation) phase of their career. Although the findings of the needs assessment indicated a lack of both preservice and in-service preparation to teach SWSLD online, for the context of this research, the scope of the proposed intervention will consider practicing teachers, given that practicing teachers do not receive additional training once they complete their in-service teaching. This chapter investigates strategies to support a potential intervention aiming to improve general and special education teachers' knowledge and practices related to teaching SWSLD online.

## **Sociocultural Theoretical Framework**

The theoretical framework for this research and intervention is Vygotsky's (1978) sociocultural theory. Vygotsky was a Russian educational psychologist known in his home country especially for his contributions to special education (Rodina, 2006). Vygotsky's ideology for special education was built on social constructionist philosophies and focused on inclusivity grounded in positive differentiation. Based on this ideology, adults mediate the mental development of children through social interactions. In practice, this ideology means a positive and resource-oriented approach that empowers students by emphasizing their strengths instead of traditional views of focusing on students' weaknesses. Vygotsky also differentiated between primary and secondary deficiencies in children with special needs (Gindis, 1999; Rodina, 2006). He believed that primary deficiencies inherent to disability, may be difficult to remedy but secondary deficiencies from social and psychological factors can be prevented and remedied through education (Rodina, 2006). Children with disabilities may only be considered as atypical when placed in a social context with other children considered to be typical (Gindis, 1999). Vygotsky's philosophies thus enabled a paradigm shift in the field of education from a biological or behavioral standpoint of disability to a sociocultural or constructivist standpoint (Gindis, 1999).

The sociocultural theory is an ideal theoretical framework for exploring the issues of online education for students with specific learning disabilities (SWSLD). For this framework, Vygotsky (1978) theorized that learning was a process based on social interactions and collaborations, wherein individuals incorporated existing cultural artifacts in their environment to establish new artifacts that guide their actions (Ameri, 2020). A key element of sociocultural theory is the zone of proximal development (ZPD), which was used to describe the distance

between a student's capability to learn with and without assistance or collaboration (Vygotsky, 1978). Assistance from experts was termed *scaffolding*, wherein experts or teachers guided students in learning new concepts or skills, gradually reducing the assistance until the student can perform independently (Vygotsky, 1978). Students with disabilities would require more assistance from teachers as they may lack the skills to monitor their own progress (Zayyad, 2020). At the same time, too much interference from adults may hinder the ZPD as children become too dependent on them (Rodina, 2006). Based on these concepts, the ZPD and scaffolding promote lower teacher-student ratios to increase opportunities for teachers to assist students and to monitor their progress while gradually reducing assistance (Stephen, 2021). As such, collaborative teaching or co-teaching between general education and special education teachers, which was the main finding from the needs assessment, supports the sociocultural theory.

Educational systems following Vygotsky's philosophies tend to be inclusive in nature, having little distinction between general and special education (Rodina, 2006). These systems focused on social learning for children with special needs wherein children could learn from communicating with peers and adults (Gindis, 1999; Rodina, 2006). According to Vygotsky (1978), special education should not be focused on the disability but instead focus on supporting intact functions in the children to empower them and help them capitalize on their health resources (Rodina, 2006). Vygotsky viewed children with disabilities as *different* rather than *delayed* (Gindis, 1999). Based on this idea, Vygotsky's vision of special education involved the creation of disability-specific strategies, such as dynamic assessment and use of accommodations, to support the various needs of children with disabilities (Gindis, 1999). Vygotsky's idea of education also follows the constructivist perspective, which emphasizes that



learning should involve active participation, and be relevant and meaningful to children's lives (Steele, 2005). Children may learn more from actively interacting with their environment, including their peers, teachers, and other resources (Steele, 2005). The contributions of Vygotsky and his sociocultural theory to the field of special education are numerous and remain relevant in the current era.

A large part of the sociocultural theory is its emphasis on social interaction as a tool for a child's learning (Ames et al., 2021). Vygotsky (1978) theorized that support from others, such as the student's parents, teachers, and peers, is necessary for acquiring knowledge and skills. Such social interactions are reflective of Bronfenbrenner's (1994) ecological model, which was also used as a framework for the problem of practice in Chapter 1, wherein interactions between different entities across various contexts influenced the child's development (Martin et al., 2021). With online education, the physical distance between students, teachers, and other stakeholders can create challenges in terms of such social interactions (Ames et al., 2021). As such, it will be important for stakeholders to collaborate and make full use of technology to ensure that such interactions remain in online education (Ames et al., 2021; Martin et al., 2021). The sociocultural theory may thus serve as a framework for emphasizing collaborations and encouraging social interactions for optimal student learning.

The sociocultural theory (Vygotsky, 1978) has also been used alongside the TPACK (Mishra & Koehler, 2006) to explain how students' individual needs and contexts were used by teachers to interconnect the technology, content, and pedagogy in their lessons (Ames et al., 2021). The sociocultural theory is especially relevant to the technological pedagogical knowledge (TPK) subunit of the TPACK (Mishra & Koehler, 2006). Vygotsky's ideal learning environment was one wherein the individual needs of all children, including children with

disabilities, were met using specialized technology and pedagogy (Gindis, 1999). Following this idea, teachers need to be trained on how to find and incorporate appropriate technology in their lessons (Gindis, 1999). While principles of the sociocultural theory focus on individual student needs, principles of TPK guide instructional leaders. In Ames et al.'s (2021) qualitative study on Australian distance education teachers, participants described strategies based on the sociocultural theory such as implementing breakout rooms for student-to-student interactions as well as implementing chat-based sessions for some students who have had difficulty speaking in the online classes. These strategies were reflective of how teachers incorporated sociocultural elements based on individual student needs and contexts in their use of technology, content, and pedagogy (Ames et al., 2021). This connection highlights the complementary nature of sociocultural theory as a theoretical framework, with the TPK as an integrated knowledge framework.

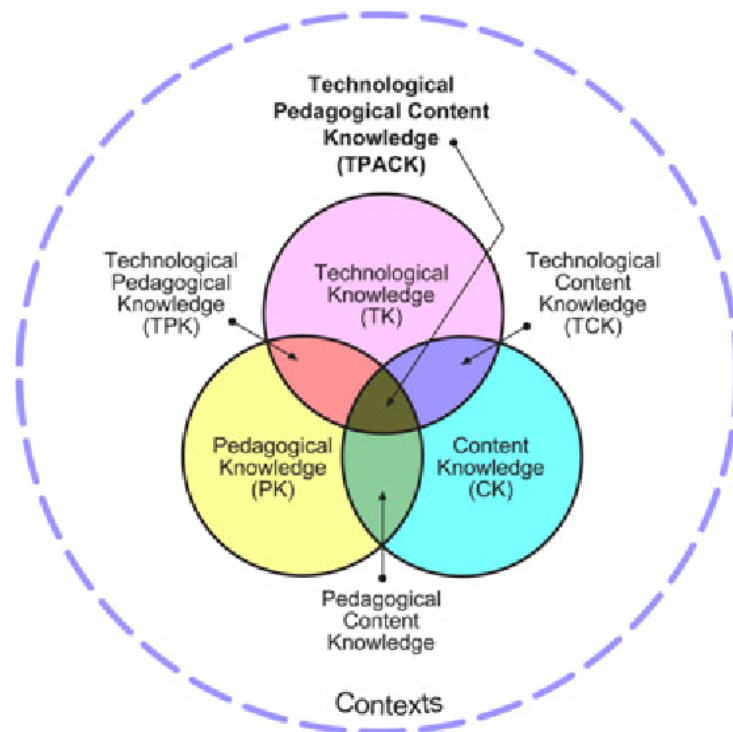
Despite being a prominent theoretical framework in the fields of psychology and education, sociocultural theory is not without critique. Ameri (2020) noted that the ZPD, which is the main concept behind the sociocultural theory, is vague and does not fully explain the process of child development. The sociocultural theory has also been critiqued for its lack of attention given to individual differences in its assertion that learning was dependent on social norms (Ameri, 2020). Nonetheless, the evidence within the literature supporting the sociocultural theory displays its numerous advantages and applicability especially for SWSLD (Ames et al., 2021; Stephen, 2021; Zayyad, 2020). The sociocultural theory is thus used as a theoretical framework to guide the present study in conjunction with the TPK framework described below.

## Technological Pedagogical Knowledge – TPK

A part of Mishra and Koehler's (2006) technology pedagogy and content knowledge framework (see Figure 2) will also serve as a technological knowledge framework to guide this research. In 2006, the technological pedagogical content knowledge (TPACK) framework encouraged the integration of technology into methods of teaching and considering how learning is impacted by the infusion of technology (Mishra & Koehler, 2006). The TPACK framework is an extension of Shulman's (1986) pedagogical content knowledge (PCK) theory which posits teaching methods and practices (pedagogy) as a knowledge domain interconnected with content (academic program) knowledge. Mishra and Koehler (2009) affirmed and expanded upon Shulman's (1986) PCK theory adding the integration of technology as a knowledge domain.

**Figure 3.1**

*TPACK Framework*



*Note.* (Mishra & Koehler, 2006) \*Public Domain Image

The TPACK model contains several knowledge domains using a combination of three constructs of knowledge (a) technological knowledge, (b) pedagogical knowledge, and (c) content knowledge. Koehler and Mishra (2009) theorized that these three constructs of knowledge are integrated to form seven new constructs where TPACK sits at the center of these interconnected constructs – (a) technology, pedagogy and content knowledge (TPACK), (b) content knowledge (CK), (c) pedagogical knowledge (PK), (d) pedagogical content knowledge (PCK, Shulman, 1986), (e) technological knowledge (TK), (f) technological content knowledge (TCK), and (g) TPK (Koehler & Mishra, 2009). With the pivotal shift to online education and the lack of pedagogical preparation for teachers (Gilmour, 2020), the TPK component of the TPACK framework serves as a guide to implementing an intervention for teachers. This research focuses on the *technological pedagogical knowledge (TPK)* domain.

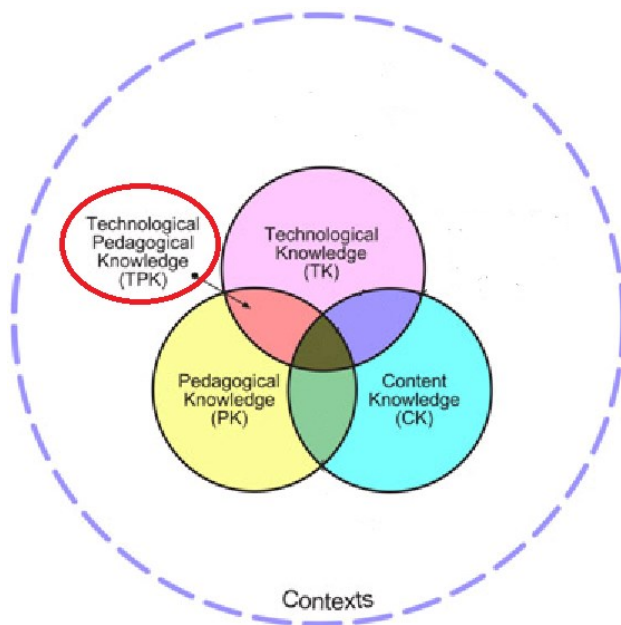
Knowledge of the benefits and restrictions of various technologies can support online teachers to meet the needs of diverse learners (Koehler & Mishra, 2009; Mishra & Koehler, 2006). However, teacher preparation programs have historically been ineffective in equipping teachers with knowledge of technology and its applicability in K-12 classrooms (Crouse et al., 2018; Starkey, 2020). Teacher preparation for technology was mostly about basic communications and presentation technology, with the notion that teachers would still rely largely on traditional face-to-face classroom teaching strategies (Crouse et al., 2018; Starkey, 2020). Findings from the needs assessment in this research indicate teachers were not prepared to teach diverse learners in fully online school programs nor did they receive in-service and ongoing development related to meeting the needs of SWSLD in the online setting. This finding aligns with previous research indicating a lack of training for teachers in terms of technologies to

teach students, especially students with disabilities within the online setting (Crouse et al., 2018; Starkey, 2020), which then calls for an intervention guided by TPK.

The TPK refers to a domain of knowledge involving understanding of various technologies to leverage them appropriately to meet the various needs of SWSLD (see Figure 3.2). This domain relies on continuous development and innovative thinking surrounding the use of technology to support student learning. As the number of technologies for teaching increases, it is imperative that teachers learn about the pedagogical uses and limitations of such technologies (Koehler & Mishra, 2009). For instance, although teachers may have become familiar with basic technological tools, such as videoconferencing, they may not be aware of more specialized tools, such as assistive technologies, which have different pedagogical uses that can be helpful for SWSLD (Crouse et al., 2018). Use of such technologies with the appropriate pedagogical strategies provides more opportunities and options to better meet the needs of students (Anderson & Putman, 2020). It is thus imperative that teachers be trained on TPK, particularly on the integration of technologies with pedagogical practices. With the TPK component of this framework, explicit training targeting the integration of technologies with pedagogical practices to better meet the needs of SWSLD is necessary.

**Figure 3.2**

*TPK (Modified from TPACK)*



### ***Critique of TPK***

There are a variety of interpretations and applications of the TPK framework (Oda et al., 2020). One potential critique of this framework, as it relates to this research, is the lack of consideration given to contextual factors such as socioeconomic factors that may affect online education. Socioeconomic inequality has been a salient issue in the field of education, creating a digital divide between schools and between students who may or may not have access to certain technologies (Oda et al., 2020). Factors related to context have the potential to influence the integration of technology. Although there has been an increase of context-specific studies supporting the adaptability of TPACK and its TPK subunit over the past few years, continuous research is needed to support the applicability of TPK parallel to the evolution of education and technologies (Tseng et al., 2020). As of this writing, there is no existing empirical evidence of

this framework being applied to teaching and learning taking place in fully online schools, however, the flexibility of TPK as a framework makes it an ideal framework to explore in this setting.

### ***Relevance to Research of SWSLD***

Although the TPK has been critiqued for lacking context, this aspect of TPK may serve as a strength as it supports the possibility that TPK may be applicable across various contexts (Tseng et al., 2020). On this account, the present study can contribute to scientific knowledge regarding the TPK's applicability to online education of SWSLD. Even before the COVID-19 pandemic, SWSLD attended online schools and there is existing evidence of shortcomings related to their academic achievement (Ahn & McEachin, 2017; Carnahan & Fulton, 2013; Deshler et al., 2014; Rice & Deschaine, 2020). Online teachers need further development to better meet the needs of students with disabilities (SWD) (Archambault, 2011; Crouse et al., 2016; Dawley et al., 2010; Mishra & Koehler, 2006; Rice & Deschaine, 2020; Zweig et al., 2015). Researchers Koehler and Mishra (2006) founded this framework under the premise that it could guide research and curricular development in teacher education and professional learning with the integration of technology. The framework is intended to be flexible to analysis and development (Koehler & Mishra, 2006). As such, this framework is believed to be applicable to guiding the study of teachers' technological pedagogical knowledge and practices as it relates to teaching SWSLD in online schools.

### **Literature Review**

In this section the researcher will explore the literature that could inform a potential intervention for improving online middle school teachers' knowledge and practices regarding teaching SWSLD online. Nearly 100% of online middle school teachers at JOS agreed that

collaboration between special and general education teachers is essential to meeting the needs of SWSLD and the literature supports this finding (Carlson et al., 2019; Crouse et al., 2018; Davis & Garfield, 2021; Tahir et al., 2019). Teachers in the needs assessment sample also indicated limited knowledge and practices related to UDL principles, which is very concerning since researchers in the field of education created UDL principles to increase accessibility of instruction and the learning environments for all students (He, 2014). In-service and ongoing professional development (PD) is intended to develop practicing teachers. Professional development has been used as a mechanism for improving teacher practices to meet the needs of SWD (Black et al., 2009) and researchers have suggested more PD be implemented to equip teachers to better meet the needs of diverse learners (Archambault, 2011; Black et al., 2009; Crouse et al., 2016; Dawley et al., 2010; DiPietro et al., 2008; Mishra & Koehler, 2006; Rice & Mellard, 2016). Below, the researcher analyzes a variety of interventions related to collaborative teacher practices and UDL knowledge and practices. Additionally, various PD methodologies are considered as potential mechanisms to support a potential intervention.

### **TPK and Teacher Education**

As the framework guiding this research study, the TPK needs to be explored in conjunction with teacher education and the subsequent impact on student outcomes. Previous researchers have indicated that the TPK framework has been useful for preparing teachers to plan and implement technologically enhanced lessons (Figg & Jaipal, 2009; Lee et al., 2014). Based on a seven-week study of four preservice teachers in Canada, teachers were able to include a variety of technologies in their lesson plans and implement them in classes for meaningful learning (Figg & Jaipal, 2009). The TPK framework was especially helpful for teachers in terms of choosing activities, sequencing, differentiation, preparation, classroom management, and



modelling for students (Figg & Jaipal, 2009). In Lee et al.'s (2014) case study with 10 preservice teachers, participants had generally positive perceptions regarding the integration of technology and pedagogy in their lessons. Participants held different perceptions regarding technology, such as trendy or exciting, pragmatic, or challenging, and pedagogical (Lee et al., 2014). These differing views reflected the idea that TPK can be flexible and utilized in different ways based on teachers' personal beliefs and teaching styles, as well as students' individual needs. Participants who used direct instruction and inductive thinking had the highest scores of TPK as they utilized various web-based tools. The authors recommended using the TPK in teacher education to support the utilization of multiple pedagogies and technological tools to enhance the process of student learning (Lee et al., 2014). As a relatively underexplored framework in teacher education literature, TPK shows promise in terms of its flexibility and utility in designing and implementing meaningful lessons.

The larger framework of TPACK, from which TPK was derived, has received relatively more attention in literature. Workshops and programs integrating the TPACK for teachers have had mixed reviews within the existing literature (Chai et al., 2020; Tanak, 2020). Chai et al. (2020) conducted a design based TPACK workshop for preservice teachers in the fields of science, technology, engineering, and mathematics (STEM) within Indonesia. The workshop lasted for a month and comprised lectures, presentations, and peer reviews, among other activities (Chai et al., 2020). After the workshop, participants were surveyed and interviewed regarding their self-efficacy, as well as their experiences and perceptions of the workshop. Based on the results, the participants' self-efficacy for STEM and TPACK significantly increased. The preservice teachers reported that they felt more prepared to incorporate TPACK into their STEM lessons (Chai et al., 2020). In another study, students from a Master of Teaching program in

Thailand also underwent a TPACK course, culminating with the creation of a TPACK-based lesson (Tanak, 2020). Results from a questionnaire following the course revealed that while the TPACK was considered as a helpful framework, participants' understanding of TPACK remained mostly modular with little integration. For instance, technology was mostly used as a motivation booster rather than being infused within the lessons and activities (Tanak, 2020). Wang et al. (2018) further called out the dearth of evidence surrounding TPACK programs for teachers, emphasizing how most studies in the past have relied only on self-reports or short-term outcomes. As such, more research is necessary to support the use of TPACK in teacher education.

Aiming for a more direct connection between TPACK and student outcomes, Handan and Ertugrul (2019) conducted a quasi-experiment on 6th grade students in Turkey. The experimental group received instructions based on TPACK Learning Activities for Computer Science, which included activities such as peer feedback, debugging or troubleshooting, testing artifacts, evaluating problems, and creating modules, among others (Handan & Ertugrul, 2019). The results revealed that the experimental group obtained significantly higher averages in academic achievement, problem-solving skills, and computational thinking skills, compared to the control group. The TPACK-based instructions were thus considered as effective in improving these student outcomes, particularly in technology courses (Handan & Ertugrul, 2019). Despite the significant evidence supporting the impact of TPACK on student outcomes, there is still a dearth of evidence regarding the impact of TPACK on online education (Corry & Stella, 2018). As teaching practices and strategies change in the transition to online education, more research on how TPACK may be incorporated within the online setting is needed (Corry & Stella, 2018). The use of TPACK in the present study may aid in advancing this field.

## Teacher Collaboration

The element of collaboration is a vital aspect of the sociocultural theory that may be useful in training teachers for the online education of SWSLD (Ames et al., 2021). Several researchers have posited collaboration as an essential activity in teaching and learning processes, as evident in Vygotsky's (1978) work. Collaboration amongst individuals and social environments are an essential part of teachers' strengthening their confidence, self-efficacy, behaviors, and learning. Teacher effectiveness is one of the most salient factors impacting student achievement (Ploessl et al., 2010). However, individual teacher effectiveness can be fragmented and have limited impact on complex groups of students. Holistically, collaboration between teachers has been proven to complement teacher effectiveness and positively influence student achievement (Carlson et al., 2019; Crouse et al., 2018; Davis & Garfield, 2021; Tahir et al., 2019). In a study conducted by Gonzalez (2017), collaboration that was built on trust between co-teachers positively impacted teachers' efficacy and reflection, which in turn contributed to improvements in pedagogical practices that impact student learning (Gonzalez, 2017).

There are a variety of collaborative teaching practices. The term *co-teaching* has been used to describe the general concept or model of collaborative teaching between general and special educators (Friend, 2008; Leko & Brownell, 2009; Mastropieri et al., 2005). Friend (2008) describes co-teaching as general and special educators providing instruction to students in the general education setting. Similarly, Leko and Brownell (2009) and Mastropieri et al., (2005) describe co-teaching as an educational endeavor where special and general educators work collaboratively to meet the needs of diverse learners. Traditionally, educational models gave minimal attention to collaboration between teachers (Rabin, 2020). The closest form of

collaboration in the traditional models involved mentoring between teachers and teacher candidates, which was gradually removed as the teacher candidates became more independent. Current models of co-teaching involve more collaboration and more balanced power structures between educators (Rabin, 2020). Co-teaching involves numerous collaborative practices such as co-planning, co-implementation of pedagogy, co-analysis, reflection, and revising. The main principle behind such practices is that all educators and professionals working with the child must be involved in the child's individual education program (IEP), and work together to achieve the IEP goals (Heisley & Thousand, 2021). Communication and trust are thus necessary for effective co-teaching (Heisley & Thousand, 2021).

There are four common pedagogical approaches to co-teaching: (a) One Teach, One Assist, (b) parallel teaching, (c) team teaching, and (d) station teaching (Cook & Friend, 1995; Heisler & Thousand, 2021; Ploessl et al., 2010). An analysis of studies involving a total of 6,459 general education and 1,773 special education teachers found the most common model of co-teaching to be where one teacher led and the other teacher assisted in delivery of instruction to the whole class (Scruggs et al., 2007) and the special education teachers most served in the assisting role. Regardless of the specific approach, it is vital that all parties are aware of their role in the co-teaching dynamic (Heisley & Thousand, 2021).

There are diverse perspectives regarding the effects co-teaching has on student outcomes. Although most qualitative findings within the literature show support from both students and teachers regarding the value and effectiveness of co-teaching (King-Sears et al., 2020; Prizeman, 2015; Strogilos & King-Sears, 2019), quantitative findings are more nuanced, with some researchers finding it to be effective while others have found non-significant effects. For instance, Beirne-Smith and Smith (1997) investigated the effectiveness of team teaching with the

use of a co-planning tool designed to aid participants in instructional planning to meet the needs of students with learning disabilities (SWLD). Findings from this study did not find a statistically significant improvement in student achievement, however, intervention outcomes suggest teachers instructional planning practices improved after their participation in collaborative teaching practices. In another study, Tremblay (2013) compared the outcomes of first grade to second grade students taught in co-teaching inclusion classes and solo-teaching special education classes. Tremblay also found non-significant results regarding the differences in reading and writing between co-taught and solo-taught second grade students, as well as in mathematics for both first and second grade students. Tremblay's findings ran somewhat in contrast to the findings in Fontana's (2005) quantitative study on eighth grade SWSLD. Based on their analysis of the students' grades, students who were co-taught had significant improvements in mathematics and self-concept, but not in writing (Fontana, 2005). These disparities showed that co-teaching may have different effects on various student outcomes for different students.

While some of the past research did not result in statistically significant changes in the performance of SWLD (Beirne-Smith & Smith, 1997; Fontana, 2005; Tremblay, 2013), Kim and colleagues' (2006) reviewed the implementation of the One Teach, One Assist co-teaching methodology where co-teachers utilized a computer-based reading program to support their instructional practices. The reading program is a research-based program referred to as Computer-Assisted Collaborative Strategic Reading (CACSR) (Kim et al., 2007). The research Kim et al. (2007) reviewed indicated a statistically significant improvement in the reading comprehension of SWLD. Participants were middle school students attending brick-and-mortar middle schools with most of the population being classified as at-risk (Kim et al., 2007). While the CACSR program was utilized by teachers as a pedagogical tool to meet the needs of SWLD,

teachers' efforts were cited as a critical factor in effective implementation of this collaborative practice.

One of the most cited barriers to effective co-teaching is collaborative planning (Kim et al., 2007). Collaborative planning involves the willingness to collaborate, the knowledge of how to and the time to do it. Some of the essential elements of co-teaching are described as co-assessing, co-planning, and co-instructing. Beirne-Smith and Smith (1997) posit an intention of their research was met after targeting the improvement of teachers' relationships through implementation of a collaborative teaching model, citing instructional planning training, tools and time as contributing to improved relationships and practices. In a study conducted by Brendle et al. (2017), teachers also reported training, planning time and relationships as essential in co-teaching. General and special educators believed their relationships, through co-teaching, as influencing their pedagogical knowledge for meeting the needs of SWD, which is a direct result of their spending time together planning and executing instruction (Brendle et al., 2017). Empirical evidence indicates training, time, and tools to collaborate are critical elements necessary to aid in effective implementation of co-teaching (Beirne-Smith & Smith, 1997; Brendle et al., 2017; Kim et al., 2007). Effective working relationships (Beirne-Smith & Smith, 1997; Brendle et al., 2017) and engagement (Thomas-Brown & Sepetys, 2011) in co-partnerships are pivotal to the method of co-teaching and its potential effectiveness.

As a result of training and collaboration with special educators, general educators reported an improvement in their knowledge of how to appropriately modify instruction to meet the needs of SWD (Thomas-Brown & Sepetys, 2011). Thomas-Brown and Sepetys (2011) conducted a small study involving two general educators and one special education teacher. The study took place at a high school serving primarily affluent communities where 90% of the

student population were identified as White. While this study is situated in contextual circumstances differing from that of the Jake Online Schools by way of student demographics and the brick-and-mortar learning environment, still similarities exist in that general and special education teachers are involved as participants and the study has a focus on improving teaching and learning of SWD. Instructional planning of student assignments can lead to effective teaching and learning. Co-teachers in Thomas-Brown and Sepetys' (2011) study planned and executed scaffolded instructional materials in attempts to meet the needs of students. Like the findings from Beirne-Smith and Smith (1997), Brendle et al. (2017), and Kim et al. (2007), general educators cited an improvement in their instructional planning for SWD because of their collaborative practices (Thomas-Brown & Sepetys, 2011).

Of the literature reviewed, scant research empirically studied the impact of co-teaching on the academic achievement of SWD, however, many researchers comment on the need for research in this area. In a meta-analysis conducted by Solis et al. (2012), only 17 of the 146 studies focused on student outcomes. Of the 17 studies, SWLD were found to have demonstrated academic gains (Solis et al., 2012), however, some of these studies collected data from students that also participated in other special education programs limiting our ability to attribute gains to any one element of their instruction. Some of the program features influencing the academic gains were explicit and individualized instruction addressing basic skills and frequent assessment of progress (Solis et al., 2012). No empirical studies that examined the effects of co-teaching on student learning in online K-12 environment were found. All studies reviewed under this section involved special and general educators in the K-12 field of education. However, online educators were not targeted in any of the studies reviewed. There is scant research studying collaborative teaching practices taking place in online schools in the K-12 sector.

## **Universal Design for Learning**

The universal design for learning (UDL) is a predominant approach in the field of special education that may also be helpful for the online education of SWSLD. The Center for Applied Technology describes UDL as principles that can be used as guides to increase accessibility of curriculum and learning environments for all students. Teachers can utilize these principles to guide their instructional plans, methodologies, assessments and maximize flexibility to meet the needs of all students. In summary, the fundamental principles of UDL encourage multiple methods of representation, action, and expression and multiple methods of engagement (Rose et al., 2005). These principles are in line with the sociocultural theory in terms of teachers providing guidance as scaffolding for student learning.

Researchers asserted that there is scarce empirical evidence studying the effects of UDL as an intervention (Canter et al., 2017; Edyburn, 2010). Out of 12 studies reviewed by Al-Azawei et al. (2016) only two of them analyzed UDL's effectiveness in online learning environments. Several empirical studies regarding UDL involve leveraging PD as a tool to improve educators' knowledge and practices (Al-Azawei et al., 2016; Canter et al., 2017). Like the findings reviewed above regarding the lack of co-teaching interventions targeting the academic performance of SWD, there are exiguous empirical studies analyzing the effects of UDL implementation on the academic performance of SWD. Canter et al. (2017) describe the challenge of measuring the construct of student academic achievement as influencing their decision to not measure this construct in their research. This rationale relates to Kennedy and colleagues' (2014) comments regarding their lack of absolute findings concerning which factors were most influential to the academic growth of SWD because of an intervention involving UDL and other research components. Studies that aimed to measure students' academic achievement



found improved outcomes (Hall, 2015; Kennedy et al., 2014). Considering the evidence supporting UDL within brick-and-mortar classrooms, as well as its connection with the sociocultural theory, it is vital to examine its applicability in online education for SWSLD.

### ***Universal Design for Learning and Academic Performance***

The application of UDL in brick-and-mortar K-12 education has had positive effects on student outcomes based on past research (Hall, 2015; Kennedy et al., 2014). For example, Kennedy and colleagues (2014) studied the effects of a UDL inspired intervention (multimedia podcast) on SWD attending a brick-and-mortar high school. The intervention also involved use of an evidence-based vocabulary intervention program. Findings indicate implementation of the multimedia intervention contributed to academic growth of SWD post-intervention and the learning gap between SWD and students without disabilities was reduced. While researchers could not definitively conclude which variables attributed to the academic growth, they theorized that use of the UDL principles influenced the improved student outcomes (Kennedy et al., 2014). Hall et al. (2015) found reading scores of SWD increased after implementation of a reading intervention program that used UDL principles. Like Kennedy et al. (2014), students in this study also attended brick-and-mortar schools, however, some of the participants' (SWD) engaged in the intervention through online methodologies and as a result performed even higher than those not involved in the online components of the program (Hall et al., 2015). While King-Sears et al. (2015) did not conclude statistically significant differences existed post-UDL intervention, findings indicated learners developed an improved perspective of learning post-intervention. Together, these findings implied the possible impact of UDL interventions on the outcomes of SWSLD. It might be potentially beneficial to train and prepare teachers in UDL and how it may be applied in the online setting.

### *Universal Design for Teaching and Learning*

The incorporation of UDL in teacher preparation may have a positive impact on their abilities to teach SWSLD. Preservice and inservice teachers recognized UDL as positively impacting their knowledge and pedagogical practices for meeting the needs of SWD (Evmenova, 2018). Inservice K-12 educators including general and special education staff such as teachers, librarians, technology specialists, psychologists and occupation therapists demonstrated improved practices after their participation in an online asynchronous course such as more effective planning, implementation, reflection, and an overall better understanding of means to support diverse learners (Evmenova, 2018). A course designed to prepare teachers to meet the needs of online K-12 students targeted the knowledge and practices of preservice teachers (He, 2014). As a result, their participation in the online course, preservice teachers reported enhanced confidence regarding their preparedness to teach online, increased awareness on the multimodalities online learning environments may have, and believe reflection is a necessary component of ongoing professional learning (He, 2014). Although He's (2014) study intended to prepare preservice teachers for teaching online, this intervention did not offer participants opportunities to practice teaching online inevitably making the effects of this intervention on inservice teacher practices unknown. While Evmenova's (2018) intervention aimed to improve inservice teachers' knowledge and practices using UDL, the course did not intentionally prepare the participants to teach in K-12 online learning environments.

Few studies analyzed pedagogical practices implemented in K-12 learning environments that target meeting the needs of diverse learners. Coy and colleagues (2014) acknowledged this gap in literature resulting in inconclusive outcomes regarding contributing factors to the online learning of SWD. In efforts to contribute to the literature base studying SWD attending school

online, Coy et al. (2014) reviewed three instruments intended to measure UDL practices taking place in online learning environments. As a result of their review, they theorize that teachers need PD on UDL to inform their knowledge and practices (Canter et al, 2017; Coy et al., 2014). Brick-and-mortar special and general education teachers reported their knowledge of UDL increased from 20% to 93% after participating in a UDL professional development (Canter et al, 2017). Also, because of the PD, teachers expressed their implementation of UDL principles and integration of technology in lessons and instruction increased and consequently students' engagement and access to curriculum improved (Canter et al, 2017). Participants attribute PD and availability of resources as essential to effective implementation of UDL and technology integration (Canter et al, 2017).

The literature reviewed in this section revealed that UDL served as an effective guide for interventions supporting SWD (Davies et al., 2012; Hall, 2015; Kennedy et al., 2014). As a predominant approach in special education, it may be necessary to examine how UDL may also be aligned with TPACK and applied to online education for SWSLD.

### **Professional Development**

Based on the needs assessment described in Chapter 2, there is a need for further professional development to improve teachers' preparedness for teaching SWSLD in online education. Professional development (PD) can serve as a mechanism for improving online teachers' knowledge and practices related to teaching SWSLD. Although literature studying online teachers and students with disabilities is scarce, much of the existing literature indicates the need for teachers to receive additional and ongoing PD (Dawley et al., 2010; DiPietro et al., 2008; Gulosino & Miron, 2017; Fitzpatrick et al., 2020; Rice & Dykman, 2018). Literature studying collaborative teaching practices indicates a lack of PD on co-teaching strategies for

special and general educators and establishes a need for on-going development (Scruggs et al., 2007). Research indicates PD (Huberman et al., 2012) and technology (VanUitert et al., 2020) as key elements for improving teachers practices which in turn improves the academic achievement of SWD.

Historically, PD has been offered in a one-stop-shop fashion (Clarke & Hollingworth, 2002). In these common cases, educators engage in a one-time session for an hour, a half-day or even a full-day and there is no continued development thereafter. When considering PD as a mechanism for improving teachers' knowledge and practices, it is essential effective that professional learning practices be considered. Darling-Hammond and colleagues (2017) cite sustained duration of PD as a critical component of professional learning (PL). Sustaining professional learning overtime is essential to its effectiveness. This research perspective is supported by other scholars (Clarke & Hollingworth, 2002; Desimone & Garet, 2015). In Darling-Hammond and researchers' (2017) review of effective PD they highlight seven common elements: (a) content-focused, (b) use active learning strategies, (c) collaboration, (d) modeling, (e) coaching and expert-level support, (f) feedback and reflection, and (g) sustained duration. In their review of literature, there is no mention of research focusing on SWD. However, they describe a Reading Recovery program that was implemented and positively affected the learning of struggling readers. Part of the success of this program is attributed to the sustained duration of the PD which in this case was one full year of a grade-level training course. Modeling, teacher implementation and collaboration were key elements of the PD.

In a study analyzing the effects of preservice and in-service PD of general and special educators, findings suggest PD in co-teaching to be significantly positively associated with teacher outcomes (Pancsofar & Petroff, 2013). Teachers with sustained duration of learning

opportunities indicated more confidence in their practices and overall positive attitudes about co-teaching (Pancsofar & Petroff, 2013). A PD program targeting general and special education teachers' knowledge and practices related to co-teaching was found to be effective (Thomas-Brown & Sepetys, 2011). The PD included imbedded time for teachers to collaborate and learn about four core co-teaching models (Thomas-Brown & Sepetys, 2011). Sustained duration and collaboration throughout the professional learning experiences seems to be a theme in the literature as supported by many researchers (Clarke & Hollingworth, 2002; Darling-Hammond, 2007; Desimone & Garet, 2015). Professional development was also found to be effective in targeting teachers' practices related to use of UDL principles (Canter et al., 2017; Courey et al., 2013).

It is important to consider the needs of your PD participants. One team of researchers found considerable variation in how teacher participants responded to the PD (Roschelle et al., 2010). Desimone and Garet (2015) posit if there is variation in how teachers respond to the same PD there may in turn be variation in student outcomes. It is essential the PD designers and facilitators consider the needs of each teacher and plan PD accordingly to meet their learning needs and interests.

### **Summary**

Improving online teachers' knowledge and practices through the integration of technology is essential to meeting the needs of SWSLD. Collaboration between general and special educators has been continuously cited by researchers as contributing to teacher effectiveness in meeting the needs of SWD (Carlson et al., 2019; Crouse et al., 2018; Davis & Garfield, 2021; Tahir et al., 2019). Teachers can utilize UDL principles to guide their instruction and increase accessibility of curriculum and learning environments for all students. Research on

the effectiveness of UDL principals and the influence on student outcomes is scarce (Al-Azawei et al., 2016).

Professional development was reviewed and considered as a strategy and as an instrument for implementing an intervention. In most studies, PD was identified as the mechanism for improving teachers' knowledge and practices. In this study's needs assessment, nearly all participants (97.01%) identified collaboration between special and general educators as a method to inform their instructional practices for meeting the needs of SWSLD, however, only 28.36% indicated utilizing collaboration in this way was a part of their practices. Considering the needs of online teachers and the overwhelming research that identifies teacher collaboration as a crucial element in effective practices, co-teaching as a potential intervention to improve online teachers' knowledge and practices related to meeting the needs of SWSLD seems most appropriate. Professional development, through technology integration, will facilitate improvement of teachers' knowledge and practices related to co-teaching between special and general educators in online schools.

## Chapter 4

### **Potential Intervention for Online General and Special Education Middle School Teachers**

A literature review studying the academic achievement of students with disabilities (SWD), with a focus on students with Specific Learning Disabilities (SWSLD) indicated SWSLD continue to be underserved in K-12 schools as evidenced by the academic achievement gap between SWSLD and their non-disabled peers (Ahn & McEachin, 2017; California Department of Education, 2019; Carnahan & Fulton, 2013; Gilmour et al., 2019; Gulosino & Miron, 2017; Moore et al., 2018; New York State Education Department, 2019; Soria, 2020). As indicated by legislations since the Elementary and Secondary Education Act (ESEA), the goal for education has been to provide full educational opportunities to enhance each student's outcomes (Marion et al., 2020), however, little is known about the achievement and outcomes of SWSLD attending online schools (Beasley & Beck, 2017; Rice & Dykman, 2018). From the scant available data, online schools appeared to have not improved the outcomes for SWSLD; rather, some evidence reports the problem as being exacerbated in the online school setting. In online schooling, it is crucial that teachers have technological knowledge and skills to effectively teach and support all students (Archambault, 2011; Koehler & Mishra, 2009).

A needs assessment was conducted to study the technological pedagogical preparation, knowledge, and practices of online middle school teachers as it relates to teaching students with SWSLD. The survey findings indicated teachers were not prepared in their preservice programs to teach SWSLD in online school settings (69.5%), nor had they received in-service training (79.1%), and ongoing professional development (74.4%) to improve their knowledge and practices specifically related to teaching SWSLD. Most teachers identified a lack of knowledge and pedagogical practices related to Universal Design for Learning (UDL) (67.2%). UDL is an

educational framework intended to guide educators in developing flexible learning environments with materials accessible to all learners. While nearly all participants (97.01%) identified collaboration between special and general educators as an optimal method to inform their instructional practices for meeting the needs of SWSLD, only 28.36% indicated utilizing collaboration in this way was a part of their practice.

### **Potential Context and Intervention Purpose**

In the Spring of 2021, the special education administration team at the online schools under study, designed co-planning and co-teaching training materials in preparation to launch a pilot program in the Fall of 2021 involving general and special educators. The pilot program was designed to train educators on co-teaching and co-planning to meet the needs of their diverse learners, namely SWD. The program was implemented and sustained through the 2021-2022 school year and resulted in teachers' having improved pedagogical technological knowledge and skills regarding co-planning and co-teaching to meet the needs of SWD.

A literature review studying interventions aiming to improve the technological pedagogical knowledge and skills of online teachers regarding co-planning and co-teaching to meet the needs of SWSLD yielded no such empirical evidence. Related existing research indicates collaboration between general and special educators contributes to teacher effectiveness in meeting the needs of SWD (Carlson et al., 2019; Crouse et al., 2018; Davis & Garfield, 2021; Tahir et al., 2019). In most studies, PD was identified as the mechanism for targeting improvement of teachers' knowledge and practices.

The following sections detail a proposed mixed methods intervention designed to target the needs of general and special education teachers working with adolescents in online schools. This carefully designed intervention entails a series of PD sessions and implementation of



collaborative practices involving online general and special education teachers targeting co-teaching and co-planning, support, and reflection.

This proposed intervention is being designed with online schools in mind. It is designed with consideration of existing research and the contextual details of the online schools under study as described in chapter two.

The following research questions would guide the study process:

1. To what extent did the study implementation adhere to proposed PD topics as outlined in the study procedures?
2. To what extent did participants attend the PD sessions as part of this study?
3. How does co-planning and co-teaching amongst online middle school special and general education teachers influence their technological pedagogical knowledge and practices used to meet the needs of SWSLD?
4. How do collaborative teaching and planning experiences differ amongst online middle school special and general education teachers?
5. How does student performance compare when measuring pre- and post- teacher training and implementation?

### **Research Design**

This study would use a convergent parallel mixed methods research design (Creswell & Plano-Clark, 2018). A mixed methods design allows for elaboration and triangulation of multiple data sources (Creswell & Plano-Clark, 2018). Combining both method typologies into a single study brings together the best of both research paradigms (Johnson & Onwuegbuzie, 2004). This comprehensive research design collects and analyzes quantitative and qualitative data aiming to compare the two types of data in answering the research questions.

Distal outcomes of this intervention study aim to include an increase in collaborative teaching practices amongst general and special educators and improved academic performance of SWSLD. A Logic Model (Figure 4.1) was created after the researcher theorized a treatment plan for this study. The logic model outlines the inputs, outputs, outcomes, and other essential components of the intervention design allowing the researcher to articulate inputs and outputs believed to be essential in making progress toward the short-term, intermediate, and distal outcomes.

**Figure 4.1**

*Intervention Logic Model*

Context	Processes		Outcomes
<p>SWSLD have historically had lower academic performance than their non-disabled peers. There is scarce empirical evidence of the academic outcomes of SWD in online schools. Existing evidence indicates teachers need additional training to better meet the needs of SWDs.</p> <p>Literature indicates teacher collaboration is an essential pedagogical teaching practice. There is a lack of empirical studies targeting co-teaching in online K-12 online schools. Needs assessment data indicates a need in the areas addressed through this proposed intervention.</p>	<p><b>Inputs</b></p> <p>Superintendent/Board approval of program and evaluation</p> <p>Willing participants (teachers)</p> <p>Supportive administrative staff</p> <p>Time reserved in master school schedule allotting time for the intervention to take place.</p> <p>Materials: Training content</p> <p>Space: Zoom video-conferencing platform</p>	<p><b>Outputs</b></p> <p><u>Activities</u> Six 60-minutes training sessions lead by researcher and other designated admin:</p> <ul style="list-style-type: none"> <li>- Fundamentals of collaborative teaching</li> <li>- Synchronous collaboration using technology (develop understanding and model execution)</li> <li>- Asynchronous collaboration using technology (develop understanding and model execution)</li> <li>- Collaboratively meeting the needs of students with learning disabilities</li> <li>- Reflecting and sharing practices: Synchronous</li> <li>- Reflecting and sharing practices: Asynchronous</li> </ul> <p>Ongoing support from Admin</p> <ul style="list-style-type: none"> <li>- Office hours and opportunities to schedule support sessions with admin will be available for the duration of the program</li> </ul> <p><u>Program Implementation</u> General and special education teacher participants will engage in various forms of co-teaching and co-planning.</p>	<p><u>Short-Term</u> Improved knowledge of co-teaching and co-planning in online schools</p> <p>Improved knowledge of collaboratively meeting the needs of students with learning disabilities</p> <p><u>Intermediate</u> Teachers co-teach to meet the needs of SWSLD</p> <p>Teachers use technology to asynchronously collaborate on instructional plans to meet the needs of SWSLD</p> <p><u>Distal</u> Increased teacher collaboration addressing the needs of SWSLD</p> <p>Improved academic outcomes of SWSLD</p>
	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• Teachers willing to participate in all aspects of the program and evaluation</li> <li>• Teachers will act in the best interest of students</li> <li>• Process (treatment) will influence Outcomes</li> </ul>	<p><b>External Factors</b></p> <ul style="list-style-type: none"> <li>• Personal life factors could interrupt attendance to work activities</li> <li>• Changes in student IEP during program cycle</li> </ul>	

**Process Evaluation**

Through a process evaluation, the researcher aims to assess factors that indicate how the intervention program was implemented and received (Baranowski & Stables, 2000). The

process evaluation provides an opportunity to examine program activities, participants' responsiveness to the activities, and consistency with design implementation (Rossi et al., 2019). Researchers have identified components that can be used to assess program implementation, which will be followed during this intervention. Fidelity of implementation being one of the more crucial components, refers to the program being implemented consistently having considered theory and with respect to the program developers' research design (Rossi et al., 2019). The researcher will use qualitative and quantitative methods to assess fidelity of a teacher training program by studying the following process components described by Dusenbury et al. (2003): (1) adherence and (2) dose which are described in the sections to follow.

The logic model identified as Figure 4.1 theorizes that the PD sessions are essential components of the intervention program, thus, adherence to the training topics may be indicative of program success (Dusenbury et al., 2003) and participant attendance to sessions is therefore a necessary component to receiving the dose (PD sessions).

### ***Fidelity of Adherence***

Adherence refers to activities and methods being implemented consistently with how the program developer intended for them to be implemented (Dusenbury et al., 2003). Table 4.1 outlines the details of this study's activities, including live training session topics. The training topics are also represented in the Logic Model (Figure 4.1). Elements found in the Logic Model are considered essential to the intervention program (Leviton & Lipsey, 2007). Adherence to the training session topics is critical to the intervention study which aims to improve online special and general education teachers' knowledge and practices related to technological co-planning

and co-teaching. Strict adherence to training topics may indicate high fidelity (Dusenbury et al., 2003).

**Table 4.1***Overview and Timeline of Intervention*

Procedure Description	Topic/Content	Timeline	Data Collection Tool
Survey Administration	Target RQs	Week 1-2	Pre-Survey instrument
PD Session 1	Fundamentals of collaborative teaching	Week 3	Post PD participation and topic survey
Optional Support Session	Open to meet teachers' needs	Week 4	Attendance tracker
PD Session 2	Synchronous collaboration using technology (develop understanding and model execution)	Week 5	Post PD participation and topic survey
Optional Support Session	Open to meet teachers' needs	Week 6	Attendance tracker
PD Session 3	Asynchronous collaboration using technology (develop understanding and model execution)	Week 7	Post PD participation and topic survey
Optional Support Session	Open to meet teachers' needs	Week 8	Attendance tracker
PD Session 4	Collaboratively meeting the needs of students with learning disabilities	Week 9	Post PD participation and topic survey
Optional Support Session	Open to meet teachers' needs	Week 10-11	Attendance tracker
PD Session 5	Reflecting and sharing practices: Synchronous	Week 12	Post PD participation and topic survey
Optional Support Session	Open to meet teachers' needs	Week 13-14	Attendance tracker
PD Session 6	Reflecting and sharing practices: Asynchronous	Week 15	Post PD participation and topic survey
Survey Administration	Target RQs	Week 16	Post Survey instrument
Interviews	Target RQs	Weeks 17-18	Interview protocol

### ***Fidelity of Dose Implementation***

Dose has been described as the amount of program content experienced by participants (Dusenbury et al., 2003; Rossi et al., 2019). In this study, six live training sessions are expected to be delivered to teacher participants and their attendance at each session (dose) will be measured. The Logic Model (Figure 4.1) describes the training sessions as activities of the intervention process. The researcher will use quantitative and qualitative data to measure doses received by participants.

In online schools, there is an opportunity to proctor asynchronous video-based training (dose), live synchronous training (dose) or a mixture of both types of training. Dusenbury et al., (2003) indicate mixed reviews from researchers regarding the impact to fidelity based on mode of training (dose). Although limited, existing empirical evidence indicates that live training resulted in higher fidelity. This intervention would entail live training sessions with sessions recorded and made available to participants to access at any time during the study.

### **Outcome Evaluation**

This study would aim to measure proximal outcomes of the intervention through a convergent parallel mixed methods research design (Creswell & Plano-Clark, 2018). A mixed methods design allows for elaboration and triangulation of multiple data sources (Creswell & Plano-Clark, 2018). Conveying both method typologies into a single study brings together the best of both research paradigms (Johnson & Onwuegbuzie, 2004). This comprehensive research design collects and analyzes quantitative and qualitative data aiming to compare the two types of data in answering the research questions.

## **Method**

This potential study was designed to meet the needs of online schools, in particular a cluster of online public charter schools serving students across a western coast state. The study will be based on adolescent-aged students or students in middle school, as adolescent-aged students are a population not studied as often in comparison to the elementary-age group as it relates to collaborative practices and diverse learners. Additionally, middle school teachers were under study as part of the needs assessment which in addition to existing literature informed this study. When considering this study design, it is essential, researchers take into consideration the content under study. The following section describes the researcher, potential participants, and measures related to the proposed intervention.

### **Participants**

Purposeful sampling entails the researcher intentionally inviting a select group of people to participate in the study (Lochmiller & Lester, 2017). When considering this intervention, purposeful sampling should be considered to increase validity of comparing groups of students' performance and teachers' practices, the researcher should select groups of teachers and their students' that demonstrate a need for improvement and meet the criteria for this proposed intervention. Considering all aspects of the study are critical to the intervention's success and fidelity of implementation. The sample selection process should be based on the research focus, availability of the desired study group and the researcher's judgement about the appropriateness of the intended sample (Pettus-Davis et al., 2011).

The needs assessment, described in chapter 2, conveniently sampled online middle school general and special education teachers of which approximately 55% of the teaching population participated in the study. Furthermore, about 10% of middle school teachers of JOS participated

in a pilot program led by the special education administrative team, not as part of an empirical study, one year prior to this intervention program. Teachers who participated in the pilot program perceived collaborative practices as positively influencing their pedagogy and knowledge, also believed to positively influence student outcomes.

### **Measures or Instrumentation**

This study would aim to evaluate the influence of collaborative practices, co-teaching, and co-planning, on general and special education teachers' technological pedagogy and knowledge as it relates to meeting the needs of students with disabilities. Perceptions of technological collaborative pedagogy and knowledge are constructs that would be under study as well as teachers' perceptions of such constructs related to the potential influence on students' educational progress. Essential constructs that would be relevant to this study are operationalized in Table 4.2.



**Table 4.2***Operational Definitions of Study Constructs*

Construct	Operational Definition
Adherence	The “extent to which implementation of particular activities and methods is consistent with the way the program is written” (Dusenbury et al., 2003, p. 241)
Technological pedagogy	Technological pedagogy is a knowledge framework which can be used to guide instruction. This refers to knowledge of the teaching strategies integrated with technology (Koehler & Mishra, 2009).
Co-planning	Brown et al., 2013 and Friend et al., 2010 describe co-planning as an essential element of collaborative teaching practices where teachers share the responsibility of this instructional strategy. Kim et al., 2006 describes collaborative planning as an essential part of co-teaching.
Co-teaching	A service delivery model wherein two teachers collaboratively share the responsibility of teaching a specified group of students. For the purposes of this study, one teacher must be a general educator and the other a special educator (Friend et al., 2010).
Collaborative practices	Collaborative practices are sometimes referenced throughout this study and are used to reference co-teaching and co-planning simultaneously.
Inclusion	Inclusion programs refer to students with individual education plans (IEPs) being supported by a special education teacher or paraprofessional while inside of a general education online class.

The following section details the proposed instrumentation as follows: surveys and interview protocol.

### ***Pre- and Post-Survey***

A survey of *Online Middle School Teachers Perspectives: Technological pedagogical knowledge of collaborative teaching* is being proposed as the pre- and post-intervention measurement related to the outcome evaluation. Appendix C represents the entirety of this instrument. While existing research indicates collaboration between general and special educators contributes to teacher effectiveness in meeting the needs of SWD (Carlson et al., 2019; Crouse et al., 2018; Davis & Garfield, 2021; Tahir et al., 2019), there is no empirical evidence studying the collaborative teaching practices of online middle school teachers focused on meeting the needs of SWSLD. The pre- and post-survey proposed for this designed intervention are the same as the survey proposed to be proctored to participants prior to the training program commencing and after the program implementation. This survey is an amended version of the quantitative survey used in the needs assessment which was then adopted and amended from a quantitative instrument Crouse et al. (2016) used to study online teachers' knowledge, practices, and sources of preparation for meeting the needs of SWD. Knowledge, practices, and sources of knowledge were studied as part of the needs assessment in Chapter 2. The primary changes made to the needs assessment instrument are noticed in the third and final section of the survey which aims to study the sources of knowledge and practices as it relates to technological knowledge and pedagogy related to collaborative practices between general and special educators. For example, the needs assessment instrument asks, "Collaboration with past and/or current special education peers has prepared me to teach students with specific learning disabilities in an online school environment."

## **Cognitive Interviews**

Cognitive interviews were conducted with a general and special education credentialed teacher, each with 2 years of co-teaching and co-planning experience. The interviews consisted of a discussion between the researcher and the two teachers. Each teacher was provided a copy of the pre- and post-survey. The pre- and post-survey instruments are identical and are designed to be measured prior to the start of the intervention and right after. Each teacher read through the pre- and post-survey two times each (Appendix C). The teachers described the entirety of the survey as concise and specific to measuring teachers' knowledge, practices (pedagogy) and training (sources of knowledge). Each of them described aloud what they believed each question to be asking and all responses were accurately representing the researcher's intention within the content of this study design.

Both teachers proposed a similar question related to the use of the term Specific Learning Disability (SLD). They wondered if teacher participants will only consider SWSLD when responding to each survey item or if they will have all students with disabilities in mind. The general education teacher said that she often thinks of all SWD in similar ways when planning lessons. While students with disabilities were under study throughout this dissertation, students with Specific Learning Disabilities are at the center of this research, therefore, the researcher will not replace that term, however, this feedback should be considered when analyzing and interpreting results from the study. Furthermore, it is essential that participants, once recruited, be often made aware this study is designed to meet the needs of SWSLD and that knowledge, practices and training related to it may be beneficial when considering other diverse learners.

### ***PD Topic and Participation Survey***

*A Survey of Online Middle School Teachers Perspectives: Perception of training attendance and topics* is being proposed as a form of measurement related to the process evaluation. Appendix D represents the entirety of this instrument. This survey aims to measure the adherence to the program training topics as proposed in the Logic Model (Figure 4.1) and doses received by participants. Adherence has been measured using a variety of methodologies with self-reporting identified as the most common form of measurement (Dusenbury et al., 2003). The survey found in Appendix D will be proctored to participants at the end of each live training session detailed in the Logic Model shown in Figure 4.1.

### ***Interview Protocol***

*Interview Protocol Seeking to Understand Online Middle School Teachers Perspectives: Technological pedagogical knowledge of collaborative teaching* is being proposed as the pre- and post-intervention measurement related to the outcome evaluation. Appendix E represents the entirety of this instrument. The researcher aims to learn how teachers' collaborative teaching and planning experiences influence teachers' technological pedagogical knowledge and practices and deeply understand the difference between the perspectives of general education online teachers compared to special educators. This interview protocol also provides a unique opportunity to learn a teachers' perspective on the influence of their knowledge and practices on the academic progress of SWSLD. This is a factor not often targeted in collaborative research with no evidence in this area existent related to academic progress of SWSLD. The protocol entails the following question that aims to gather online teachers' perspectives of student benefit of collaborative teaching knowledge and practices, "Please describe how your students have benefited from asynchronous and synchronous collaboration between online general and special

education teachers?” The interview protocol also asks, “How has the collaborative training program influenced your knowledge and practices meeting the needs of students with Specific Learning Disabilities?”.

### **Procedure**

Intervention procedures should be aligned with concurrent parallel mixed methods using quantitative and qualitative methodologies including the intervention design, collection of data, and analysis of data. The quantitative and qualitative data will be analyzed and interpreted together (Creswell & Plano-Clark, 2018; Lochmiller & Lester, 2017). Practicing mixed methods as described allows the researcher to maximize the strengths of quantitative and qualitative methodologies including opportunities to gain a deeper understanding of the phenomenon under study (Mertens, 2018; Johnson & Onwuegbuzie, 2004). The following section describes the intervention procedures, data collection, and data analysis.

### **Intervention**

The intervention is designed to be 18 weeks in length. Further details can be found in the Logic Model shown in Figure 4.1.

The training program includes a series of six live/synchronous sessions of 60 minutes in length. Each training session should be facilitated at least once weekly. These sessions are designed to be facilitated by general and special education teachers and leaders with expertise in co-teaching and co-planning practices in online schools. Sustained duration, support, application of knowledge and collaboration throughout professional learning experiences is a theme noticed in the literature as supported by researchers (Clarke & Hollingworth, 2002; Darling-Hammond, 2007; Desimone & Garet, 2015). The full length, or a comparable length, for this study is essential to consider. Participants engaging in the training program are intended to be practicing

teachers already required to engage in collaborative practices with respective inclusion and shared instruction programs implemented throughout the online middle schools under study. All training topics will be designed to consider the needs of SWSLD. The training topics are as follows:

### ***Training Session 1***

*The fundamentals of collaborative teaching* will be targeted in the first training session aiming to improve the collaborative knowledge and practices of online general and special educators. This short-term outcome is represented in the Logic Model (Figure 4.1).

### ***Training Session 2***

*Synchronous collaboration using technology* will be the focus of the second training session. Improving teachers' knowledge of UDL principles will increase accessibility of curriculum and learning environments for all students. Research on the effectiveness of UDL principals on student outcomes is scarce, however, some research exists indicating UDL principles' positive influence on pedagogical practices aiming to meet the needs of diverse learners (Al-Azawei et al., 2016).

### ***Training Session 3***

*Asynchronous collaboration using technology* will be the focus of the third training session. Improving teachers' knowledge of UDL principles will increase accessibility of curriculum and learning environments for all students. Research on the effectiveness of UDL principals on student outcomes is scarce, however, some research exists indicating UDL principles' positive influence on pedagogical practices aiming to meet the needs of diverse learners (Al-Azawei et al., 2016)

#### ***Training Session 4***

*Collaboratively meeting the needs of students with learning disabilities* will be the focus of the fourth training session as this session will take a deeper dive into effective pedagogy designed to meet the needs of SWSLD and infusing such practices with collaborative teaching techniques.

#### ***Training Session 5***

*Reflecting and sharing practices synchronously* will be the focus of the fifth training session which will provide participants with an opportunity to openly reflect and share practices they have found to be effective or ineffective related to co-teaching and co-planning for live synchronous sessions.

#### ***Training Session 6***

*Reflecting and sharing practices synchronously* will be the focus of the sixth training session which will provide participants with an opportunity to openly reflect and share practices they have found to be effective or ineffective related to co-planning for asynchronous pedagogy.

Professional development has been cited as effective in targeting teachers' practices related to use of UDL principles (Canter et al., 2017; Courey et al., 2013). Furthermore, research indicates PD (Huberman et al., 2012), using technology (VanUitert et al., 2020), has been key in improving teachers practices which in turn improves the academic achievement of SWD. Darling-Hammond et al. (2017) posit collaboration, expert-level support, modeling, sustained duration, and feedback as effective PD elements all of which will be represented in this intervention. Expert-level support will be available to participants throughout the intervention process and feedback will be collected using the data collection instruments described in the

instrumentation section and further below. Details regarding the intervention timeline and procedures are displayed in the Logic Model image in Figure 4.1.

### **Data Collection**

Data collected as part of this study involves quantitative and qualitative sources. A detailed timeline of the data collection can be found in Table 4.1.

#### **Pre- and Post-Survey**

This survey would be created using Qualtrics, or a similar software, and is designed to consist of eight demographic items and 17 Likert scale items. This electronic survey is estimated to take participants approximately 8-16 minutes to complete. The survey instrument, including informed consent, can be found under Appendix C. The survey should be left open for a determined period and close prior to the first live training session as outlined in Table 4.1. The same survey will be electronically proctored to participants at the end of the final training session. Participants should have until the day before interviews commence in the 17th week of the program to complete the post-survey (see Table 4.1).

#### **PD Topic and Participation Survey**

This survey would be created using Google forms, or a similar platform, and consist of three required questions and one optional question. Participants will be invited to complete this survey at the end of each (6) live training session. This survey aims to measure the fidelity of implementation related to adherence to the training topics and dose (training) received by each participant. The survey will be analyzed to determine whether teachers perceived the training topics to have been covered as the researcher intended as well as measurement of the participants receiving the dose (training).



## **Interview Protocol**

Interviews will be conducted after the post-survey has been completed as outlined in Table 4.1. Participants in the intervention program will be offered an opportunity to partake in an interview with the researcher. The interview protocol involves 13 items which will guide the interview and aim to answer research questions three and four.

## **Data Analysis**

Quantitative and qualitative analysis methods would be used to analyze data collected as part of the intervention study described herein. The qualitative and quantitative data are proposed to be analyzed separately and then converged (Creswell & Plano Clark, 2018; Lochmiller & Lester, 2017; Mertens, 2018). Merging data will provide an opportunity to examine ways in which the findings converge and diverge (Creswell & Plano Clark, 2018; Johnson & Onwuegbuzie, 2004; Mertens, 2018) and provide a deeper understanding of the phenomenon under study. Descriptive and inferential statistics are suggested to analyze the quantitative survey results. Next, it is recommended the researcher uses qualitative method coding strategies to analyze the qualitative data. Finally, the researcher should engage in an analysis of all data. The Summary Matrix displayed in Table 4.3 outlines the alignment between research questions, instruments, and potential data analysis.

**Table 4.3***Summary Matrix*

Research Question	Constructs	Measures or Instrumentation	Data Collection	Data Analysis
RQ 1: To what extent did the study implementation adhere to training topics outlined in the study procedures?	Fidelity of implementation (Dusenbury et al., 2003)	PD topic survey	Google survey	Descriptive statistics (Lochmiller & Lester, 2017)
RQ 2: To what extent did participants attend the PD sessions as part of this study?	Fidelity of dose (Dusenbury et al., 2003)	Pre and post survey  Interview protocol	Qualtrics Survey  Interview protocol	Descriptive statistics (Lochmiller & Lester, 2017)  In Vivo Coding (Miles et al., 2014)
RQ 3: How does co-planning and co-teaching amongst online middle school special and general education teachers influence their technological pedagogical knowledge and practices used to meet the needs of SWSLD?	Co-planning (Friend et al., 2010) Co-teaching (Friend et al., 2010)  Technological pedagogical knowledge (TPK_ (Koehler & Mishra, 2009)	Pre and post survey  Interview protocol	Qualtrics Survey  Interview protocol	Descriptive statistics (Lochmiller & Lester, 2017)  In Vivo Coding (Miles et al., 2014)
RQ 4: How do collaborative teaching and planning experiences differ amongst online middle school special and general education teachers?	Collaborative teaching and practices (Friend et al., 2010)	Pre and post survey  Interview protocol	Qualtrics Survey  Interview protocol	Inferential statistics (Lochmiller & Lester, 2017)  In Vivo Coding (Miles et al., 2014)
RQ 5: How does student performance compare when measuring pre- and post- teacher training and implementation?	Student performance data	Analysis of student performance data comparing pre- and post-training (e.g., district or school-wide standardized assessment, formative teacher assessments, course assignments, etc.)	Review of students' performance data (determined by school)	Descriptive statistics (Lochmiller & Lester, 2017)  Inferential statistics (Lochmiller & Lester, 2017)  In Vivo Coding (Miles et al., 2014)

## Conclusions

It is evident that general and special education online teachers, serving adolescent-aged diverse learners, need training that informs their pedagogical knowledge and practices aiming to better serve our students. Teacher collaboration has been cited as a pedagogical practice positively influencing teacher practices and academic outcomes of students with disabilities (Davis & Garfield, 2021; Huberman et al., 2012). Some teacher preparation institutions have recognized the value of collaboration amongst general and special educators (Gilmour et al., 2019), still, there is room for improvement given the scant literature that substantiates cross-department collaboration in teacher preparation programs (Ricci & Fingon, 2018). Inservice online special and general educators continue to report a lack of preparedness related to supporting SWD (DiPietro et al., 2008; Fitzpatrick et al., 2020; Rice & Dykman, 2018).

The proposed intervention intends to use live professional development sessions, application of knowledge, and ongoing support aiming to improve online teachers' knowledge and practices related to meeting the needs of diverse learners, namely SWSLD. Under the proposed intervention, the professional development training sessions would be sustained for a minimum of one semester as an effective training strategy that considers sustained duration of training as emphasized by Darling-Hammond et al. (2017) and other researchers (Clarke & Hollingworth, 2002; Desimone & Garet, 2015). Educators and students need this critical intervention. While empirical evidence exists studying teacher collaboration, online teachers and SWSLD, studies involving all three factors are nearly non-existent. This intervention has the potential to positively contribute to teachers' pedagogy and support the educational progress of diverse learners.

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## Appendix A

### E-Survey Participant Consent

I invite you to participate in a study entitled, Online Middle School Teachers: Knowledge, Practices and Preparation for Teaching Students with Specific Learning Disabilities (SLD). The purpose of this study is to learn about your knowledge, practices, and preparation for teaching students with specific learning disabilities in an online school environment.

Completing the survey is voluntary and you may stop at any time without consequences. You will not be remunerated for participation. This survey asks you questions about your knowledge, practices and sources of knowledge pertaining to teaching students with specific learning disabilities.

No direct identifiers are included in this survey though some demographic data is requested. I will use this information to explore possible similarities and differences within and across groups.

#### **BENEFITS**

Your responses will assist me in studying the technological pedagogical knowledge and practices of teachers as well as the sources that attributed to such knowledge and practices. This information will serve as a guide for action planning and future program development.

#### **RISKS**

There are no known risks associated with this study. The study does not include any questions or information that can link the participant to the answers. Participants can stop the survey at any time without penalties to avoid any unforeseeable risks and/or discomforts, including physical, psycho-social, or legal risks.

- Whenever you provide information online, your data could be intercepted. I am using a secure system to collect this data [e.g. Qualtrics], but cannot completely eliminate this risk.
- Data collected is anonymous.
  - **I will not collect the IP address for the responses and will not link your answers back to your email or computer.**
  - I will store all electronic data on the servers for the online survey software (Qualtrics) and downloaded data will be stored in a password-protected, encrypted computer.

Only the researcher will have access to the information you provide. Results will be shared to support discussions that work to improve educational programs. If findings are shared in publications or presentations, the results will be in aggregate (grouped) data, with no individual results. Use of quotes will be masked with pseudonyms (fake names).

If you have any questions about this research, contact Breana Wall, [bwall@caliva.org](mailto:bwall@caliva.org). If you have any questions about your rights as a research participant, please contact Dr. Camille Bryant from the College of Education at Johns Hopkins University - [cbryan16@jhu.edu](mailto:cbryan16@jhu.edu).



If you meet the eligibility criteria below and would like to participate in this study, click the button to begin the survey. If you do not wish to continue with the survey, please exit the survey. Remember, your participation is completely voluntary, and you're free to withdraw at any time.

- I am at least 18 years old
- I am a current middle school teacher with California Virtual Academy

## Appendix B

### A Survey of Online Middle School Teachers: Knowledge, Practices and Preparation for Teaching Students with Specific Learning Disabilities

**Directions:** Please answer the following demographic questions.

1. What content domain do you teach?  
General Education ELA  
General Education Math  
Other General Education Content  
Multiple General Education Subjects  
Special Education
2. What are your total years of experience teaching online?  
0-1, 1-2, 3-5, 6-10, 11-15, 16+
3. How many years, if applicable, did you teach in a traditional face-to-face classroom prior to your current online teaching assignment?  
0-1, 1-2, 3-5, 6-10, 11-15, 16+
4. Please identify your gender.  
Male, Female, Non-binary
5. Which of the following best describes your current teaching credential?  
General education  
Special education  
Administration  
General and Special Education  
General Education and Administration  
Special Education and Administration  
Administration, General Education and Special Education
6. In the space provided, please list your current active credentials held with the California Commission on Teacher Credentialing.  
OPEN-ENDED
7. Which path to licensure best describes the path you took?  
Teaching credential earned through a school district internship program  
Teaching credential earned through a university or college internship program  
Teaching credential earned through degree from a college or university  
Teaching credential earned with experience from a private school  
Teaching credential earned with Peace Corps experience

Other, not listed

## **Technological Pedagogical Knowledge, Practices and Sources of Knowledge and Practices**

Scale:

- 1= Strongly disagree
- 2 = Disagree
- 3 = Neither agree nor disagree
- 4 = Agree
- 5 = Strongly agree

### **Technological Pedagogical Knowledge**

Children with Specific Learning Disabilities, also known as learning disabilities, are identified as having significantly lower performance than their same-aged peers in reading, writing and/or math that is unexplainable by external factors nor by their learning potential (p.76). These students have average or above average general intelligence (IQ) with a discrepancy between their IQ and academic achievement score(s) (Buttner & Hasselhorn, 2011). Knowledge and practices that support meeting the needs of students with SLD may also benefit meeting the needs of other diverse learners.

**Directions:** The following statements aim to learn about your knowledge of technological teaching practices for teaching students with specific learning disabilities (SLD). Please rate your level of agreement with each statement.

1. I know how to modify online class materials in order to meet the needs of students with specific learning disabilities.
2. I know how to use online student assessment data, that either I have collected in my class or was collected through school-wide measures, to modify instruction to meet the needs of students with specific learning disabilities.
3. I have knowledge of the Universal Design for Learning (UDL) principles.
4. I know how to access Universal Design for Learning (UDL) tools.
5. I know that teacher collaboration, between general and special education, can inform my instructional practices for meeting the needs of students with specific learning disabilities in an online school environment.
6. I know different instructional strategies to support online learning for students with specific learning disabilities in an online environment.

### **Technological Pedagogical Practices**

**Directions:** The following statements aim to learn about your technological teaching practices for teaching students with specific learning disabilities (SLD). Please rate your level of agreement with each statement.

7. I modify the online class materials in order to meet the needs of students with specific learning disabilities.

8. I use online student assessment data, that either I have collected in my class or was collected through school-wide measures, to modify instruction to meet the needs of students with specific learning disabilities in an online school environment.
9. I utilize the principles of Universal Design for Learning (UDL) within my online synchronous classroom.
10. I utilize the principles of Universal Design for Learning (UDL) when assigning asynchronous assignments.
11. I utilize Universal Design for Learning (UDL) tools in my online teaching.
12. I collaborate with general education teachers to inform my instructional practices to **meet the needs of students with specific learning disabilities in an online school environment.**
13. I collaborate with special education teachers to inform my instructional practices to **meet the needs of students with specific learning disabilities in an online school environment.**
14. I am proficient in my ability to implement instructional activities to meets the needs of students with specific learning disabilities in an online school environment.

### **Sources of Knowledge and Practices**

**Directions:** The following statements aim to learn about the sources that you attribute to your current knowledge and practices for teaching students with specific learning disabilities (SLD). Please rate your level of agreement with each statement.

15. My teacher preparation program prepared me to teach students with specific learning disabilities in an online school environment.
16. The in-service training/s I received during my first year as an online teacher, in my current placement, prepared me to teach students with specific learning disabilities in an online school environment.
17. The ongoing professional development I received, thus far, in my current placement has prepared me to teach students with specific learning disabilities in an online school environment.
18. My relationships with past and/or current students and their families prepared me to teach students with specific learning disabilities in an online school environment.
19. Collaboration with past and/or current special education peers has prepared me to teach students with specific learning disabilities in an online school environment.
20. Collaboration with past and/or current general education peers has prepared me to teach students with specific learning disabilities in an online school environment.
21. Consultation with past and/or current administration has prepared me to teach students with specific learning disabilities in an online school environment.
22. The curricular resources I have access to are enough to support my instructional practices for teaching students with specific learning disabilities in an online school environment.

## Appendix C

### **Survey of Online Middle and High School Teachers Perspectives: Technological Pedagogical Knowledge and Practices of Collaborative Teaching.**

I invite you to participate in a study titled, **Survey of Online Middle and High School Teachers Perspectives: Technological pedagogical knowledge and practices of collaborative teaching.**

This study targets the technological pedagogical knowledge and practices of general and special education online teachers as it relates to co-planning and co-teaching (collaboration) to meet the needs of students with Specific Learning Disabilities. Often knowledge and practices that address the needs of students with Specific Learning Disabilities also meet the needs of other diverse learners.

This survey is a part of the study. Participating in this study is voluntary and you may stop at any time without consequences. You will not be remunerated for participation. This survey asks you questions about your knowledge and practices pertaining to collaboratively supporting students with specific learning disabilities.

No direct identifiers are included in this survey though some demographic data is requested. I will use this information to explore possible similarities and differences within and across groups.

#### **BENEFITS**

Your responses will assist me in studying the technological pedagogical knowledge and practices of teachers as well as the sources that attributed to such knowledge and practices. This information will serve as a guide for action planning and future program development.

#### **RISKS**

There are no known risks associated with this study. The study does not include any questions or information that can link the participant to the answers. Participants can stop the survey at any time without penalties to avoid any unforeseeable risks and/or discomforts, including physical, psycho-social, or legal risks.

- Whenever you provide information online, your data could be intercepted. I am using a secure system to collect this data [e.g. Qualtrics] but cannot completely eliminate this risk.
- Data collected is anonymous.
  - **I will not collect the IP address for the responses and will not link your answers back to your email or computer.**
  - I will store all electronic data on the servers for the online survey software (Qualtrics) and downloaded data will be stored in a password-protected, encrypted computer.

Only the researcher, principal investigator and student member will have access to the information you provide. Results will be shared to support discussions that work to improve

educational programs. If findings are shared in publications or presentations, the results will be in aggregate (grouped) data, with no individual results. Use of quotes will be masked with pseudonyms (fake names).

If you have any questions about this research, contact Breana Wall, [bwall@caliva.org](mailto:bwall@caliva.org). If you have any questions about your rights as a research participant, please contact Dr. Laura Flores Shaw from the School of Education at Johns Hopkins University – [lshaw14@jhu.edu](mailto:lshaw14@jhu.edu).

If you meet the eligibility criteria below and would like to participate in this study, click the button to begin the survey. If you do not wish to continue with the survey, please exit the survey. Remember, your participation is completely voluntary, and you're free to withdraw at any time.

- I am at least 18 years old
- I am a current full-time middle or high school teacher employed by one of the California Virtual Academies and hold at least a general subject/s credential and/or an education specialist credential

### **Survey of Online Middle and High School Teachers Perspectives: Technological pedagogical knowledge and practices of collaborative teaching**

**Directions:** Please answer the following questions.

1. What content domain do you teach?  
General Education ELA  
General Education Math  
Other General Education Content  
Multiple General Education Subjects  
Special Education
2. What are your total years of experience teaching online?  
0-1, 1-2, 3-5, 6-10, 11-15, 16+
3. How many years, if applicable, did you teach in a traditional face-to-face classroom prior to your current online teaching assignment?  
0-1, 1-2, 3-5, 6-10, 11-15, 16+
4. Please identify your gender.  
Male, Female, Non-binary
5. Which of the following best describes your current teaching credential?  
General education  
Special education  
Administration

General and Special Education  
General Education and Administration  
Special Education and Administration  
Administration, General Education and Special Education

6. In the space provided, please list your current active credentials held with the California Commission on Teacher Credentialing.

OPEN-ENDED

7. Which path to licensure best describes the path you took?

Teaching credential earned through a school district internship program

Teaching credential earned through a university or college internship program

Teaching credential earned through degree from a college or university

Teaching credential earned with experience from a private school

Teaching credential earned with Peace Corps experience

Other, not listed

8. Did you participate in the training sessions as part of this research study?

The training sessions have not yet been offered

I participated in all three live training sessions

I participated in some of the live training sessions

I participated in none of the live training sessions

*Children with Specific Learning Disabilities, also known as learning disabilities, are identified as having significantly lower performance than their same-aged peers in reading, writing and/or math that is unexplainable by external factors nor by their learning potential (p.76). These students have average or above average general intelligence (IQ) with a discrepancy between their IQ and academic achievement score/s (Buttner & Hasselhorn, 2011). Knowledge and practices that support meeting the needs of students with SLD may also benefit meeting the needs of other diverse learners.*

Scale:

1= Strongly disagree

2 = Disagree

3 = Neither agree nor disagree

4 = Agree

5 = Strongly agree

### **Technological Pedagogical Knowledge**

**Directions:** The following statements aim to learn about your perceived knowledge of technological teaching practices that can be supportive in meeting the needs of your students with Specific Learning Disabilities (SLD). Please rate your level of agreement with each statement.

23. I know how to modify online class materials to meet the needs of students with specific learning disabilities.
24. I know how to use online student assessment data, that either I have collected in my class or was collected through school-wide measures, to modify instruction to meet the needs of students with specific learning disabilities.
25. I know that teacher collaboration, between general and special education, can inform my instructional practices for meeting the needs of students with specific learning disabilities in an online school environment.
26. I have knowledge of the Universal Design for Learning (UDL) principles.
27. I know how to access Universal Design for Learning (UDL) tools.
28. I know different instructional strategies to support online learning for students with specific learning disabilities in an online environment.

### **Technological Pedagogical Practices**

**Directions:** The following statements aim to learn about your perceived technological teaching practices that help your meeting the needs of your students with Specific Learning Disabilities (SLD). Please rate your level of agreement with each statement.

29. I collaboratively plan to accommodate/modify the online class materials to meet the needs of students with specific learning disabilities.
30. I collaboratively use online student assessment data, that either I have collected in my class or was collected through school-wide measures, to modify instruction to meet the needs of students with specific learning disabilities in an online school environment.
31. I utilize the principles of Universal Design for Learning (UDL) within my online synchronous classroom.
32. I utilize the principles of Universal Design for Learning (UDL) when assigning asynchronous assignments.
33. I am proficient in my ability to implement collaborative instructional activities to meet the needs of students with specific learning disabilities in an online school environment.

### **Sources of Knowledge and Practices**

**Directions:** The following statements aim to learn about the sources that you attribute to your current knowledge and practices support your meeting the needs of students with specific learning disabilities (SLD). Please rate your level of agreement with each statement.

34. My teacher preparation program prepared me to teach collaboratively to meet the needs of students with specific learning disabilities in an online school environment.



35. The recent trainings I received related to collaborative pedagogy, in my current placement, prepared me to teach students with specific learning disabilities in an online school environment.
36. **Co-teaching with** current special education/general education peers has prepared me to teach students with specific learning disabilities in an online school environment.
37. **Co-planning with** current special education/general education peers has prepared me to teach students with specific learning disabilities in an online school environment.
38. Consultation/support with current administration has prepared me to teach students with specific learning disabilities in an online school environment.
39. The resources I have access to are sufficient to support my collaborative instructional practices for teaching students with specific learning disabilities in an online school environment.

## Appendix D

### A Survey of Online Middle and High School Teachers Perspectives: Perception of training attendance and topics.

**Directions:** Please answer the following questions.

8. Please indicate whether you are a general or special education teacher.  
General education teacher  
Special education teacher
  
9. Please indicate your attendance at today's (insert date) training session:  
I was in attendance for part of the training session, but not all of it  
I was in attendance for all the training session  
I did not attend the training session
  
10. Please indicate which of the following training topic/s were covered during today's training session:  
Fundamentals of collaboration teaching meeting the needs of SWSLD  
Synchronous implementation of accommodations/modifications  
Synchronous implementation of accommodations/modifications  
None of the above
  
11. If the questions above did not effectively capture your perception of your attendance and understanding of training topics, please feel welcome to provide additional details below (optional).

## Appendix E

Interview Protocol of Online Middle and High School Teachers Perspectives: Technological pedagogical knowledge and practices of collaborative teaching

*The collaborative teaching training program aimed improve technological knowledge and teaching practices related to co-teaching and planning for students with Specific Learning Disabilities, also known as learning disabilities. Students identified under this category of special education eligibility are known for having significantly lower performance than their same-aged peers in reading, writing and/or math that is unexplainable by external factors nor by their learning potential (p.76). These students have average or above average general intelligence (IQ) with a discrepancy between their IQ and academic achievement score/s (Buttner & Hasselhorn, 2011). Knowledge and practices that support meeting the needs of students with SLD may also benefit meeting the needs of other diverse learners.*

This interview is intended to be a discussion where the researcher aims to learn about your technological knowledge and pedagogy related to collaboratively meeting the needs of SWSLD.

How many years of experience do you have teaching in a traditional face-to-face classroom prior to your current online teaching assignment?

How many years of experience do you have teaching in online K-12 schools?

Please identify your gender.

Please describe your current teaching assignment at JOS?

Please describe the teaching credentials you currently possess.

Please describe the licensure path you took to earn your teaching credential.

Please briefly describe the training you have received while at JOS that has directly informed your collaborative practices meeting the needs of students with Specific Learning Disabilities.

Do you believe collaboration between general and special education teachers is necessary to meet the needs of students with Specific Learning Disabilities?

How has the collaborative training program influenced your knowledge and practices meeting the needs of students with Specific Learning Disabilities?

How has the support from administration influenced your knowledge and practices meetings the needs of students with Specific Learning Disabilities?

Please describe how your students have benefited from asynchronous and synchronous collaboration between online general and special education teachers?

How can training and support be improved to help you meet the needs of students with Specific Learning Disabilities?

Is there anything else you'd like to share about your experiences working collaboratively, using technology, to meet the needs of students with Specific Learning Disabilities?