Reducing the Gap: Preparing Teachers to Use Evidence-Based Practices in Autism

by

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Abstract

Research shows that there is a gap between the educational research and classroom practice regarding students diagnosed with autism spectrum disorders (ASD) (Callahan, Henson, & Cowan, 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). While evidence-based practices (EBPs) have been established specific to students diagnosed with autism spectrum disorder, these practices are not consistently used in public school classrooms (Callahan et al., 2008; Cook & Odom, 2013; Cook, Tankersley, & Landrum, 2009; National Autism Center, 2015; Wong et al., 2015). This gap may be the result of limited access to effective professional development that was designed to meet the complex needs of those with ASD (Boyd & Shaw, 2010; Lord et al., 2005; Scheuermann, Webber, Boutot, & Goodwin, 2003; Wong et al., 2015). The purpose of this mixed methods concurrent study was to increase a) the knowledge of ASD and EBPs in teachers working with students with ASD, b) the frequency of use of discrete trial training and visual supports in the classroom, two EBPs designed for students with ASD, and c) self-efficacy of teachers working with students diagnosed with ASD. The participants were self-contained special education teachers from a district located in the southeastern United States. Each participant took part in four face-to-face professional development sessions, completed two online modules, and participated in four coaching individualized sessions. Qualitative and quantitative data included professional development sign-in sheets, coaching logs including an implementation checklist and anecdotal notes, a social validity survey, pre- and post-program surveys focusing on knowledge of ASD, evidence-based practices, and self-efficacy. Results indicated the participants showed growth in knowledge of the characteristics of ASD. Participants also demonstrated an 81% increase in their level of knowledge of twenty-seven of EBPs, and an 85% increase in their comfort in

implementing twenty-six of the EBPs. In contrast, there was a decrease in comfort of implementation of one of the EBPs. Finally, the self-efficacy levels of the participants improved in 23 out of 30 questions.

Keywords: autism spectrum disorder, evidence-based practices, professional development, research-to-practice gap

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The student has made all necessary revisions, and we have read, and approve this dissertation for submission to the Johns Hopkins Sheridan Libraries as partial fulfillment of the requirements for the Doctor of Education degree.

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Dedication

My mother always taught me that children are raised by the village of people who surround them with love and support. This dissertation is dedicated to all those members of my village who continue to love, support, and stand by me daily, specifically:

To my grandmother, Carol D. Troy, whose love continues to be felt long after her death.

To my parents, Mary Lou Troy and Fred Kaiser, your unconditional love and endless support, you have been my rock throughout this process and my life.

To my husband, Stanley J. Armstrong, your unwavering love has guided me and helped me to persevere through every challenge.

To my children, Jack T. Armstrong and Rylie G. Armstrong, thank you for your overwhelming love and forgiveness during this process. May you always love to learn and be willing to persevere even in the difficult times.

To my family and friends, I am grateful for your love, support, and patience over these past three years and always.

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To my students, past, present, and future, may you always continue to learn in everything you do.

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My doctoral journey began with the hope that I could make a small difference in the lives of my students now and in the future. I would like to thank each of my participants for giving of their time and energy. Each of them were willing to dive in, learn new practices, and to share their honest reflections throughout the program. May all of our work make a difference for the students in Stone Run County Schools, as well as others around the U.S.

I am grateful for the unending support and encouragement of Dr. Christine Accardo, my advisor. I would never have survived this process without your constant support. Thank you for the countless phone calls, emails, and texts which kept my work and me on track. Your constant advise, questions, and feedback were the backbone of this study. I will be forever grateful for all that you have done for me and my work.

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encouragement, stimulating feedback, and endless questions. I am so lucky to have walked beside you on this journey.

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Executive Summary

Autism spectrum disorder is one of the fastest growing developmental disabilities (CDC, 2014). The prevalence of autism spectrum disorder (ASD) has risen by 290% since 1997 (Boyle et al., 2011). In 2018, the Center for Disease Control and Prevention recorded the prevalence of ASD in 8-year olds at a rate of 1:59 (Baio et al., 2018). Subsequently, many public schools in the U.S. are seeing a rise in the number of students who are diagnosed with ASD (U.S. Department of Education, 2018). According to the United States Department of Education (2018), as many as 576,000 students across the United States are receiving special education services in the public schools under the eligibility category of ASD. Consequently, many public schools are facing with determining how to assist students with ASD in learning effectively.

The Gap Between Education and Practice

Current literature establishes a gap between autism-focused educational research and the practices being used with students diagnosed with ASD in the public-school setting (Callahan, Henson, & Cowan, 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). While research has been published identifying evidence-based instructional practices designed for use with students diagnosed with ASD, they are not consistently used across the United States (Chasson, Harris, & Neely, 2007; National Autism Center, 2015; Stahmer, 2007; Stahmer, Collings, & Palinkas, 2005, Wong et al., 2015). Teachers may use instructional strategies that are not supported by empirical research (Chasson et al., 2007; Cook & Odom, 2013; Stahmer et al., 2005) or the practices they use may lack fidelity (Cook & Odom, 2013; Iovannone, Dunlap, Huber, & Kincaid, 2003). As a result of the

research-to-practice gap, students diagnosed with ASD may be enrolled in special education services that may not lead to increased achievement or meet their specific needs.

Examination of Underlying Factors

The dissertation reviewed literature through the lens of a networked ecological systems theory, examining the root causes of the gap in the microsystem, mesosystem, exosystem, and macrosystem (Neal and Neal, 2013). The use of this lens assisted in establishing a variety of underlying factors that contribute to the gap such as the complexity of an ASD diagnosis. The factors include the vast array of student needs; the dissemination of research into the educational setting; the translation of research into the classroom practice; the wide variety of evidence-based approaches; the requirements of educational policy and law; the costs of educating a student diagnosed with ASD; lack of teacher preparation specific to knowledge and practices that support students with ASD; the collaboration with and support of administrators; the self-efficacy of teachers; and the limited access to effective professional development (Callahan et al., 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). While a broad variety of factors contribute to the research-to-practice gap, the scope of this dissertation focused the lack of teacher preparation and training specific to the knowledge and practices designed to support students diagnosed with ASD. This study examined the extent to which these factors vary in Stone Run County Schools, and how these factors might be changed through an intervention study.

The Context of the Study

The study was conducted in Stone Run County Schools, which is situated within a state in the U.S. Stone Run County Schools encompasses 591 square miles including sections of two counties. Stone Run County Schools includes a small, semi-urban city, bordered by suburban

and rural areas with a few smaller farming towns. During the 2018- 2019 school year, the Stone Run County Schools reported serving 15,077 students from pre-school through twelfth grade across 29 schools.

A needs assessment was completed during 2017 and 2018. The needs assessment was divided into two phases. The first phase, completed in the spring of 2017, examined the knowledge and beliefs of special education administrators regarding the research-to-practice gap in ASD, within Stone Run County Schools. The second phase, completed in the spring of 2018, expanded the investigation to include an examination of the knowledge, beliefs, and practices of the exceptional education (special education) teachers of students with ASD by surveying exceptional education teachers working in both the general and adaptive curriculum classrooms. Results established gap between the current research and practices within Stone Run County Schools. The interview responses discussed factors including the lack of teacher preparation, the chasm between the need for effective instruction and the current instructional practices, and the continued need for on-going training and support (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). The background section of the survey confirmed the need for further teacher training, as a majority of respondents had not received training specific to students with ASD. Additionally, further results from the knowledge section of the survey indicated that while respondents demonstrated knowledge in behavioral terminology and strategies for dealing with behaviors, but their knowledge was more limited in regard to the specifics of working with students with ASD. Furthermore, interview responses revealed the need for increased efficacy among some teachers (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). The

combined data established that there is a gap between current research recommendations and the daily practices of the teachers in Stone Run County Schools.

The participants in the study were four self-contained Exceptional Children's (EC) (Special Education) teachers from across Stone Run County Schools. The study announcement was sent through an email, as well as listed on the Stone Run County School's special education professional development calendar. Participants were assigned to a self-contained classroom with at least one student diagnosed with ASD on their current caseload. Participation in the study was voluntary.

Theoretical Framework

The intervention study was built on a foundation of the Core Conceptual Framework model described in the work of Desimone (2009). The model was based on the researched connections between teacher knowledge, instruction, and student achievement (Desimone, 2009). In the conceptual framework, four key elements including a) the features of professional development, b) increases in teacher knowledge and/or change in the beliefs of teachers, c) changes in classroom instruction, and d) increases in student learning are interrelated along a pathway format (Desimone, 2009). While the long-term goal was to improve student achievement, the overall purpose of the dissertation study was to transform the participants' knowledge, beliefs, and daily instruction.

Preparing Teachers to Use Evidence-Based Practices

The reviewed literature revealed that teachers who work with students diagnosed with ASD, often have limited access to both pre-service and in-service training specific to ASD (Callahan et al., 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). Consequently, many teachers may require ongoing in-

service training centered on evidence-based practices for students diagnosed with ASD (Callahan et al., 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007; Strong, 2014). The intervention study model was based on the work of Higginson and Chatfield, 2012; Marder and deBettencourt, 2012; Mueller and Brewer, 2013; Scheuermann et al., 2003; and Stahmer et al., 2015.

The Purpose of the Study

The purpose of this study was to examine the effect of using a combination of professional development, online modules, and instructional coaching on the knowledge and beliefs of teachers working with students diagnosed with ASD and on the use and fidelity of the EBPs in the classroom. The study was based on the conceptual framework hypothesizing that if teachers participated in a professional development designed using the elements of content focus, active learning, coherence, duration, and collective participation, their knowledge and level of efficacy around EBPs would increase, which in turn would contribute to changes in instruction, and eventually, improve student learning (Desimone, 2009). The research questions for the study addressed both the process and outcome evaluations.

- To what extent was the combined program, including professional development, online modules and instructional coaching, implemented with fidelity including dose, reach, and adherence to the program?
- What was the participants' experience in the combined program?
- To what extent did the combined program increase teacher knowledge of ASD and EBPs?
- To what extent did the combined program increase the frequency of use of EBPs in the classroom setting?

- To what extent did the combined program increase teacher self-efficacy levels regarding working with students with ASD?

Research Design

This study was based on a concurrent design, in which researchers collected both qualitative and quantitative data during the same timeframes (Creswell & Plano Clark, 2011). The qualitative data collection included coaching logs, classroom observations, and semi-structured interviews. The quantitative data collection measured the changes in (a) teacher knowledge, (b) the frequency of use, and (c) in the level of the participants' self-efficacy. The quantitative data collection included professional development attendance, module completion, a social validity survey, the pre- and post-tests measures.

Intervention

The intervention took place from December 2018 to May 2019. Participants participated in a series of face-to-face sessions, online modules, and coaching sessions which focused on understanding the characteristics of ASD, an introduction to EBPs, and reviewing and applying material learned within the online modules. Participants were expected to complete four 1-hour to 1-1/2-hour long face-to-face sessions, two 2-hour to 3-hour long online modules and four 1-hour long coaching sessions. In addition, participants were expected to record their frequency of use of Discrete Trial Training and Visual Supports three times throughout the intervention. Finally, the participants were asked to complete a 1-hour long semi-structured interview with the student investigator.

Data Collection

To evaluate the process of implementation, data were collected from multiple sources. The student investigator took attendance using the Attendance Sheet at each of the four

professional development sessions. Additionally, data was collected using the Online Modules Completion Certificates, the Coaching Logs, and the Implementation Checklists. Finally, semi-structured interviews were conducted with each participant after the completion of the combined program. To determine if the teachers' increased their level of knowledge about ASD, the participants completed the Knowledge of ASD survey section during the pre-program session and the combined program wrap-up session. Additionally, data focused on the participants' knowledge and comfort level with EBPs, was collected using the EBPs Inventory, during the pre-program session and the combined program wrap-up session. To confirm, the change in the frequency of EBPs, the participants' recorded their use of discrete trial training and visual supports in the classroom context. The data were recorded three times each, across a five-day period using reminders from Google Calendar. An outside observer was used to confirm the use of EBPs in the classrooms of the participants. The observer collected data using the implementation checklist during several visits to each of the participants' classrooms. The pre-program and post-program sessions data were collected on knowledge, use/familiarity, and self-efficacy. All three sections of the survey were combined with the Background, Experience, and Demographic Information which was only given during the pre-session. All quantitative data were analyzed using descriptive statistics of frequency and central tendency.

Findings

This study hypothesized that the use of the combined program would impact the participants' knowledge of ASD and EBPs, change the participants instruction, and improve their level of self-efficacy based on the information examined in the research questions. Research question one addressed the components of the intervention program, including the face-to-face sessions, online modules and coaching sessions were implemented with fidelity, as evidenced by

the attendance data, the completion certificates for the online modules, anecdotal notes taken during face-to-face sessions and in the coaching logs. The collected sign-in sheets, completion certificates, and coaching logs demonstrated that reach had been achieved. Additionally, dose delivered and received were shown by analyzing the data collected as part of observer data, coaching logs, and interview transcripts. Each of the process data points demonstrated the intervention was implemented with fidelity. As a result, the components of fidelity were fully met. The data collected for research question two, including data collected from the Social Validity survey and the semi-structured interviews demonstrated that the participants overall response to the program was positive and they believed the combined program was meaningful to their classroom work. Individual question data revealed that all of the participants felt the intervention improved teacher knowledge, skills, and beliefs about students with ASD. In reference to research question three, the data showed growth in knowledge in both ASD and EBPs based on the Knowledge of ASD Survey and the EBP Checklist data. However, the growth on the Knowledge of ASD survey was minimal. The data collected for research question four demonstrated an increase of use of DTT in the classroom setting across all participants, based on the Frequency of Use data sheet, when comparing the pre-program results to the post-program results. While all participants increased their use of DTT from the pre-program to the post-program data, the frequency of use decreased between the post-program and the maintenance data collection, once implementation support was reduced. Similarly, in the use of VS all of the participants increased their frequency of use between the pre-program and post-program period, with the exception of participant D4. Additionally, only one participant increased their use of VS between the post-program and maintenance period, participant C3. Finally, the data for research question five demonstrated an increase in each participants' level of

self-efficacy in working with students diagnosed with ASD over the course of the combined program, based on the ASSET survey.

Reducing the Gap: Preparing Teachers to Use Evidence-Based Practices in Autism

Chapter 1

Introduction

The incidence of autism spectrum disorders (ASD) has increased from 1997 through 2008 by 290% (Boyle et al., 2011). The Centers for Disease Control and Prevention (CDC) (2014) has released prevalence data every two years since 2004. The released data establishes a consistent rise in the prevalence of ASD (Centers for Disease Control and Prevention, 2014). The most recent data released in 2018 showed the prevalence rate of (ASD) rose to 1:59 among 8-year-old children (Baio et al., 2018). Due to the large increase in the prevalence of ASD, it was not surprising that the numbers of students diagnosed with ASD and enrolled in U.S. public schools has grown as well (U.S. Department of Education, 2016). While not all students diagnosed with ASD receive special education services, data from the US Department of Education demonstrated that 10% of the public-school students in the United States were eligible for special education services in the category of autism based on data collected during the 2015-2016 school year (U.S. Department of Ed., 2018). As a result of the large population of students receiving special education services in the category of autism, schools serving students with ASD are expected to create educational programs that meet their students' unique and individual needs (National Autism Center, 2015; U.S. Department of Ed., 2018).

Simultaneously, educational researchers have developed a number of EBPs which are designed for students with ASD (Cook & Odom, 2013; National Autism Center, 2015; Roth, Gillis, & Reed, 2014; Spencer, Evmenova, Boon, & Hayes-Harris, 2014; Wong et al., 2015). The research demonstrates that there was a significant gap between practices being developed and the practices used in U.S. schools (Callahan et al., 2008; Cook & Odom, 2013; Cook, et al.,

2009; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). Often schools and their teachers have relied on ineffective, non-proven instructional strategies (Chasson, Harris, & Neely, 2007; Cook & Odom, 2013; Stahmer, Collings, & Palinkas, 2005), do not implement EBPs with fidelity (Cook & Odom, 2013; Iovannone, Dunlap, Huber, & Kincaid, 2003), or mixed EBPs in a way that is not scientifically researched (Cook & Odom, 2013; Stahmer et al., 2005). The following dissertation examined the research-to-practice gap in ASD as it relates to the public-school classroom. Additionally, this dissertation analyzed the research-to-practice gap and the factors that lead to its existence. To study the nature of the research-to-practice gap, the literature review examined ASD and the characteristics of autism, as well as analyzed the research-to-practice gap through the ecological systems approach. Using an ecological systems approach assisted in organizing the literature into a clearer understanding of the underlying factors, drivers, and issues surrounding the research-to-practice gap in autism spectrum disorders.

Statement of the Problem

There is a disparity between research focused on educating students with ASD and the classroom practices currently used with students diagnosed with ASD in the United States (Callahan et al., 2008; Cook & Odom, 2013; Cook, et al., 2009; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). Educational researchers identified the best instructional practices which meet the unique range of needs that students with ASD present, yet many educators have not incorporated these practices into their daily instruction (Chasson et al., 2007; Stahmer, 2007; Stahmer et al., 2005). A review of the literature established a variety of underlying factors that contribute to the gap such as the complexity of an ASD diagnosis: the wide array of student needs; the dissemination of research into the educational setting; the

translation of research into the classroom setting; the wide range of evidence-based approaches; the requirements of educational policy and law; the costs of educating a student diagnosed with ASD; lack of teacher preparation specific to knowledge and practices specific to students with ASD; the support of administrators; the self-efficacy of teachers; and the limited access to effective professional development (Callahan et al., 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). Due to the research-to-practice gap, students diagnosed with ASD may be enrolled in educational programming that does not meet their specific needs.

The Research-to-Practice Gap in ASD

Scholars use the term research-to-practice gap to explain the difference between what researchers recommend and the strategies used by practitioners daily (Korthagen, 2007). The research-to-practice gap affects students across all ability levels, age groups, genders, and races (Earles-Vollrath, 2012), as well as in multiple disciplines (Greenwood & Abbott, 2001). Greenwood and Abbott (2001) posit that there are several key reasons for the research-to-practice gap in education, including the division of the research and practice communities; the perception of applicability to the classroom setting; the minimal number of usable practices that result from research; and lack of communication between the researchers and classroom teachers.

The gap has been a focus of stakeholders in education since John Dewey (1904) noted the difference in education thought and the procedure. Dewey (1904) described two views on educating teachers, the laboratory and the apprenticeship approaches. The laboratory approach focused on studying and experimenting with new ideas and practices, while the apprenticeship approach emphasized learning through modeling of current practices and the knowledge of

others (Dewey, 1904). Dewey (1904) concluded that the laboratory approach, based on scientific research, was more effective in educating teachers for their future profession. While Dewey's (1904) focus on the importance of scientific research in education still holds true, there is now an emphasis on how to translate that research into educational practice (Korthagen, 2007). More recently, researchers examining special education issues have focused on the gap between theory and practice as a way of improving daily student performance and overall outcomes (Burns & Ysseldyke, 2009). Burns and Ysseldyke (2009) posit that all instructional practices should be built on the foundation of research to ensure that daily instruction meets the needs of all students. Burns and Ysseldyke (2009) further explain that the research-to-practice gap has been the focus of many studies including: research focused on the underlying factors of the gap; how to transfer the information gained during research in daily classroom instruction; teacher perceptions of researched practices; and the effect size of varying methods. The need for instruction based on sound scientific research affects all students, especially those with special needs (Earles-Vollrath, 2012).

In that way, as the prevalence of ASD has increased, there has been an increasingly significant gap between researched practices designed for students with ASD and the current strategies used in public school classrooms in the United States (CDC, 2014; Goldson, 2016). Consequently, the academic focus on the research-to-practice gap in ASD continues to increase. More specifically, researchers looking to improve education, healthcare, and long-term outcomes for people with ASD have examined issues surrounding the gap between research and practice (Lord et al., 2005). To understand the factors that contribute to the gap, a focused literature review was completed using an ecological systems framework.

Theoretical Framework

According to Brofenbrenner (1979), an ecological system consists of the individuals, structures, and settings and the interactions between them. Systems may consist of an individual, a family, a school, a community, a school system, or the public education system. Each system can be connected through relationships and interactions. To better understand how various factors contribute to the research-to-practice gap in ASD, the theory of ecological systems can be applied (Bronfenbrenner, 1979; Neal & Neal, 2013).

Ecological Systems Framework: Nested and Networked

Ecological systems theory provides a way to understand how a person develops by focusing on the variety of contexts that contribute to a person's development (Bronfenbrenner, 1979). Bronfenbrenner (1979) identified four contexts nested within each other, which contribute to the development of individuals including the microsystem (the immediate environment and people the developing person directly interacts with), mesosystem (the connections between multiple settings in which the developing person directly interacts), exosystem (connections a setting in which the developing person directly interacts to one or more settings that indirectly impact the developing person), and macrosystem (multiple settings that indirectly impact the developing person but are not directly connected to that person). Neal and Neal (2013) extended the ecological systems theory (Bronfenbrenner, 1977), by focusing on the individual or microsystem being connected within a variety of settings. Therefore, instead of viewing the contexts in which a person develops as nested within each other, Neal and Neal (2013) consider the contexts in term of social networks and modified the definitions of each system. According to Neal and Neal (2013), a microsystem is defined as the interactions between the developing person and others within the same setting; the mesosystem is an

interaction between people, including the developing person, from differing settings; the exosystem is an interaction between people in a different setting that does not include the developing person but does impact the person's development and the macrosystem "is a set of social patterns that govern the formation the formation and dissolution of social interactions between individuals, and thus the relationship among ecological systems" (p. 729). In addition, Neal and Neal (2013) expanded the networked systems approach to include the chronosystem, which is defined as "the observation that patterns of social interactions between individuals change over time, and that the changes impact the focal individual, both directly and by altering the configuration of ecological systems surrounding him/her" (p. 729). The networked framework (Neal and Neal, 2013) transforms Bronfenbrenner's (1979) nested systems by emphasizing the social interactions between people rather than the setting in which people interact. Within these systems are classrooms and schools that are made up of a variety of stakeholders, including students, teachers, therapists, administration, family members, and community members who interact with each other. Within the larger education system there are interactions between stakeholders and their environments may affect the research-to-practice gap.

Application of the Networked Ecological Systems Theory

The networked version of the ecological systems theory helps explain the connections between the factors that influence the research-to-practice gap in ASD. Each of the researched elements is rooted in a specific system, whether research in ASD, educational policy, the school system, the school, a teacher, the family, or the individual. Each system has a relationship with other systems within the entire ecological framework (see Figure 1 for a detailed view of the connections within the framework). Those diagnosed with ASD, their family, teachers, and

school community members may influence different structures and systems within a student's life. For this literature review, the factors will be organized in order of the ecological systems theory EST systems, from the individual to the macrosystem.

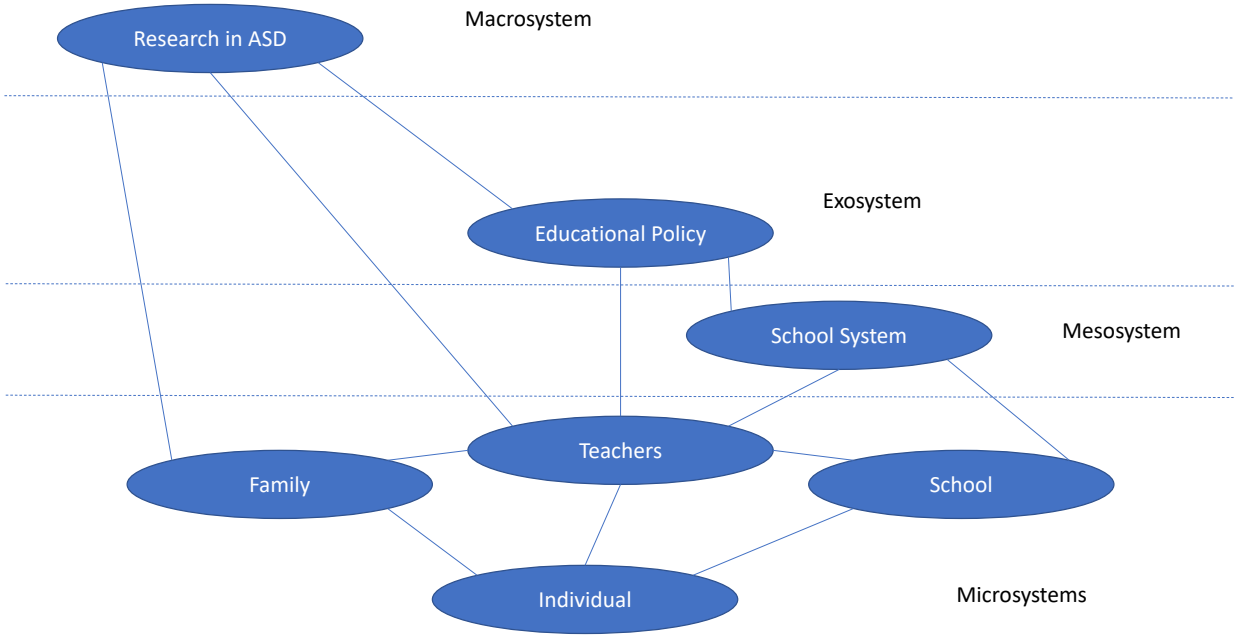

Figure 1. The Networked Ecological System of the Research-to-Practice Gap in Autism. The figure illustrates the connections between people and structures within each of the ecological systems.

Review of the Literature

Autism spectrum disorder is a developmental disorder that affects multiple areas of life and is characterized by difficulties in language development, impairments in social functioning, and the development of restricted or repetitive behaviors (APA, 2013). In the United States, the prevalence of ASD has quickly climbed over the past twenty years (CDC, 2014). ASD affects one in fifty-nine 8-year-old children and is four times more likely in boys than girls (Baio et al., 2018). While ASD affects the lives of those diagnosed, it also affects the lives of family members, teachers, and peers (Boyd & Shaw, 2010; Callahan et al., 2008; Hendricks, 2011; Heflin & Simpson, 1998; Simpson, McKee, Teeter, & Beytien, 2007). Moreover, an ASD

diagnosis may affect a student's family, classroom, school, or community (Boyd & Shaw, 2010; Callahan et al., 2008; Hendricks, 2011; Heflin & Simpson, 1998; Simpson et al., 2007). Taking this notion a step further, the gap between research and classroom practice is impacted by multiple people, communities, and organizations (Boyd & Shaw, 2010; Callahan et al., 2008; Hendricks, 2011; Heflin & Simpson, 1998; Simpson et al., 2007). For this literature review, factors that impact classroom practices were explored, analyzed, and described. The results were organized using ecological systems theory, which aids in understanding the fissure between the research and the instructional practices used in the classroom. To begin the review, the factors that influence the individual student diagnosed with ASD within the microsystem are examined.

Factors Rooted in the Microsystem

Factors based in the microsystem includes the evolution of the ASD diagnosis, accompanying medical conditions and comorbidity, and the resulting needs of those diagnosed with ASD. The literature was examined through the lens of each factor in the sections that follow.

Evolution of the ASD diagnosis. Autism was first described by Leo Kanner in 1943 (Goldson, 2016; Geschwind, 2009). At the time Kanner focused on describing autism in a child by describing the unusual characteristics they demonstrated (Goldson, 2016; Geschwind, 2009). The features of autism described by Kanner included a difficulty connecting with others around them, a lack of functional language use, and an extreme difficulty dealing with change (Goldson, 2016; Geschwind, 2009).

The current diagnostic criteria focus on two main areas which need to develop in the first few years of life, cannot be the result of another medical or psychological condition and must hinder a person's function in many areas of life (APA, 2013). The two main areas that the

diagnostic criteria focus on are: 1) consistent difficulties in using and understanding communication, both verbal and nonverbal, in a variety of social settings and 2) patterns of consistent focus on specific behaviors or interests that are limited in scope and tend to be almost ritualized in use (APA, 2013). ASD is considered an umbrella disorder since an ASD diagnosis encompasses the previous diagnoses of autistic disorder, Asperger's Syndrome, pervasive developmental disorder-not otherwise specified, and childhood disintegrative disorder (APA, 2013). Moreover, ASD symptoms manifest differently in each person, creating a wide range of needs within the ASD population (CDC, 2014).

Accompanying medical conditions and comorbidity. While ASD diagnosis is focused on the three key criteria of communication, deficits in social interaction, and repetitive behaviors, there are a variety of other medical conditions and disorders that may accompany an ASD diagnosis (CDC, 2014). As many as 83% of people diagnosed with ASD have at least one accompanying condition that is not a result of their ASD (CDC, 2014). Accompanying conditions may include mood, anxiety, attention, or sleep disorders, difficulties with their immune or gastrointestinal systems. Furthermore, up to 10% of those with ASD are also diagnosed with genetic disorders, such as Fragile X syndrome, Angelman syndrome or tuber sclerosis (CDC, 2014). Conditions such as sensory processing disorders or Pica may affect those diagnosed with ASD (CDC, 2014). In many with ASD intellectual disabilities may be comorbid (CDC, 2014). Based on the CDC (2014) reports and Wei, Christiano, Yu, Wagner, and Spiker (2015), about 33% of students with ASD have an IQ score of <70. Students diagnosed with ASD and a comorbid intellectual difficulty may demonstrate extreme difficulties in functional communication, academic achievement, and daily living skills (Wei et al., 2015).

Resulting needs. Students diagnosed with ASD have varying needs, based on how the symptoms of the disorder manifest. Issues may result from difficulties with each diagnostic criteria including communication skills, social skills, or restricted and repetitive behaviors, (Boyd & Shaw, 2010). Some students may only have issues centered around one diagnosis criteria point, while other students may develop issues that center around multiple points of diagnosis. As a result, the disorder may be relatively invisible for some students, who can complete schoolwork with minimal assistance or need little support to navigate social situations. In contrast, some students diagnosed with ASD have complex needs which may require supports such as speech-generating devices, visual schedules, or specialized instruction focused on behaviors. While each student's symptomology is different, the symptoms affect all microsystems within a student's life including home, relationship with their teachers, and their school (APA, 2013; Boyd & Shaw, 2010; CDC, 2014).

Factors Rooted in Mesosystem

Factors based in the mesosystem includes the schools and students diagnosed with ASD and teachers of students diagnosed with ASD. The literature was examined through the lens of each factor in the sections that follow.

Schools and students diagnosed with ASD. Within a networked framework, a mesosystem focuses on the individual and their immediate social connections in a differing setting (Neal & Neal, 2013). Within the mesosystem of the school, students diagnosed with ASD may experience issues with joint attention, imitation, expressive language, receptive language, obsessive interests, the persistence of sameness in routines, inappropriate use of objects, forming friendships, and viewing the perspective of others (Boyd & Shaw, 2010). Students with ASD may have trouble following directions, understanding abstract meanings of

words or phrases, filtering environmental noises, and coping in new social situations (Boyd & Shaw, 2010). The variety of needs may affect academic, social, and behavioral learning in the school setting. Consequently, difficulties that hinder students with ASD may lead to disruptions in class, a reduction in the pace of learning, inappropriate behavior, or difficulty working with peers. For this reason, specialized instruction that focuses on the needs of students with ASD is crucial. Moreover, the interactions between the students diagnosed with ASD and the teachers lead to additional factors within the research-to-practice gap.

Teachers of students diagnosed with ASD. Teachers and their interactions with students diagnosed with ASD within the school setting are also factors within the mesosystem. In each state, teachers have specific requirements that must be met for licensure (Hendricks, 2011). In most cases, teachers who work with students diagnosed with ASD require a state license in Special Education (Hendricks, 2011). Licensure often requires the completion of a university preparation program and successfully passing the required examinations (Hendricks, 2011). Often those requirements do not specifically address the needs of students diagnosed with ASD, such as characteristics of ASD, understanding communication delays, atypical behavior, and instructional strategies specific to students with ASD (Boyd & Shaw, 2010; Scheuermann et al., 2003; Wong et al., 2015).

In addition, multiple researchers within the field of ASD recommend the teachers of students diagnosed with ASD need to be well-informed about specific instructional practices designed for students with ASD, along with basic instructional strategies (Boyd & Shaw, 2010; Scheuermann et al., 2003). Clearly, the techniques should include practices designed to assist students with delays in communication, functional tasks, and academic skills (Boyd & Shaw, 2010; Scheuermann et al., 2003). In the same way, teachers need to be prepared to work with

students who may have self-injurious or physically aggressive behaviors (Boyd & Shaw, 2010; Scheuermann et al., 2003). Therefore, students with these types of intensive needs, require knowledgeable teachers who understand not only ASD but the specific needs of each student they teach.

Factors Rooted in the Exosystem

The exosystem refers to the structures including school systems and laws which indirectly impact the individual student with ASD. Educational law, teacher preparation, self-efficacy of teachers, and school administrators all impact the research-to-practice gap at the exosystem level. To begin exploring the exosystem level factors, the research focuses on how school systems address the needs of students with ASD.

Addressing the needs of students with ASD within the school system. All school-age students, including those diagnosed with ASD, which are eligible to receive special education in the United States are entitled to a free and appropriate public education based on the Individuals with Disabilities Act legislation (IDEA, 2004). The federal legislation requires that students receive an appropriate education, are evaluated in a nondiscriminatory manner, are placed within the least restrictive environment, receive due process, and it allows for parent and student involvement in decision-making; in contrast the legislation does not require specific educational interventions or settings to be used (Boyd & Shaw, 2010; IDEA, 2004). Instead, IDEA (2004) recommends the use of scientifically based interventions when working with students diagnosed with ASD (Boyd & Shaw, 2004). Moreover, students may receive services in the general education classroom, a special education resource classroom, or in a self-contained classroom either in the local public school or a separate public school (Boyd & Shaw, 2004). Where a student receives their special education, services are determined as part of the yearly

Individualized Education Plan process (Boyd & Shaw, 2010). Furthermore, while special education policies are set through federal legislation, states and local districts interpret and implement the legislation. How states interpret and implement IDEA is key in determining how each school addresses the needs of the students diagnosed with ASD in their population. Students with comparable strengths and needs regarding their ASD symptoms may be offered differing educational settings and education interventions based on each states' interpretations. Consequently, personnel who are knowledgeable in EBPs that are designed for a wide variety of skill areas, along with the use of scientifically researched strategies and practices become paramount in the education of many students with ASD (Boyd & Shaw, 2010).

Teacher preparation. Within the exosystem, teachers interact with the institutes of higher education as they hone their instructional skills. Teachers are essential to the adoption, implementation, and maintenance process of incorporating research-based interventions into classroom instruction. Since teachers are the personnel that must effectively implement each practice, their knowledge, preparation, efficacy, and ongoing training have a key impact on the use of effective practices with students diagnosed with ASD.

The preparation of teachers to educate students with ASD is essential to the daily use of effective research-based instructional practices. In their study of teacher and administrator perspectives on the training needs of ASD teachers, Brock, Huber, Carter, Juarez, & Warren, (2014) found that approximately 37% teachers received training focused on students with ASD as part of a professional development program rather than in college coursework. This is consistent with results of Hendricks (2011) and Morrier, Hess, and Heflin (2011) which indicated a significant need for teacher preparation in the field of educating students with ASD. Barnhill, Polloway, and Sumutka (2011) used a survey method to examine the availability of programs

that prepare teachers to educate students with ASD. While participation was limited, 87 out of 184 institutions agreed to participate, and the results demonstrated that only 51 of those institutions had some coursework or program that was specific to students with ASD (Barnhill et al., 2011). Offerings include undergraduate and graduate courses, practica that focus on building experience with students with ASD, degrees that have a focus on ASD or result in licensure endorsements (Barnhill et al., 2011). According to Corona, Christodulu, and Rinaldi (2017), teacher preparation regarding the known EBPs is minimal. The work of Barnhill et al. (2011) and Hart and Malian (2013) notes the need for institutions of higher education to increase the level of ASD-related instruction in their coursework and call for more states to add licensure endorsements in ASD for qualified teachers. In addition, both Barnhill et al. (2011) and Hart and Malian (2013) focus on the need for more states to develop and adopt competencies specific to educating students with ASD. Beyond building teacher knowledge of practices, a focus on teacher self-efficacy in working with students diagnosed with ASD is vital (Corona et al., 2017).

In-service teacher training. The ongoing professional development of teachers is another factor in the research-to-practice gap in ASD. Research illustrates that teachers often have limited pre-service preparation (Brock et al., 2014; Hendricks, 2011; Morrier et al., 2011), as well as limited access to continued professional development (Barnhill, Sumutka, Polloway, & Lee, 2014; Scheuermann et al., 2003). In-service training is essential for teachers of students diagnosed with ASD, as through in-service training teachers are informed, instructed on research-based instructional strategies specific to ASD (Barnhill et al., 2014; Scheuermann et al., 2003). In-service training may be implemented in multiple formats include professional development workshops, conferences, college-based coursework (either on campus or online), and summer institutes (Brock et al., 2014). The research suggests that it is essential for training

to be focused on instructional methods that are both grounded in research and proven to be effective (Brock et al., 2014; Lerman, Vorndran, Addison, & Kuhn, 2004; Morrier et al., 2011; Scheuermann et al., 2003). Furthermore, it is important to note that in-service training has limitations as well. According to research in-service training often focuses on didactic learning, lasts for a short duration and does not include access to guided practice (Birman, Desimone, Porter, & Garet, 2000; Desimone, Porter, Garet, Yoon, & Birman, 2002; Garet, Porter, Desimone, Birman, & Suk Yoon, 2001). The research establishes that ineffective training is less likely to lead any positive change in teacher practices, which in turn widens the gap between research and classroom practice (Birman et al., 2000; Desimone et al., 2002; Garet et al., 2001).

With teacher training in mind, another factor within the exosystem that needs to be explored is the concept of self-efficacy in teachers. By the same token, for in-service training to be impactful and lasting, the positive interaction between teachers and the training may influence a teachers' level of self-efficacy.

Self-efficacy. The concept of self-efficacy was developed by Bandura (1977). In his seminal article, Bandura (1977) describes self-efficacy as the confidence a person has in themselves to overcome difficult or challenging situations. He also notes that self-efficacy is generalizable from one situation to another (Bandura, 1977). According to Bandura (1997), people define their level of self-efficacy based on "performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal" (p. 195). The combination of these four factors builds self-efficacy within a person (Bandura, 1977). A study authored by Gibson and Dembo (1984) applied the concept of self-efficacy to teachers and their instruction. In a three-phase study, the authors used a Teacher Efficacy Scale of 30 Likert-type items, an open-ended version of a teacher efficacy scale, and classroom observation to analyze teacher efficacy by

factor, trait, and behavior patterns (Gibson & Dembo, 1984). While the results aligned with Bandura's (1977) understanding of self-efficacy, Gibson and Dembo's (1984) work applied the definition of self-efficacy to the work of teachers. Their definition stated that self-efficacy was the beliefs a teacher holds about their abilities which aides them in bringing about positive changes in student learning (Gibson & Dembo, 1984). More recently, self-efficacy was defined as a teacher's beliefs that they are capable and knowledgeable enough to use known instructional practices to bring about increased outcomes in their students (Corona et al., 2017). Teachers with higher levels of self-efficacy (1) have been found to use more effective methods of instruction, (2) have higher expectations for their students, and (3) tend to be more deliberate in their planning and execution of the instruction (Ruble, Usher, & McGrew, 2011). Consequently, teachers with higher levels of self-efficacy tend to have more positives student outcomes (Ruble et al., 2011).

In the work of Ruble et al. (2011), the authors used a secondary data population sample to focus on 35 teachers of students with ASD. The study used a self-survey method to determine the level of self-efficacy and burnout among teachers of students with ASD (Ruble et al., 2011). The findings demonstrated that teachers' level of burnout was connected to their self-efficacy level (Ruble et al., 2011). Surprisingly, the study also found that the number of years of experience a teacher has was not associated with their level of self-efficacy (Ruble et al., 2011). In another study, Corona et al. (2017) demonstrated positive associations between teacher preparation in ASD and Positive Behavior Support Intervention Systems and a teacher's level of self-efficacy. The work of Corona et al. (2017) notes the importance of self-efficacy amongst teachers of students with ASD, due to the wide-spread and unique needs students with ASD

present. Additionally, a teachers' level of self-efficacy should be supported through interactions with an administrator.

Administrators. Within the exosystem, administrators play a key role in transforming educational research into educational practice. According to Pazey, Gevarter, Hamrick, and Rojeski (2014) administrators are an essential component of implementing and maintaining the effective use of research-based practices in their schools. Conversely, few administrators have had significant amounts of training on the characteristics of ASD, research-based interventions, or the ways to support their teachers of students with ASD (Pazey et al., 2014). The work of Brock et al. (2014), used a self-survey method to investigate the beliefs about interventions and training across schools in Tennessee. The study demonstrated that administrators had an average of 14.9 years of experience working with children diagnosed with ASD (Brock et al., 2014). Administrators tended to have confidence in their teachers' ability to effectively use functional behavioral assessment, reinforcement, technology-aided instruction methods, task analysis, and promoting (Brock et al., 2014). However, administrators noted the need for their teachers to participate in continued training, specifically focused on improving student behavior Brock et al., 2014). Conversely, Pazey et al. (2014) used a more representative population of administrators to investigate their beliefs and views on educating students with ASD. While many of the administrators had experience with students diagnosed with ASD, most of the administrators were not as familiar with effective interventions used in educating students with ASD and noted barriers to adopting effective interventions in their schools (Pazey et al., 2014). While several barriers within the exosystem exist, the most prominently discussed barrier contained within the study was the lack of qualified or trained teachers (Pazey et al., 2014). Beyond the factors

contained within the microsystem, mesosystem, and exosystem are the larger issues of the research-to-practice gap rooted in the macrosystem.

Factors Rooted in the Macrosystem

According to the work of Neal and Neal (2013), a macrosystem is principles, attitudes or expectations that defines a culture. By applying the macrosystem lens to the ecological systems framework of the research-to-practice gap in ASD, the macrosystem is viewed as the research, laws, and policies in ASD that sets the principles, attitudes, and expectations in working with students diagnosed with ASD. Therefore, examining the costs, laws governing students with disabilities, dissemination of research, and a variety of research is essential to fully understand the factors that add to the gap in practice.

Costs of research and intervention. The cost of effective interventions and therapies for students with ASD tends to be much higher than the cost of educating neurotypical students (Swiezy, Stuart, & Korzekwa, 2008). The work of Leigh and Du (2015) focused on estimating the financial burden that diagnosis, treating, educating, and long-term care for people with ASD would have on the United States in 2015 and in 2025. Leigh and Du (2015) noted that the most significant portion of their estimate focused on the education of students with ASD. Additionally, the cost of educating students with ASD in the public schools will continue to be significant in the future as education law requires that public schools serve students with ASD and in cases of students with lower functioning ASD, schools are required to educate students until they reach their 22nd birthday (Boyd & Shaw, 2010; IDEIA, 2004).

Laws governing students with disabilities. Several laws influence the education of students with disabilities and more specifically students who have been diagnosed with ASD. Three specific laws have a significant impact on students diagnosed with ASD in the United

States, by guiding specific practices in the classroom and mandating the Individualized Education Plan process (Boyd & Shaw, 2010; IDEIA, 2004; No Child Left Behind; 2001). The Individuals with Disabilities Education Improvement Act (2004), No Child Left Behind (2001), and the Combating Autism Act of 2006 (Govtrac.us, 2009) have components focused on closing the gap between educational research and educational practice. Individuals with Disabilities Education Improvement Act requires public schools serve students with ASD and mandates that students who meet qualification criteria receive specially designed instruction based on their individualized needs (IDEIA, 2004). No Child Left Behind (2001) focuses on the need for research-based instructional methods, requiring that teachers are trained and use strategies that have been proven by research. The Combating Autism Act of 2006 (Govtrac.us, 2009) focuses on the use of EBPs, increasing the number of professionals who use EBPs effectively and encouraging the use of EBPs (Boyd & Shaw, 2010).

Dissemination of research. While the use of EBPs is required by law (IEDIA, 2004; NCLB, 2002), the first step in implementing an EBP or other scientifically based practice is dissemination (Dingfelder & Mandell, 2011). Carrington et al. (2016) explained that educational practitioners learn about researched practices through different means than professional researchers learn about researcher practices. Education professionals tended to receive information or training on researched practices at conferences or as part of professional development and have more limited access to academic journals (Carrington et al., 2016). According to Dingfelder and Mandell (2011) administrators need to be aware of current research and practices early in the implementation process. Consequently, access to current research is essential for educational practitioners (Carrington et al., 2016). While access to research is key for those working with students diagnosed with ASD, understanding the specific

recommendations that guide current researchers in determining the significant areas and types of research that are beneficial to those working with students diagnosed with ASD.

Recommendations for research in ASD. ASD has been a significant focus of medical and educational research from the 1990s until the present. Areas of research include communication, behavioral, and educational interventions, along with a focus on working with students with ASD from early childhood all the way through adulthood. In the beginning of the 2000s, the National Institutes of Health called together a wide range of stakeholders to examine interventions and practices being used with people diagnosed with ASD (Lord et al., 2005). The meetings were outcome-centered, with the goal to inform a variety of government agencies about the current research surrounding interventions in the areas of behavior and education, and the obstacles that researchers saw that would impede effective practice in the field of ASD (Lord et al., 2005). Simultaneously, strategies for solving the potential obstacles were also discussed (Lord et al., 2005). The stakeholder meetings conducted by the National Institutes of Health led to a series of investigations resulting in a series of eight recommendations that would assist in closing the gap between theory and practice (Lord et al., 2005). The recommendations were: 1) ongoing focus on the gap between the evidence base and current practice using ongoing collaboration of professionals; 2) increasing the diversity of population samples in research: 3) an emphasis on research designed in a way that would allow for increased data; 4) continued workshops focused on professional development of ASD researchers; 5) focus on outcomes that are meaningful to stakeholders of people with ASD and people with ASD; 6) careful review of developing research to determine if there is a need for larger sample sizes, and if that is possible in the field of ASD, and consider "treatment versus no treatment designs" (p. 705); 7) prioritizing research; and 8) developing a national agenda to consider use of "innovative

treatment designs and application of statistical models" (p. 705-706). Today these recommendations are considered relevant and are still used as the basis of research in the field of ASD (Lord et al., 2005; Dingfelder & Mandell, 2011; Smith et al., 2007).

Types of research. Much of the research that focuses on teaching students diagnosed with ASD incorporates a variety of study designs including experimental group design, correlational design, longitudinal, and single case design. Each type of design has specific criteria for implementation and specific uses (Lord et al., 2005). Additionally, certain types of research pose difficulties when used with ASD populations (Lord et al., 2005).

A longitudinal study follows a single subject or a group of subjects overtime (Bristol et al., 1996). While longitudinal studies that focus on ASD exist, this type of study often follow a smaller population sample and take an extensive amount of time to complete (Bristol et al., 1996). However, longitudinal studies are also critical to understanding the development of students with ASD overtime (Bristol et al., 1996).

Correlational research design examines the relationship between two factors (Creswell & Plano Clark, 2011). Correlational designs are non-experimental and assist the researcher in determining the degree in which two factors are connected (Cook, Campbell, & Shadish, 2002). However, correlational designs are not able to determine causation (Cook et al., 2002).

Experimental group design is a type of research that focuses on determining the impact of an independent variable in a specific situation (Cooper, Heron, & Heward, 2007). Within an experimental group design, the independent variable can be increased or decreased, introduced or taken away, which leads to an understanding of how the situation and the independent variable correlate (Cooper et al., 2007). Experimental group design allows for population samples to be placed in control and treatment groups (Lord et al., 2005).

While experimental group design involves a larger sample population, in contrast, a single case design focuses on an individual subject and how the independent variable impacts their specific situation (Cooper et al., 2007). Consequently, the generalization of the single case research may be limited, as results may be specific to the subject in the study. One type of single-subject design, multiple-baseline design, focuses on determining the relationship between the independent variable and two subjects, situations, or behaviors at a time (Cooper et al., 2007; Lord et al., 2005). Recent studies have demonstrated that most research focused on ASD have used multiple baselines or single case design (Guldberg, 2017; Lord et al., 2005; Wong et al., 2014). Consequently, much of the research in ASD focuses on single subjects, which makes generalization to a larger group more difficult. Subsequently, using single subject designs as the basis for classroom implementation requires strategies developed through sound research, with strong evidence of success, which demonstrate few obstacles during the implementation process. However, since the characteristics of ASD are complex and varied, recruiting larger population samples is difficult (Boyd & Shaw, 2010; Lord et al., 2005). Therefore, single subject design is a common method of research in developing treatment approaches that are evidence-based (Lord et al., 2005).

While experimental group design is considered to be the ideal design in research, the requirement of a larger population size makes this type of research difficult with students diagnosed with ASD. In the same way, the use of smaller populations sizes makes correlation design, longitudinal design, and single-subject design easier to use have some limitations, their use of smaller population size (Bristol et al., 1996; Cook et al., 2002; Lord et al., 2005).

Approaches in ASD research and treatment. Research approaches in ASD are usually either centered on the medical aspects of ASD or the treatment aspects of ASD. According to the

CDC (n.d.) a variety of popular approaches include behavior and communication, dietary, medication, complementary and alternative medicine, developmental and therapeutic interventions. While there has been research focusing on dietary, medication, and complementary and alternative medicine approaches much of the work has demonstrated these techniques are ineffective and may be dangerous (Höfer, Hoffman, & Bachmann, 2017). In contrast, evidence-based studies focusing on behavior, communication, developmental or therapeutic approaches more widely impact the school setting. These approaches often focus on the elements of a student's ASD that can influence classroom successes. Approaches that focus on a student's communication and behavior skills include Applied Behavior Analysis, otherwise known as ABA (CDC, n.d.; Cooper et al., 2007; Lovaas, 2010), the Early Start Denver Model (Ryberg, 2015; Vivanti, Dissanayake, & The Victorian ASELCC Team, 2016), and the Social Communication/ Emotional Regulation/ Transactional Support (SCERTS) (CDC, n.d; Molteni, Guldberg, & Logan, 2013; Prizant, Wetherby, Rubin, & Laurent, 2003). A variety of additional approaches and therapies that focus on a students, development, sensory issues, communication issues, and educational development include Developmental Individual Differences, Relationship-Based Approach (DIR), also known as Floortime (Pajareya & Nopmaneejumruslers, 2011; Wieder & Greenspan, 2003), Speech/Language Therapy (Low & Lee, 2011; Wei et al., 2014), Occupational Therapy (Bagatell & Mason, 2015), Physical Therapy (Downey & Rapport, 2012), Social Skills (Gray & Garand, 1993), the Picture Exchange Communication System (Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2011), Sensory Integration Therapy (Schaaf, Benevides, Kelly, & Mailloux-Maggio, 2012), and Treatment and Education of Autistic and related Communication-handicapped Children (TEACCH) (D'Elia, Valeri, Sonnino, Fontana, Mammone, & Vicari, 2013; Kliemann, 2014; Mesibov & Shea, 2010).

This dissertation will focus on the examination of several popular treatment models and therapeutic approaches, as well as evidence-based practices.

Applied behavior analysis. Applied behavior analysis is defined as "a scientific approach for discovering environmental variables that reliably influence socially significant behavior and for developing a technology of behavior change that takes practical advantage of those discoveries" (Cooper et al., 2007, p. 3). Within ABA, there are several educational interventions that have been proven effective for students diagnosed with ASD including discrete trial training, early intensive behavioral intervention, pivotal response training, and verbal behavior intervention (CDC, n.d). Discrete trial training focuses on teaching a specific skill by using a series of small work sessions in which students are rewarded for their correct answers while wrong answers are ignored (CDC, n.d; Cooper et al., 2007; Lovaas, 2010). Early intensive behavioral intervention is focused on children who are younger than five years old and uses techniques found in ABA, including the use of discrete trial training including the one-on-one teaching setting across a minimum of 20 hours per week (CDC, n.d; Reichow, Barton, Boyd, & Hume, 2014). Pivotal response training emphasizes building motivation in students by teaching them to self-monitor behavior and how to initiate conversations (CDC, n.d). Verbal behavior intervention uses teaching techniques similar to those techniques proven effective in ABA to teach requesting, responding, and conversational skills that are often difficult for students diagnosed with ASD (CDC, n.d; Cooper et al., 2007; Lovaas, 2010).

The early start denver model. The Early Start Denver Model is a comprehensive program designed for young children with ASD that focuses on using a developmental-behavioral approach that emphasizes joint interaction and intrapersonal communication exchanges (Ryberg, 2015; Vivanti et al., 2016). While Vivanti et al. (2016) demonstrate

improvement in language delays, although limitations including the restricted scope of ages of the subjects and the lack of a control group to compare results, lead to questions about the effectiveness of the model.

The social communication/ emotional regulation/ transactional support. The SCERTS model is a comprehensive developmental program that emphasizes building a student's capacities for three core areas of need: social communication, emotional regulation, and transactional support (Molteni et al., 2013; Prizant et al., 2003). Through the SCERTS model, individualized goals have developed that focus on specific skills within each of the three core areas (Molenti et al., 2013; Prizant et al., 2003). SCERTS has proven to be a useful model that works to build collaboration between educational practitioners and families while focusing on the education of students diagnosed with ASD (Molenti et al., 2013; Prizant et al., 2003).

Developmental individual differences, relationship-based approach. DIR is a developmental approach that focuses on social language and interactions with family and the environment (Pajareya & Nopmaneejumruslers, 2011; Wieder & Greenspan, 2003). As DIR is a comprehensive model that focuses on interactions within educational and home environments, this model is not commonly used in the public schools (Pajareya & Nopmaneejumruslers, 2011; Wieder & Greenspan, 2003). While DIR has been found effective, studies focused on DIR have had limitations including the lack of control groups and parent self-reporting (Pajareya & Nopmaneejumruslers, 2011; Wieder & Greenspan, 2003).

Treatment and education of autistic and related communication-handicapped children (TEACCH). Another developmental intervention model for students diagnosed with ASD is TEACCH (D'Elia et al., 2013; Kliemann, 2014). TEACCH is a comprehensive model with a multidisciplinary approach (D'Elia et al., 2013; Kliemann, 2014). The TEACCH model is

centered on building structure into a student's daily routine in four areas: physical environment, daily schedule, work systems, and task organization (D'Elia et al., 2013; Kliemann, 2014). TEACCH can be used in the home-based or school setting (D'Elia et al., 2013). However, may be difficult to incorporate in the school setting as the focus of the model is to design the physical environment, daily schedule, work system, and task organization to the needs of each student (D'Elia et al., 2013). Studies have shown limitations with reliability and validity (D'Elia et al., 2013; Kliemann, 2014). In contrast, the work of Mesibov and Shea (2010) uses a set core points that define EBPs in psychology as a lens review the TEACCH model through previously reported research. Throughout their work, Mesibov and Shea (2010) break down components of the TEACCH model and investigate each component individually, including structure, visual information, special interests, and meaningful communication. Additionally, the authors review overall program research and discuss the base of evidence in the areas of clinical expertise, individualization, real-life measures, and generalizability. The authors conclude that TEACCH should be considered an evidence-based practice in ASD (Mesibov & Shea, 2010).

Other intervention in ASD. Other examples of researched educational interventions that focus on communication include social skills training and the Picture Exchange Communication System. Social skills training based on the social stories work of Carol Gray, and Joy Garand (1993) teaches students diagnosed with ASD ways to interact with peers, family, and community through clear demonstration and simulated situations. The Picture Exchange Communication System teaches students to use cards with pictures or symbols to interact with people around them (Ryan et al., 2011). Students with ASD learn fundamental communication skills that lead the student toward spontaneous language use (Ryan et al., 2011).

Therapeutic components. Therapeutic interventions may be paired with educational interventions for students with ASD. Therapies such as speech and language, physical, occupational, and sensory integration therapy are used to complement educational interventions in schools. A majority of students who are diagnosed with ASD and receive special education services receive speech and language therapy, although the number of students receiving speech and language therapy goes down as students age (Wei et al., 2014). In most cases, speech and language therapy on three core areas: communication and preverbal skills, language comprehension, and speech and language production (Low & Lee, 2011). Comparatively, occupational therapy is used with most pre-school and elementary aged students with ASD (Bagatell & Mason, 2015). Studies demonstrate that the goal of occupational therapy is to increase student engagement in daily school and home activities (Bagatell & Mason, 2015; Wei et al., 2014). Along with occupational therapy, sensory integration therapy is an intervention used by many occupational therapists to assist students in integrating sensory information from their body and the environment (Schaaf, Benevides, Kelly, & Mailloux-Maggio, 2012). Results from sensory integration therapy demonstrate improvements in attention, motor planning, and behavioral control in students diagnosed with ASD (Bagatell & Mason, 2015; Schaaf et al., 2012).

The concept of evidence-based practices. Across the field of ASD education, there are an extensive amount of instructional practices or strategies that claim to be based on scientific research (Heflin & Simpson, 1998; Llaneza, 2010; Lovaas, 1987; Spencer et al., 2014; Stahmer et al., 2005; Reichow & Volkmar, 2010; Wong et al., 2015). Several studies use the term evidence-based practices (EBPs) to refer to instructional practices that have been proven effective for students with ASD and have been rigorously evaluated using a systematic literature

review process (National Autism Center, 2015; Reichow & Volkmar, 2010; Wong et al., 2015). Subsequently, the federal government, school systems, and schools recommend the use of evidence-based practices.

Evidence-based practices. The concept of practices based on scientific research was established in the field of medicine in the 1960s (Reichow, Volkmar, & Cicchetti, 2008; Wong et al., 2015). More recently, the use of scientifically research-based practices was incorporated into psychosocial intervention practices (Chambless & Hollon, 1998). Since 1998, several professional associations representing school psychologists, speech and language therapists, and special education teachers have adopted the use of scientifically-based research or evidence-based practices that have become known as EBPs (APA Presidential Task Force on Evidence-Based Practice in Psychology, 2006; Wong et al., 2015). While there are a variety of definitions used for EBPs, the consensus is that an EBP is a practice proven effective for use with students with ASD and investigated in multiple peer-reviewed studies using an experimental, quasi-experimental, or single case design research (Cook & Cook, 2011; National Autism Center, 2015; Reichow & Volkmar, 2010; Wong et al., 2015). While the student outcomes are not directly mentioned in EBP definitions, across the research, it is perceived that for an intervention to be considered an EBP there must be a significant positive outcome for students (Cook & Cook, 2011; National Autism Center, 2015; Reichow & Volkmar, 2010; Wong et al., 2015).

Issues in evidence-based practices. One issue raised by the literature is the use of single case design in studies that are reviewed for the possibility of being an EBP (Bulkeley, Bundy, Roberts, & Einfeld, 2013; Horner et al., 2005). Researchers and policymakers' concerns are based on the sample size of each study being only one participant or a small sample size, which may limit the reliability of the study (Bulkeley et al., 2013; Horner et al., 2005). Often in

education research and educational policy, the method of research that is the most reliable is the randomized control trials (Bulkeley et al., 2013; Horner et al., 2005). Randomized control trials demonstrate reliability as the process includes comparing the results of two similar population samples being divided into a treatment group and control group, which does not receive the treatment (Bulkeley et al., 2013; Horner et al., 2005). Both Bulkeley et al. (2013) and Horner et al. (2005) have developed processes to assist in developing reliable single case design studies. Bulkeley et al. (2013) posits using standardized pre- and post-measurement tools; comparing two differing interventions, based in differing theoretical perspectives, while using the same individual, in the same study; adding in a follow-up observation stage after a period of not recording data but continuing to use the intervention; and developing and implementing a plan for to check for fidelity of use of the intervention. In contrast Horner et al. (2005) states for single case design research to be considered of quality, it should meet a specific list of criteria. The criteria have a dual use of defining the single case design research as evidence-based. Horner et al.'s (2005) criteria are:

(a) the practice is operationally defined;

(b) the context in which the practice is to be used is defined;

(c) the practice is implemented with fidelity;

(d) results from the single-subject research document the practice to be functionally to change in dependent measures; and

(e) experimental effects are replicated across enough studies, researchers, and participants to allow confidence in the findings. (p. 175-176)

Results of the work of Bulkeley et al. (2013) and Horner et al. (2005) have led to a wide variety of acceptable single case design research that is used in many secondary studies that review and determine EBPs.

Identification of evidence-based practices. To determine and identify EBPs a variety of systematic processes have been used, typically based on literature review or meta-analysis processes (Asaro-Saddler, 2016; Hong et al., 2015; King, Lemons, & Davidson, 2016; Knight, Sartini, & Spriggs, 2014; National Autism Center, 2015; Reichow & Volkmar, 2010; Wong et al., 2015). Research demonstrates an assortment of focused systematic reviews of EBPs that specifically look at a single skills area (Hong et al., 2015; King et al., 2016; Knight et al., 2014; Reichow & Volkmar, 2010). Each of these studies used clear inclusion and exclusion criteria to choose studies, and similar requirements for determining if an intervention is an EBP (Hong et al., 2015; King et al., 2016; Knight et al., 2014; Reichow & Volkmar, 2010). The comparable criteria focused on studies that included 1) populations diagnosed with ASD, 2) which were peer-reviewed, and 3) had specifically defined content. (Hong et al., 2015; King et al., 2016; Knight et al., 2014; Reichow & Volkmar, 2010). Hong et al. (2015) used a literature review process to examine and determine EBPs for improving daily living skills in students with ASD. Of the four interventions studied in Hong et al. (2015) only one intervention, video modeling was found to qualify as an EBP. King et al. (2016) used a systematic review process to determine the individual skills that math interventions target for students with ASD, and the effectiveness of those interventions. The results demonstrated that a limited amount of effective math intervention studies for students with ASD exist and many of those did not meet the standards of quality research (King et al., 2016). Based on the results, none of the reviewed math

interventions identified in the review process met the criteria for being considered an EBP (King et al., 2016).

Knight et al. (2014) used a similar literature review process to that of Hong et al. (2015) and King, et al. (2016), to determine if a single intervention, Visual Activity Schedules met the criteria for an EBP. The review process examined 31 studies using requirements based on the Horner et al. (2005) requirements for an EBP (Knight et al., 2014). Only 16 of the studies met the acceptable level of the requirements (Knight et al., 2014). The results indicated that Visual Activity Schedules could be considered an EBP for use in specific situations including: "(a) to teach on-task, on-schedule, and appropriate, and independent transitions; (b) to improve latency to task from task direction, percentage of correctly completed responses, tasks, or task-analysis steps; and (c) decrease level of prompts necessary for transitions." (Knight et al., 2014, p.173).

Reichow and Volkmar (2010) also used a study synthesis process to examine social skill interventions for students with ASD using specific age groupings. Results demonstrated that only one intervention met the criteria for an established EBP for school-aged children, social skills grouping. Additionally, video modeling met the criteria for a promising EBP when used with school-age children (Reichow & Volkmar, 2010). In contrast to the focused skills area systematic review process, Asaro-Saddler (2016) used the previously done comprehensive review completed by Wong et al. (2015) to apply the findings to use in writing with students with ASD. Iovannone et al. (2003) took a different approach, instead of determining specific EBPs, the authors used a review of the literature to identify key elements that should be included in any instructional program for students with ASD. The key elements are: "1. individualized supports and services for students and families, 2. systematic instruction, 3. comprehensible and/or

structured environments, 4. specialized curriculum content, 5. a functional approach to problem behaviors and, 6. family involvement." (Iovannone et al., 2003, p. 153).

Current evidence-based practices in ASD. In addition to the skill area studies, researchers have attempted to complete comprehensive examinations of EBPs that can be used across content areas (National Autism Center, 2009; National Autism Center, 2015; National Research Council, 2001; Wong et al., 2015). Wong et al. (2015) and the National Standards Project (National Autism Center, 2015) are two recent widely known comprehensive studies that have identified EBPs for people with ASD. While similar in process, Wong et al. (2015) and the National Standards Project (National Autism Center, 2015) had somewhat differing results. Both studies are considered updates of their original studies, the National Autism Standards Project, Phase 1 (National Autism Center, 2009) and Odom et al. (2010) completed by the National Professional Development Center in Autism Spectrum Disorders (National Autism Center, 2015; Wong et al., 2015). Both studies attempted to focus on children and adults with ASD, although both noted that there were relatively few studies focused on interventions specifically for adults (National Autism Center, 2015; Wong et al., 2015). Using a well-documented literature review process with trained reviewers, set criteria for inclusion and exclusion, and inter-rater agreements Wong et al. (2015) examined 456 studies. As a result, the review process identified 27 EBPs for use with students with ASD.

The National Standards Project (National Autism Center, 2015), like Wong et al. (2015) used a clearly outlined literature review process, including defined inclusion and exclusion criteria, and inter-rater agreements. In contrast, while the National Standards Project (National Autism Center, 2015) used professional reviewers, each reviewer was not specifically trained in the coding process, although each reviewer was given a coding manual. The National Standards

Project (National Autism Center, 2015) surveyed 389 studies and divided its results using categories based on the level of evidence of effectiveness. Findings demonstrate fourteen "Established Interventions" (p. 41), eighteen "Emerging Interventions" (p. 14), and thirteen "Unestablished Interventions) (p. 41) designed for students ages 22 and younger (National Autism Center, 2015). In comparing the findings of Wong et al. (2015) and the National Standards Project (National Autism Center, 2015) twenty-one practices are considered EBPs and Established Practices, four are considered EBPs and Emerging Practices, and two EBPs were not identified by the National Standards Project (see Table 1).

Table 1. A Comparison of Established Interventions to their Corresponding EBP

Established Interventions as found by the National Standards Project	Evidence-Based Practices as found by Wong et al. (2015)
Behavioral Interventions	Antecedent-based Intervention
	Differential Reinforcement
	Discrete Trial Training
	Extinction
	Modeling[1]
	Prompting
	Reinforcement
	Response Interruption/ Redirection
	Scripting
	Task Analysis
	Video Modeling[1]
	Time Delay
Cognitive Behavioral Interventions	Cognitive Behavioral Interventions

Established Interventions as found by the National Standards Project	Evidence-Based Practices as found by Wong et al. (2015)
Modeling	Modeling[1]
	Video Modeling[1]
Natural Teaching Strategies	Naturalistic Intervention
Parent Training	Parent-Implemented Intervention
Peer Training Package	Peer-mediated Instruction & Intervention
Pivotal Response Training	Pivotal Response Training
Schedules	Visual Supports
Scripting	Scripting[1]
Self-Management	Self-Management
Social Skills Package	Social Skills Training
Story-based Intervention	Social Narratives

[1]*indicates EBPs that are found in more than one Established Intervention* (Based on information contained within Barnhill et al., 2014)

While the identification of EBPs focused on the instruction of students with ASD is essential, the evaluation alone does little to support positive student outcomes (National Autism Center, 2015; Morrier et al., 2011; Scheuermann et al., 2003; Wong et al., 2015). There is a strong need for educational practitioners to implement EBPs into the classroom (National Autism Center, 2015; Morrier et al., 2011; Scheuermann et al., 2003; Wong et al., 2015).

Summary of Factors that Lead to the Research-to-Practice Gap in ASD

In educating students with ASD, the research-to-practice gap continues to be the focus of much educational related research. The dissemination and use of evidence-based research are essential for the teachers working with students diagnosed with ASD. While educational policy and laws (IDEIA, 2004; NCLB, 2002) continue to mandate the use of research-based practices

that have been proven effective with the unique needs of students with ASD, the complex needs of students diagnosed with ASD also requires the use of effective EBPs developed specifically to meet their needs (National Autism Center, 2015; Scheuermann et al., 2003; Wong et al., 2015). Pursuing this further, by viewing the research-to-practice gap through networked ecological systems model the literature review confirmed that a wide variety of factors that influence the education of students diagnosed with ASD (Barnhill et al., 2011; Brock et al., 2014; Neal & Neal, 2013; Scheuermann et al., 2003; Wong et al., 2015). The research affirmed that underlying factors including the complexity of an ASD diagnosis; the wide variety of student needs; the requirements of educational policy and law; the costs of educating a student diagnosed with ASD; the dissemination of research into the educational setting; the translation of research into the classroom setting; the wide range of evidence-based approaches; lack of teacher preparation in knowledge and practices specific to students with ASD; the support of administrators; the self-efficacy of teachers; and the limited access to effective professional development have deepened the gap the resides between educational research and daily instruct in the classroom setting (Callahan et al., 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). For schools to continue to meet the needs of their students diagnosed with ASD, implementing effective practices rooted in research is crucial.

Chapter 2

Determining the Needs within Stone Run County Schools

The current problem examines the gap between educational research and the daily instructional practices used by teachers of students with Autism Spectrum Disorders (ASD). Existing studies demonstrate that evidence-based practices (EBPs) are being developed and evaluated specifically for students with ASD, through the scientific research process (Cook & Odom, 2013; National Autism Center, 2015; Roth et al., 2014; Spencer et al., 2014; Wong et al. 2015). Simultaneously, multiple studies posit that the practices being developed are not implemented frequently or consistently in U.S. classrooms (Callahan et al., 2008; Cook & Odom, 2013; Cook, et al., 2009; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). Consequently, there is a significant gap between research and practice pertaining to students diagnosed with ASD in the public-school system. One school that this phenomenon appears to be true in Stone Run County Schools[1]. In order to determine if the gap between research and practice does exist, a two-part needs assessment was conducted to determine if the research-to-practice gap was present.

Stone Run County Schools is located within a southeastern U.S. state and comprises a small, semi-urban city, surrounded by suburban and rural areas with a few smaller farming towns scattered around the county. Stone Run County Schools serves 15,426 students from pre-school through twelfth grade (Participant A, Interview[2]). Students with ASD make up an estimated 1.5% of the entire student population (Participant B, Interview). Of the 1.5% of the student

[1] To protect confidentiality a pseudonym was used.
[2] Interviews are designated by identification letter of participant and instrument.

population with ASD, with about 40% of the ASD students enrolled in the adaptive curriculum and the remaining 60% of students were enrolled in the general education curriculum.

This needs assessment was divided into two phases. The first phase, completed in the spring of 2017, examined the knowledge and beliefs of special education administrators regarding the research-to-practice gap in ASD, within Stone Run County Schools. The second phase, completed in the spring of 2018, expanded the investigation to include an examination of the knowledge, beliefs, and practices of the exceptional education (special education) teachers of students with ASD by surveying exceptional education teachers working in both the general and adaptive curriculum classrooms.

The Needs Assessment

Goals and Objectives

Direct evidence from teacher requests for additional supports suggests that the research-to-practice gap in ASD contributes to some of the teachers' and students' daily struggles in the adaptive classroom. Furthermore, teachers have limited access to training specific to ASD in both their preservice and in-service contexts (Barnhill et al., 2014; Brock et al., 2014; Hendricks, 2011; Morrier et al., 2011; Scheuermann et al., 2003). As a result, teachers may not have developed the requisite knowledge and instructional skills to effectively address the complex needs of students with ASD, thus illustrating the gap between research and practice (Morrier et al., 2011; Scheuermann et al., 2003). To better understand how the research-to-practice gap manifests in the knowledge, beliefs, and practices of the personnel in Stone Run County Schools, phase one of the needs assessment focused on data collected from special education administrators and special education teachers. Based on the work of Pazey et al. (2014), the student investigator developed four questions that focus on investigating (a) teacher knowledge

of characteristics of ASD and the EBPs designed for students with ASD, (b) teacher and administrator beliefs regarding the impact of teacher instruction on student needs, (c) the amount of ASD-specific training teachers and administrators have received, and (d) the effects of the research-to-practice gap in Stone Run County Schools (see Table 2). Using quantitative and qualitative methods, these questions were examined in two phases over the span of a year.

Table 2. Research Questions for the Needs Assessment

Research Question Number	Research Question
R1	To what extent are the teachers and administrators informed about the characteristics of ASD and the EBPs designed for use with students diagnosed with ASD?
R2	To what extent have teachers or administrators received pre-or in-service training in the field of education? To what extent were any of these trainings specific to ASD?
R3	Phase 1: To what extent do administrators feel their teachers can meet the needs of students with ASD? Phase 2: To what extent do the teachers feel they can meet the needs of students with ASD?
R4	What impact does the research-to practice gap in ASD have in the Stone Run County Schools? In the classroom?

Methodology

Phase one used a qualitative research design to examine the knowledge, views, and beliefs of whom? about how the gap between research and practice impacts Stone Run County Schools. To gather relevant data on administrator views and knowledge, structured-research interviews were conducted (Gibbs, 2013). Data collected from the research interviews were coded, organized, and analyzed based on deductive and emergent themes (Miles, Huberman, & Saldana, 2013; Southampton Education School, 2012).

Phase two employed a quantitative design to examine the knowledge, views, and beliefs about how the gap between research and practice impacts the exceptional children's teachers in Stone Run County Schools (see Table 2). Participants responded to a self-reported electronic survey in order to gather information about teachers' backgrounds, experience, levels of training, understanding of ASD, and level of self-efficacy in working with students diagnosed with ASD. Data collected from the electronic surveys were analyzed using descriptive statistics.

Participants. Two special education administrators consented to participate in interviews (see Appendix B) for phase one of the data collection. Both participants were female, between 45 and 60 years old and of different ethnicities, African-American, and Caucasian. Both participants had previous experience as special education teachers before assuming their current administrative roles, although neither had taught in adaptive classrooms specific to ASD students. Participant A served as an Exceptional Children's Program Specialist overseeing adaptive ASD classrooms and students with significant behaviors, serving on and guiding the AST team, and monitoring manifestation determinations, long-term placements, special education transportation, and student placement in adaptive and alternative settings (Participant A, Interview). Participant B acted as an Exceptional Children's Director in Stone Run County

Schools overseeing the complete programmatic needs, budgeting, personnel allocations, and related services for students with disabilities (Participant B, Interview). In the hierarchy of Stone Run County Schools, an Exceptional Children's Program Specialist reports to the Exceptional Children's Director. The Exceptional Children's Director reports to the Assistant Superintendent of Curriculum and Instruction. Both participants were responsible for the students with ASD enrolled in the adaptive classrooms, the types of instruction those students receive, the hiring process of teachers who work with students with ASD, and the ongoing professional development of teachers who work with students with ASD.

Phase two of the needs assessment included 37 participants. Prior to the beginning of phase two, the Special Education Director of Stone Run County Schools gave permission to recruit participants within the department (see Appendix C)**.** One participant's response was excluded from the data analysis, as the respondent reported their role as an Exceptional Children's Program Specialist, rather than as a teacher. Due to the one exclusion, the survey had a response rate of approximately 28%, or thirty-six participants out of the one-hundred teachers that were invited to participate. When asked their role in the district, of the thirty-six respondents, ten identified their role in the district as an Exceptional Children's teacher while twenty-six of the respondents identified their roles using detailed terminology, reporting roles of self-contained autism teacher, self-contained cross-categorical teacher, behavior teacher, K-2nd-grade exceptional children's teacher, and high-school teacher. The respondents had a range of years of experience, from 0 through 20 years, with approximately 44% of teachers reporting 0-5 years of experience (see Table 3).

Table 3. Number of Years of Experience of Surveyed Exceptional Education Teachers

Years of Experience	Number of Reporting Teachers
0 to 5 years	16
6 to 10 years	3
11 to 15 years	3
16 to 20 years	10
20 or more years	4

Table 4. Highest Degree Earned by the Participants

Degree	Number of Reporting Teachers
Bachelor's Degree	24
Some graduate level work	2
Master's Degree	10

Two-thirds of the respondents reported earning a bachelor's degree, while one-third of the respondents had completed some graduate level work or earned a master's degree (see Table 4). Of the thirty-six respondents twenty-five reported more than one area of licensure including certifications in the areas of exceptional children's, learning disability, behavioral and emotional disorders, special education cross-categorical, special education general curriculum, special education adapted curriculum, deaf and hard of hearing, mental retardation, intellectually disabled mild, intellectually disabled moderate, intellectually disabled severe and profound, and lateral entry (see Appendix G for a detailed table of the certification responses).

Measures. Interviews in phase one of the needs assessment were based on an interview protocol. The interview protocol, developed by the student investigator included thirty-one

questions, divided into six sections (see Appendix A) including twelve overview questions, two questions about professional goals, three questions regarding teachers of students with ASD, eight questions focused on the effective instruction for students with ASD, four questions involving beliefs, and two questions specific to Stone Run County Schools (Appendix A). The interview protocol examined each administrator's (a) knowledge of ASD and (b) beliefs regarding students with ASD, daily instruction, and district practices. Questions allowed the participants to explore their current roles as administrators, educational and professional backgrounds, knowledge of effective instruction, expectations of teachers of students with ASD, and the strength and weaknesses within Stone Run County Schools regarding students with ASD. Interviews were conducted individually with each participant.

Phase two relied on an electronic survey that included three sections: Background and Experience, the Autism Knowledge Questionnaire, and the Autism Self-Efficacy Scale for Teachers. The Background and Experience section included ten multiple-choice questions that focused on the participants' current professional role, educational background, and experience levels. The second section of the electronic survey used questions from the Autism Knowledge questionnaire based on the work of Corona et al. (2017). The authors designed the survey to examine a respondents' knowledge of the characteristics of ASD, the criteria used in diagnosis of ASD, and positive behavior strategies used in the supporting appropriate behavior in the school setting (Corona et al., 2017). Cronbach's alpha reported a lower level of reliability (.53) (Corona et al., 2017). After an exhaustive database search yielded no published tools to measure a teachers' knowledge of ASD the student investigator decided to use the Autism Knowledge survey was used. The final section of the electronic survey relies on a self-efficacy measure titled The Autism Self-Efficacy Scale for Teachers, ASSET (Ruble et al., 2011). The ASSET

comprises 30 questions focused on a teacher's level of self-efficacy in working with students diagnosed with autism spectrum disorder, using a 0-100 Likert-type scale (Ruble et al., 2011). According to Corona et al. (2017), even though measuring teacher self-efficacy working with students diagnosed with ASD is a relatively new research area, the ASSET tool has a strong internal consistency with a .98 Cronbach's alpha.

Participant Recruitment. Participants were recruited through phone calls explaining the research goals, purpose of the interview, and the process for both phases of this needs assessment. Both participants agreed verbally and were sent a copy of the participant consent letter for their review. Interviews were scheduled via email for May 1, 2017, at Stone Run County Schools' special education department office. The interviews were conducted separately one after the others. Before the beginning of each interview, the student investigator reviewed the purpose of the interview and the full needs assessment with the participant. If after hearing a description of the needs assessment, the participant agreed to be interviewed, the student researcher reviewed the consent agreement with each participant. Both participants agreed to complete the interviews and signed the consent forms.

In phase two of the needs assessment, the participants were recruited through email. An introduction letter including survey information was sent through the exceptional children's department. The emails were sent to every exceptional children's teacher in Stone Run County Schools, a total of 130 teachers. If a recruit was interested in participating, they responded to the initial email indicating their interest and a consent form including the survey link was sent. The introductory letter and consent form clearly explained the study to the recruitment pool. If a teacher chose to participate he/she continued to the survey in Qualtrics, through an electronic link at the bottom of the letter.

Data Collection and Analysis

For phase one of the needs assessment, the interviews were recorded using Quick Time Player for Mac, while the student investigator simultaneously took notes. In phase two of the needs assessment, Qualtrics recorded the data for each survey question. Initial descriptive statistics were completed in Qualtrics and included the frequency, and the mean. After reviewing the analysis report from Qualtrics, the student researcher manually examined the data by calculating frequency percentages, determining how most teachers answered individual questions, and determining if there were any inconsistencies in the data.

Qualitative Coding and Analysis. After the completion of both interviews, the student researcher used InSqribe software to transcribe each interview (Inquirium, 2015). To improve accuracy of data collection, interview transcripts were compared against audio data and triangulated using notes from each interview. Using word processing software, interview responses were organized by question and participant and then divided into single lines. The data were analyzed using the pre-determined codes using concepts brought about in the synthesis of the literature. Next, the student researcher developed themes based on the pre-determined codes and the codes that emerged from the data. The deductive themes included preparation of teachers, effective instruction, knowledge base of administrators, ongoing training and support, teacher efficacy and attitudes, data and research, and student characteristics and needs. Finally, the student investigator used an inductive process to develop themes from other codes that emerged from the data. The inductive themes that emerged were system barriers to implementing EBPs or other interventions, outdated research, and student achievement.

Summary of Results

Qualitative Data

Table 5. Deductive Themes and Evidences of Themes

Deductive Themes	Evidence of Themes
Effective Instruction	• Based on research • Emphasis on TEACCH or structured teaching methodology • Emphasis on mixed methodologies
Knowledge Base of Administrators	• Developed over time • Gained from professional development, knowledgeable colleagues, and own experiences
On-going training and support	• Used to support teachers and build one's own knowledge base • Variety of sources: conferences, workshops, state department, district consultants, in-district training • Difficult to increase teachers understanding quickly
Data and Research	• Used to inform all decisions including regarding programs, student placement, practices, student growth, types and focus of professional development • Collected through many sources
Student Characteristics and Needs	• Not all teachers and staff understand ASD and its' characteristics • Wide variety of unique needs

Deductive Themes	Evidence of Themes
Teacher Efficacy and Attitudes	• To improve teachers, need to be willing to learn new concepts • Experience and training builds efficacy • Understanding characteristics of ASD assists in increasing efficacy
Teacher Preparation	• Difficult to find teachers who are fully qualified for adaptive classroom positions. • Most preparation is not specific to ASD. • No licensure or endorsements in ASD offered currently • Look for teachers who have had previous experience, either in education or in mental health • Lack of preparation affects student progress

Findings. The first research question examined the administrators' knowledge about ASD and the EBPs designed to meet the needs of students with ASD. Several responses revealed the participant's solid understanding of the characteristics of ASD and how it impedes their academic progress (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Both participants mentioned the need for teachers to understand that students with ASD may have difficulty with social communication, which can impact student performance in the classroom (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). When asked what characteristics impede the learning of students with ASD, Participant A explained "The social communication, I mean it's really the social communication and then it goes back to the kids with the low cognitive ability, the processing, …" (personal communication, May 1, 2017). While Participant B

responded “probably communication and being able to communicate out what they truly know, would be one for me. Sometimes it's the behaviors and the attention to task, being able to have joint attention…” (personal communication, May 1, 2017). In contrast, the responses also demonstrated that the administrators were not as confident in some teachers' understanding of the characteristics of ASD (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant B illustrated this when referring to the struggle of hiring qualified teachers by explaining “some people [are] coming in with no prior knowledge…”(personal communication, May 1, 2017). Furthermore, their responses demonstrated that some teachers have difficulty making academic progress when students have a wide variety of needs (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant A explained that “[some] teachers who just don't have a clear grasp on what they are doing” (personal communication, May 1, 2017). participants indicated that students with varied needs increased the demands on teachers to use a range of instructional methods ranging from those focused on academics to those working on communication, behavior, and sensory needs (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017).

Interview responses demonstrated that the administrators are concerned about whether students with ASD are receiving effective instruction (see Table 5) (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). While both participants noted that instructional methods should have a history of being effective with students with ASD, Participant B clarified that the use of research to determine if an instructional practice is effective is essential (personal communication, May 1, 2017). Both participants gave examples of a wide variety of commonly used practices including structured routines, visual

schedules, multi-sensory activities, station teaching, and planned transitions (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant B gave several examples including "structured teaching, visual schedules, multi-sensory type activities, um even if we're throwing in some sensory diets" when discussing instruction for students with ASD (personal communication, May 1, 2017). In a similar discussion with Participant A effective instruction was described as "structured teaching, we have ABA, we have mixed methodology in our classrooms" (personal communication, May 1, 2017). Throughout the interview, both participants emphasized the use of TEACCH or structured teaching, a methodology for working with students with ASD, developed at the University of North Carolina (Mesibov & Shea, 2010). While both participants referred to TEACCH as an EBP (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017), structured teaching is not currently explicitly identified by either of the two most current and comprehensive reviews of EBPs (National Autism Center, 2015; Wong et al., 2015). Another area of emphasis was the use of mixed methodologies in the adaptive classrooms (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Both participants noted that teachers should understand a variety of effective methods of instruction, and classroom instruction should be based on the unique needs of each student (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). When discussing the use of data and research, both participants emphasized the expectation of teachers and the district to use collected data in all decision-making processes (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Their responses indicated that student achievement data are collected from state assessments, progress monitoring, anecdotal notes, class reporting,

behavior report cards, behavior logs, benchmarks, and teacher or service provider observations (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant A elaborated on the types of data used by listing "classroom observations … benchmark assessments, the EOG testing, we're going to look at classroom observations… anecdotal notes, checklists, ABC, ABC data sheets…overall class reporting, report cards… behavior report cards and different things like that, our checklists, our behavior checklists, um just a whole lot of different things, district-wide assessments, teacher observation" (personal communication, May 1, 2017). Data from these sources are used in decisions about student placement, service frequency, instructional methodology, professional development, and instructional programming (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Additionally, Participant B hoped that data-driven decisions are being used within the district, saying "What I would like to see is the data and more professional learning communities, where we're actually problem-solving the data. And [if the] kids aren't responding, so what do we need to do to our instruction" (personal communication, May 1, 2017). Furthermore, Participant B discussed how she uses research to determine effective instructional methods (personal communication, May 1, 2017). Her response indicated that when research is used, the department is careful to make sure studies used to inform decisions contain similar population samples to the intended group of students and to carefully determine who has paid for the research to be conducted (Participant B, personal communication, May 1, 2017).

Research question two examined the extent to which administrators and teachers have received training specific in ASD. The respondents explained that much of their knowledge about ASD and EBPs was received through in-service training (Participant A, personal

communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant A illustrated her point by saying "We did a lot of ABA training, we have done a lot of curriculum based stuff with X State Department of Ed., and uh, I mean a lot of training, just in house service training from the autism support team, we can go, I tell you, me and my understanding of it has grown so much because of a lot of the professional development and I can't say that that's my specialty that's all I've had, but through the years I think my knowledge of autism has grown" (personal communication, May 1, 2017). Both participants explained that while they had some basic instruction on ASD at the college level, they developed most of their knowledge base over time (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Both participants cited professional development, conferences, and workshops as the primary sources of their knowledge (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). In addition, both participants commented on how their own teaching experiences helped to further develop their knowledge about ASD (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Furthermore, Participant A mentioned the importance of learning from colleagues, "Like they say, a good leader surrounds them self with good qualified people" (personal communication, May 1, 2017). Similarly, Participant B explained that one of the strengths of Stone Run County Schools regarding students with ASD was having "a core group of educators…who are very knowledgeable" (personal communication, May 1, 2017).

In discussing on-going training and support of their teachers, both participants mentioned professional development as a way of increasing a teacher's knowledge base, especially when teachers lack pre-service preparation (Participant A, personal communication, May 1, 2017;

Participant B, personal communication, May 1, 2017). When asked how Stone Run County Schools could help improve the instruction of its teachers, Participant A explained "as far as the EC department, we want to make sure that if their employed at the school, that the school also supports, you know we want to make sure that we give them professional development when they need it, they see a workshop they need to go to, we send our new teachers to the EC conference to get sessions on autism, we send they to TEACCH training, we send them to ABA training, we bring providers inside the district to do trainings, we seek support from DPI, we seek support from our autism support team…" (personal communication, May 1, 2017). Furthermore, it was noted that while professional development can increase effective instruction in the classroom setting, the significant amount of time needed to bring some teachers to a satisfactory level of understanding may adversely affect student achievement (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant B shared her frustration in trying to train teachers with limited previous training, during the school year, equating it to "building the plane as it's flying" (personal communication, May 1, 2017). Additionally, both participants remarked on the wide variety of types of professional development offered within Stone Run County Schools, including: workshops, conference attendance, coaching, modelling, state and in-district trainings, and trainings by district consultants (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant A explained that teachers have access to "TEACCH training, curriculum design training, summer institute, different things, behavior management, um, classroom management, I mean all kinds of things. We offered over the school year like trainings in the evenings and the afternoons after-school, we offered a whole list of different trainings where it came to writing behavior plans, strategies in the classroom,

working with children with autism, compliance, all those trainings we offered for teachers and they were optional, but they could take it and they could use it, and it was offered the entire year…" (personal communication, May 1, 2017). Participant B noted her own frustration regarding the lack of teacher participation in many of the offered sessions, especially those sessions that were not mandatory training (personal communication, May 1, 2017).

In addition, the participants discussed the deductive theme of teacher preparation, specifically pre-service preparation. Both participants explained that qualified teachers with pre-service preparation in ASD are difficult to find (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant A explained that one of the reasons might be related to the lack of state licensure or endorsement in ASD (personal communication, May 1, 2017). Both participants mentioned that a limited number of qualified applicants are available for positions in the adaptive curriculum, and even fewer of them have had any specific training in ASD (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). In discussing the issue of hiring teachers, Participant A mentioned "the thing is not getting the qualified and quality of teachers, and then the change of teachers when the teachers start retiring, new teachers come in, and it's just a whole new day." (personal communication, May 1, 2017). According to the responses, most pre-service instruction is limited to characteristics of ASD and a few key strategies, with no in-depth coursework specific to ASD (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). As a result, Participant B explained that when hiring adaptive special education teachers for ASD classrooms, they often look to those with experience in mental health (personal communication, May 1, 2017). Additionally, both participants connected the lack of solid pre-service preparation in ASD to the lack of progress some students

within adaptive ASD classrooms in Stone Run County Schools (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017).

Research question three focused on the extent to which administrators feel their teachers can meet the needs of their students with ASD, or the teachers' levels of self-efficacy. In discussing teacher efficacy and attitudes, both participants commented on the importance of teacher attitudes (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant B explained that even if a teacher has not had previous experience working with students with ASD, if they are willing to be trained than they are more likely to have success with their students (personal communication, May 1, 2017). When speaking about teacher efficacy, participants commented that teachers who have a better understanding of the characteristics of ASD are more likely to have higher levels of efficacy than a teacher who lacks an understanding of the characteristics (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Finally, both participants highlighted a connection between experience and effective training, and increased levels of teacher confidence (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017).

Table 6. Emergent Themes and Findings

Emergent Themes	Evidences of Themes
Outdated Research	• Emphasis on TEACCH or structured teaching • Focus on sameness across settings • Focus on learning styles
Student Achievement	• Overall goal to increase student achievement across all students including those with ASD • Lack of student achievement leads to change in district-wide practice
System Barriers to Implementing EBPs or Other Interventions	• Budget, personnel allocations • Level of teacher preparation, knowledge, and attitudes towards working with students with complex needs • Emphasis on mixed methodologies

Research question four which focused on the impact of the research-to-practice gap on Stone Run County Schools, was mainly answered through the themes discovered during the emergent coding process. In reviewing the interview responses, one emergent theme that arose was the reliance on outdated research (see Table 6) (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). In multiple responses, both participants referred to TEACCH or structured teaching as an EBP, although both comprehensive studies that identify EBPs removed the practice in 2015 (National Autism Center, 2015; Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017; Wong et al., 2015). Both administrators discussed its' effectiveness with students with ASD and called for the practice to be used across all adaptive ASD classrooms within Stone Run County Schools (Participant A, personal communication, May 1, 2017; Participant B,

personal communication, May 1, 2017). Additionally, Participant A explained her desire to see each of the adaptive ASD classroom using the same practices, "I honestly think all of our classes need to be set-up the same way. I think where ever we go, we need to see the same things, or some of the same, you can put your individual spin on it but we need to be set-up the way we need to transition with cards, we need to have transitions, we need the transitions built in, all those things that we need to consistently do across the board because they have been proven to work" (personal communication, May 1, 2017). She indicated that adaptive ASD classrooms should use the same transition procedures, classroom set-ups, and routines (Participant A, personal communication, May 1, 2017). Another outdated practice that was referred to was designing instruction based on student learning styles (Participant A, personal communication, May 1, 2017).

Another area of discussion that came about was student achievement. Both participants noted the overall goal of for their students with ASD was to increase student achievement (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). When discussing the goals for students with ASD, Participant B noted "I want to increase outcomes and performance, um, for students with disabilities within the district specifically that includes also autism. So, I want to see that our children with autism are growing both academically" (personal communication, May 1, 2017). Consequently, student achievement data are used to inform district-wide decisions (Participant A, personal communication, May 1, 2017). Participant B commented that when achievement data are low or has decreased, then the district needs to begin to look at what practices need to change, yet both participants were not confident in their teachers' knowledge and ability to do so (personal communication, May 1, 2017).

Finally, the last inductive theme that emerged was the system barriers that hinder the implementation of EBPs or other interventions. Both participants explained that under-qualified teachers tend to interrupt the implementation process, either by their attitudes toward the new process, their lack of understanding of the process, and their difficulties in dealing with complex student needs (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Furthermore, while many of the participants' responses emphasized the use of mixed methodologies, none mentioned if those methodologies have been researched in combination or are effective in combination (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Finally, both participants stressed that budgeting and personnel allocations make implementing new strategies difficult in the adaptive classroom setting (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017).

Additionally, both participants commented on the wide variety of unique needs students with ASD often present, but still expected classrooms to use the same procedures and routines across the district (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). Participant B noted that the district seems to play a continual game of "catch-up", due to under-qualified teachers trying to learn the appropriate strategies while teaching (personal communication, May 1, 2017). Both participants discussed the perceived relationship between parent complaints and change (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017).

Quantitative Data. To examine research question one, the second section of the electronic contained sixteen questions from the Autism Knowledge questionnaire based on the work of Corona et al. (2017). The sixteen questions, four were true and false-type questions, one

was an open-ended response, and eleven were multiple-choice questions, with four answer choices, with each question having a correct answer. Eight of the thirty-six respondents did not complete this section of the survey, reducing the response rate to 22% out of one hundred thirty invited participants. The survey examined the teachers' knowledge of ASD and the EBPs designed for use during instruction with students diagnosed with ASD.

Table 7. Percentage of Correct Answers on the Autism Knowledge Questionnaire

Question	Percentage of Correct Answers
1. The Center for Disease Control currently estimates that _____ individuals have an autism spectrum disorder.	48%
2. In May 2013, the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013) was published. What statement is not true according to the new criteria?	14%
3. What IS an empirically validated and evidence-based intervention?	41%
4. What of the following related characteristics primarily involves a difficulty in regulating emotion and carrying out goal-directed behavior?	28%
5. It is very important that the team select at least one Prevent, Teach, and Reinforce (PTR) intervention when creating a behavior support plan.	96%
6. A Functional Behavior Assessment includes the following:	59%
7. The ability to understand another person's perspective, feelings, and emotions, and attribute them as the cause of (or contributing to) that person's actions is,	10%
8. What is most important when choosing a reinforcer for an individual with autism spectrum disorder (ASD)?	83%
9. Sometimes when implementing supports and interventions, you may see an increase in undesired behaviors. This is known as,	54%
10. The following describes the PTR process except,	41%
11. Which of the following statements is true?	76%

12. One new skill that is essential to teach is the elimination of the individual's restricted patterns of behavior, interests, or activities.	76%
13. "He is disobedient" is an operational definition.	93%
14. When going through the Person-Centered Plan (PCP) process, it is not advised to include the individual with ASD.	79%
15. The "A-B-Cs" of behavior stand for,	85%
16. If the performance of a skill is too hard for a student, you would	90%

Findings. Out of the sixteen questions, 50% or more of the respondents answered ten questions correctly (see Table 7). The six questions with correct answer percentage of less than 50, focused on definitions or characteristics of ASD, functional behavior assessments, theory of mind, executive functioning skills, and the prevent, teach, reinforce model. The results of question one demonstrated that 48% of teachers knew that the current rate of prevalence in ASD was 1:68 among 8-year-old children. However, it should be noted the prevalence data changed during the last week the electronic survey was available for respondents to complete. The new prevalence rating changed from 1:68 to 1:59 based on the CDC (2014) report. Consequently, it is important to note that while the electronic survey did not have an answer choice of 1:59 8-yearolds, 31% of the respondents thought the prevalence rate was 1:50 8-year-olds. While the choice of 1:50 8-year-olds may not have been directly related to the change in prevalence rating, the timing of the change should not be ignored. The results of question two showed that 14% of the respondents knew that the new definition does not list three core characteristics of ASD. Simultaneously, the results indicate that 86% of the respondents did not have a clear understanding of the components contained in the definition of ASD. The data collected on question 3 confirmed that 41% of the respondents knew that Positive Behavior Support was an empirically validated practice. In contrast, 59% of the respondents thought that practices

including facilitated communication, chelation, and auditory integration training were empirically-based, when in fact these practices are not proven effective for students diagnosed with ASD. The data from question 4, revealed that while 28% of the respondents understood the elements of executive functioning skills, 72% of the respondents confused the definition with that of sensory processing, adaptive skills, and communication skills. On question 7, most of the respondents had significant difficulty identifying the term theory of mind, when given the definition. According to the data collection, only 10% of the respondents answered the question correctly, while the remaining respondents confused the term with social cognition, central coherence, or executive functioning. The results from question 10 demonstrated that a higher percentage of respondents did not fully understand the prevent, teach, reinforce intervention model, while 41% of respondents answered the question correctly. Overall, the respondents demonstrated a basic understanding of behavior, including higher percentages of correct answers on questions involving the elements and strategies for working with student behaviors, including the components of the functional behavior assessment, guidelines for choosing a reinforcing item, and understanding behavioral terminology.

Table 8. Percentage of Participants that had Either Received Coursework, Training, or Worked with Students with ASD?

Question	Percentage of participants that had either received coursework or training or worked with students with ASD?
Have you ever had coursework on autism spectrum disorder?	52.77%
Have you had professional development or training regarding students with autism spectrum disorder?	44.44%
Have you ever taught students with autism spectrum disorder?	75%

Research question two examined the extent of the training received by the teachers in Stone Run County Schools, specific to ASD. To answer research question two, the data collected in the background section of the survey included information about whether the respondents had coursework in ASD; if so, what types of information the coursework covered; what types of professional development or training in ASD the respondents had; and if the respondents had ever worked with ASD students and in what role. Of the thirty-six respondents, only 52.77% of respondents reported having previous coursework in ASD. Most of 52.77% respondents reported the coursework including information on the characteristics of ASD, behavioral, communication, and instructional strategies. Two respondents reported having a single session of a special education class titled "Is autism a brain disorder or a disorder of the brain?" Additionally, three respondents reported specific training in TEACCH or the Treatment and Education of Autistic

and related Communication-handicapped Children. When asked about whether they had received professional development or training focused on ASD, only 44.44% of the respondents reported receiving training specific to ASD (see Table 8). Of the 44.44%, only one respondent described training in EBPs including social skills training, video modeling, and applied behavior analysis. Comparatively, seven teachers reported receiving TEACCH training. Additionally, four respondents reported attending ASD-related session at conferences. The final question asked the respondents if they had ever worked with students diagnosed with ASD, of the thirty-six respondents, twenty-seven responded that they had, while two responded that they had not, one responded that the question was not applicable to them, and one did not answer that specific question. The respondents reported having worked with students diagnosed with ASD in inclusion, resource, and self-contained settings. In analyzing the background section, it was found that 75% of Stone Run County Schools teachers reported working with students diagnosed with ASD at some point in time, but only 44.44% of those teachers had received professional development or training in ASD within their professional context.

Research question three examined the teachers' beliefs about their abilities to meet the needs of students with ASD. The questions in the ASSET scale were used to examine the respondents' beliefs about working with students with ASD and their level of self-efficacy in working with students diagnosed with ASD (Ruble et al., 2011). The final section of the electronic survey contained the 30 questions developed under the ASSET title. Similar to the original ASSET Likert-type scale, the respondents used individual scales of 0-100 to answer each question (Ruble et al., 2011). The directions explained that a score of 100 meant that the participant was highly certain they could complete the task described, a score of 50 meant that the participant was moderately certain they could do the task described, and a 0 meant that the

participant knew they could not perform the task described. As with the knowledge section of the survey, several respondents did not respond to all the questions in this section. For each question, the respondent count ranged between nineteen and twenty-two respondents. The questions were analyzed by examining the mean score and how many respondents fell into each answer range according to the question scale.

Table 9. ASSET Scores by Question

Question	Mean	Number and Percentage of Scores in the 0-49 Range	Number and Percentage of Scores in the 50-79 Range	Number and Percentage of Scores in the 80-100 Range
1. Conduct an assessment of this student's developmental skills/learning skills.	66.00	7 32%	5 23%	10 45%
2. Describe this student's characteristics that relate to autism.	71.52	2 9%	9 43%	10 48%
3. Describe the implications for intervention based on this student's characteristics of autism.	61.62	5 24%	9 43%	7 33%
4. Translate assessment information into teaching goals and objectives for this student.	67.86	5 24%	10 48%	6 28%
5. Write a measurable objective for this student.	79.55	2 9%	7 32%	13 59%
6. Write a teaching plan for this student based on goals and objectives.	77.82	3 14%	5 23%	14 63%
7. Generate teaching activities for this student.	79.76	2 9%	5 24%	14 67%
8. Organize the classroom to increase opportunities for learning for this student.	76.55	2 9%	5 23%	15 68%
9. Use visual structure to increase this student's independence.	79.00	0 0%	7 32%	15 68%
10. Help this student understand others.	68.95	3	10	9

		14%	45%	41%
11. Help this student be understood by others.	75.59	1 5%	8 36%	13 59%
12. Provide opportunities for communication in the classroom throughout the day for this student.	76.14	3 14%	6 27%	13 59%
13. Assess the causes of problematic behaviors of this student.	68.27	4 18%	6 27%	12 55%
14. Design positive behavioral supports for this student.	70.32	3 14%	9 41%	10 45%
15. Implement positive behavioral supports for this student.	77.64	3 13%	5 23%	14 64%
16. Collect data to monitor this student's progress toward objectives.	74.90	4 19%	5 24%	12 57%
17. Make use of data to re-evaluate this student's goals or objectives.	78.81	3 14%	4 19%	14 67%
18. Assess this student's social interaction skills.	69.68	3 16%	7 37%	9 47%
19. Assess this student's play skills.	63.60	6 30%	7 35%	7 35%
20. Teach this student social interaction.	66.67	6 29%	7 33%	8 38%
21. Teach this student play skills.	61.05	7 31%	7 31%	8 38%
22. Train peer models to improve the social skills of this student.	64.95	4 21%	9 47%	6 32%
23. Describe parental concerns regarding this student.	74.14	4 18%	6 27%	12 55%
24. Communicate and work effectively with this student's parent(s) or caregiver.	82.91	2 9%	5 23%	15 68%
25. Describe parental priorities for learning with regard to this student.	74.41	3 14%	6 27%	13 59%
26. Help this student remain engaged.	67.59	4	8	10

		18%	36%	45%
27. Sustain this student's attention.	66.18	5 23%	8 36%	9 41%
28. Motivate this student.	68.55	4 18%	7 32%	11 505
29. Help this student feel successful.	71.64	3 14%	7 32%	12 54%
30. Teach this student academic skills.	76.41	2 9%	7 32%	13 59%

In analyzing research question three, several interesting trends were noticed, especially since there was a wide range of scores for each question (see Table 9). For each of the thirty questions, the mean score was higher than 50, meaning that for every question the majority of the respondents' beliefs fell within the moderately to highly certain range of being able to complete the task described in each question. Comparatively, none of the questions had a mean score over an 80, with the exception of question 24, which asked respondents if they thought they could effectively work and communicate with a student's parent. Out of the thirty questions, twenty of the questions had a mean score within the range of 50 to 75.99, while ten of the questions had a mean score within the range of 76.00-100. When examined, the twenty questions with the lowest mean score focused on topics of student motivation, attention, engagement, social skills, behaviors and play skills, as well as, conducting assessments and using the data to choose meaningful interventions, describing parent concerns, and creating appropriate goals for the student. Question 3 asked teachers how they felt about describing the implications for intervention based on this student's characteristics of autism. The mean score, of 61.62, demonstrated that the majority of the responding teachers believed they fell in the range between "cannot describe the implications of the intervention" to they "can moderately describe the intervention." In the same way, the mean scores for questions 1 and 4, a 66.00 and a 67.86

respectively, demonstrated that teachers did not feel as comfortable with conducting an assessment of a student's academic skills or using the assessment information to develop appropriate goals for the student. Pursuing this further, questions 26, 27, and 28 focused on the teachers' belief in their ability to motivate, engage, and support the attention of a student with ASD. The mean scores for these questions, which ranged from 66.15 to 68.55, continued to express the teachers' uncertainty of being able to support these skills. Questions 10, 18, 19, 21, and 22 concentrated on the areas of play and social skills. The mean scores ranged from 61.05 to 69.68, indicating that more teachers lacked confidence that they could assess and teach play and social skills in an effective manner. Finally, question 13 examined the teachers' belief that they could assess the root cause of a student's behavior. The mean score for question 13 was 68.27, which demonstrated that a significant number of teachers did not have a high level of self-efficacy when assessing student behavior. Overall, while the mean scores demonstrate that for most of the questions the teachers felt reasonably comfortable completing the described tasks, for each question, there was at least one teacher, often more, who felt they could not complete the described task.

Conclusion

In conclusion, through the examination of the research questions the data collected during this needs assessment revealed a gap between the current research and practices within Stone Run County Schools. The interview responses discussed factors including the lack of teacher preparation, the chasm between the need for effective instruction and the current instructional practices, and the continued need for on-going training and support (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). The background section of the survey confirmed the need for further teacher training, as a majority of

respondents had not received training specific to students with ASD. Following this, further results from the knowledge section of the survey indicated that while respondents demonstrated knowledge in behavioral terminology and strategies for dealing with behaviors, but their knowledge was more limited in regard to the specifics of working with students with ASD. Furthermore, interview responses revealed the need for increased efficacy among some teachers (Participant A, personal communication, May 1, 2017; Participant B, personal communication, May 1, 2017). To this point, the survey results indicated there was a contingent of teachers who demonstrated a lack of confidence in their ability to work with students with ASD for almost every question asked. The combined data established that there is a gap between current research recommendations and the daily practices of the teachers in Stone Run County Schools.

Chapter 3

A Review of Intervention Literature

The literature establishes a significant gap between the research focused on instructional practices designed for students diagnosed with autism spectrum disorder (ASD) and the daily classroom practices used with these students (Cook & Odom, 2013; Cook, et al., 2009; Roth et al., 2014; Spencer et al., 2014; National Autism Center, 2015; Wong et al., 2015). Studies demonstrate the research-to-practice gap in ASD results from multiple factors, ranging from student needs to teacher preparation (Callahan et al., 2008; Cook & Odom, 2013; Cook et al., 2009; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). The wide range of potential causes result in numerous intervention practices, stretching from changes in the undergraduate preparation of teachers to incorporating teachers in the research process (Lang et al., 2010; Masterson, Dimitriou, Turko, & McPartland, 2014; Shyman, 2012).

The Underlying Factors and the Classroom Setting

Reducing the gap between research and practice in ASD requires an in-depth look at the each of the underlying factors. Students diagnosed with ASD bring a variety of unique educational needs into the classroom setting (APA, 2013; Boyd & Shaw, 2010; CDC, 2014). Students with ASD exhibit deficits in communication and social interaction, as well as repetitive behaviors, differing sensory reactions, difficulties engaging in traditional classroom instructional methods, and a lack of flexibility (Boyd & Shaw, 2010). Often teachers do not have adequate knowledge of research-based practices to meet the needs of students with ASD (Boyd & Shaw, 2010). Many teachers lack sufficient self-efficacy to work effectively with students diagnosed with ASD, which can affect how practices are implemented in the classroom setting (Corona et al., 2017; Ruble et al., 2011). While research focused on ASD is abundant, as well as varied in

design, focus, and approach, limitations exist (Heflin & Simpson, 1998; Llaneza, 2010, Lovaas, 1987; Stahmer et al., 2005; Spencer et al., 2014; Reichow & Volkmar, 2010; Wong et al., 2015). Common limitations of ASD research include studies based on single subjects and difficulty transferring interventions between research and classroom settings (Guldberg, 2017; Lord et al., 2005). Additionally, dissemination of educational research in ASD is limited, as educational professionals tend to receive information about current interventions through conferences and one-time professional development, rather than through access to the researchers or scholarly journals (Carrington et al., 2016; Marder & deBettencourt, 2015; Morrier et al., 2011). Multiple studies have shown that single session or didactic workshops are ineffective, as they lack a chance for teachers to practice and feedback (Desimone et al., 2002; Garet et al., 2001; Guskey, 2033; Morrier et al., 2011). The needs assessment for this study established that dissemination of research-based practices is minimal, and results in teachers relying on outdated instructional practices. Recent federal legislation including the Individuals with Disabilities Education Improvement Act and No Child Left Behind, mandate that classroom instruction should use scientifically-based instructional strategies for both general education students and students with disabilities (IDEIA, 2004; Iovannone et al., 2003; NCLB, 2002; Spencer et al., 2014; Yell, Drasgow, & Lowrey, 2005).

A key underlying factor in persistence of the gap is limited training and application of EBPs designed for students with ASD available to teachers (Callahan et al., 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). Though EBPs are essential to the education of students with ASD, several obstacles limit their use in the classroom setting. One obstacle is the available funding for schools to implement research-based interventions and therapies for students diagnosed with ASD (Swiezy et al.,

2008). The data collected as part of interviews conducted in the needs assessment within the school district demonstrated that budgeting was a significant barrier to implementing research-based interventions. Additionally, many teachers have limited preparation and experience instructing students diagnosed with ASD or learning research-based interventions designed for ASD (Pazey et al., 2014; Brock et al., 2014). The data collected during the needs assessment also confirmed that special education teachers have little preservice training specific to students diagnosed with ASD. Finally, research demonstrates teacher self-efficacy is related to preparation levels for teachers with students diagnosed with ASD (Corona et al., 2017; Ruble et al., 2011).

While a broad range of factors lead to the research-to-practice gap in ASD, two that are immediately actionable through intervention 1) increasing teacher knowledge of EBPs and 2) the implementation of EBPs in the classroom setting. To determine the best way to increase teacher knowledge and increase the level of EBP implementation in the classroom, a review of literature was conducted. The literature review focused on the methodologies for professional development, the quality of professional development, and the specific EBPs that were used in the intervention study. Finally, an introductory description of the intervention study was developed.

Conceptual Framework

It is essential for teachers to continue building their knowledge surrounding student learning and instructional techniques, as well as practice applying those newly learned skills into the classroom setting (Desimone, 2009). In the same way, it is equally as important to build professional learning experiences that offer effective, meaningful, and applicable to the daily instructional practice of the teachers involved (Desimone, 2009). To accomplish these goals, the

survey of literature is based on the conceptual framework based on the work of Desimone (2009). The conceptual framework proposed by Desimone (2009) incorporates several core elements that lead toward the eventual improvement of student learning (see figure 2 for a detailed illustration of the Core Conceptual Framework).

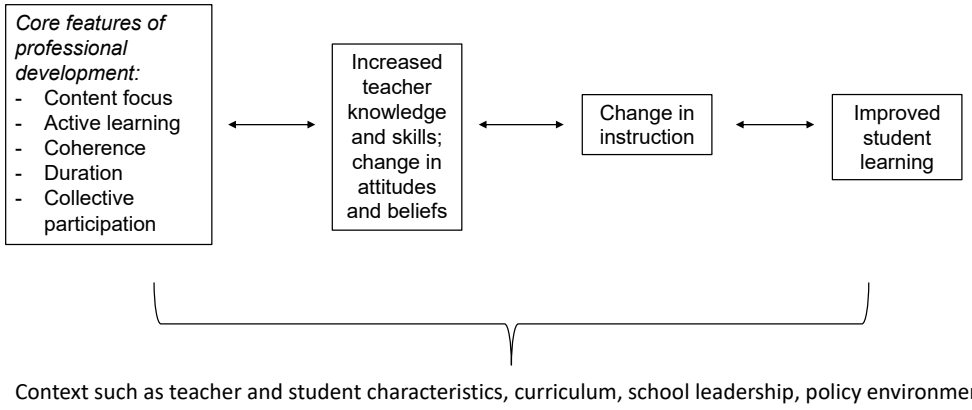

Figure 2. The Core Conceptual Framework for designing a structured, meaningful, and effective professional development experience for teachers as found in Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, *38*(3), 181-199.

The Core Conceptual Framework model was developed based on the researched connections between teacher knowledge, instruction, and student achievement (Desimone, 2009). In the conceptual framework, four key elements including a) the features of professional development, b) increases in teacher knowledge and/or change in the beliefs of teachers, c) changes in classroom instruction, and d) increases in student learning are interrelated along a pathway format (Desimone, 2009). The pathway is based on studies that affirm that content knowledge and the change of teacher beliefs have a positive impact on classroom instruction and thus increases student achievement (Carpenter et al., 1989; Desimone, 2009; Franke, Carpenter,

Levi, & Fennema, 2001). Moreover, the framework acknowledges the effect of the moderating elements of the curriculum, school leadership, and the characteristics of the teacher or student (Desimone, 2009). The Core Conceptual Framework creates a foundation to explore the literature related to professional development, the quality preparation of teachers, and the specific EBPs used to change the daily classroom instruction. In addition, an explanation of the essential concepts used in developing the intervention and a brief overview newly design intervention will be described.

Research in Teacher Preparation and Professional Development

The following section will examine some of the research aimed at understanding the pre-service preparation of teachers, professional development, online training, and coaching. It is followed by a section focused on the research supporting the combined approach of the above methodologies, as well as a closer look at the overall professional development needs of educators.

Pre-service Preparation

The need for pre-service preparation of teachers working with students diagnosed with ASD was emphasized by Volkmar in 1988. More recently, several studies have demonstrated the need for pre-service preparation for teachers who work with students with ASD (Donaldson, 2015; Morrier et al., 2011; Ruef, Nefdt, Openden, Elemsdorp, Harris, and Robinson, 2009). Morrier et al. (2011) surveyed teachers via email to examine their levels of teaching experience and education. Additionally, they compared the characteristics, including the gender, grade level taught, type of class taught, type of degree earned, and type of certification earned by each teacher, of a population of teachers using EBPs to a population of teachers not using evidence-based practices. Responses were submitted by 234 teachers, of which 185 were used in the

analysis. Most of the respondents were female, had earned their master's degree, and were special education teachers. Of these, less than 15% received training in ASD at the university level. Responses revealed that most coursework tended to focus on general special education topics including laws, federal education requirements, and eligibility requirements rather than EBPs or other teaching strategies (Morrier et al., 2011).

The work of Ruef et al. (2009) focused on designing a collaborative model approach to training preservice teachers in ASD. Two universities worked together to develop a three-layered approach toward training pre-service teachers and parents (Ruef et al., 2009). The layer that focused on training pre-service teachers required participants to have had experience in working with children, completed several course requirements and assessments, and to have shown leadership potential. Embedded within the coursework were field placements that focus on Pivotal Response Treatment (PRT), an evidence-based practice (Ruef et al., 2009). PRT is an intervention that combines a developmental approach with Applied Behavior Analysis techniques, using procedures that teach students with ASD in the natural setting (Ruef et al., 2009). Through the collaborative model, pre-service teachers benefited from practical experience in real-world contexts, along with practice in evaluation, and instruction design.

Alternately, Donaldson (2015) uses the apprenticeship model of supervision in training speech-language pathologists to serve students with ASD. The apprenticeship model is comprised of four components described by Feeney and Lamparelli (2002) and clarified by Donaldson (2015, p. 62):

1) The client is served effectively through sound planning and execution
2) There is not extensive use of trial and error within the clinical practice itself
3) Supports are provided liberally as needed and faded when no longer needed

4) Mentors and student clinicians both make explicit their thought processes and clinical decision-making process

The model was incorporated in studying incorporated while studying interventions including Peer Mediation and Video Modeling, and PRT. Donaldson (2015) notes that using the apprenticeship model allowed the SLPs to have intensive hands-on practice and growth in implementing the evidence-based interventions with students with ASD.

Conversely, in a differing approach Masterson et al. (2012) collaborate to design an undergraduate level course to prepare pre-service teachers for work with students with ASD. In the non-experimental paper, Masterson et al. (2012) note that while there are a few undergraduate level courses focused on ASD in the United States, the effectiveness of these courses has not thus far been evaluated. In response, Masterson et al. (2012) posit that a course in ASD at the foundational level include "diagnostic, assessment, etiological, biological, theoretical, and treatment components" (p. 2647). When developing a foundational course in ASD, the paper notes the importance of basing content on research in the field (Masterson et al., 2012). While preservice preparation is essential for teachers in the field of ASD, it is not yet common (Brock et al., 2014; Morrier et al., 2011). Consequently, there is a strong need to provide effective professional development for teachers working with students diagnosed with ASD.

Professional Development

While professional development is important for teachers of students with ASD, it is equally as essential for fostering teacher knowledge across a variety of subject areas (Desimone et al., 2002). Consequently, multiple studies that focused on determining the characteristics of effective professional development are reviewed below (Birman et al., 2000; Desimone et al.,

2002; Garet et al., 2001). Several of these studies have been conducted by key authors in the field of professional development including Dr. Desimone of the University of Pennsylvania; Dr. Garet of the American Institutes for Research; and Dr. Guskey of the University of Kentucky.

In a U.S. Department of Education commissioned the study by Garet et al. (2001), analyzed and determined the components of professional development that were necessary for increasing teacher knowledge and practice. Using a population sample derived from participants involved in the Eisenhower program for professional development, the study examined responses from 1027 teachers from across the U.S. (Garet et al., 2001). Findings demonstrated the importance of incorporating five key elements when developing professional development sessions for teachers (Garet et al., 2001). The key elements, according to Garet et al. (2001) include content, active learning, coherence, duration, and collective participation. A year later, the same team of authors published a longitudinal study they completed focusing on a similar purpose (Desimone et al., 2002). Using data collected from a 207-teacher sample, collected across five states, the study was completed over a three-year period (Desimone et al., 2002). The results corroborated the earlier data positing that content, coherence, active learning, duration, and collective participation were again central in designing effective professional development sessions (Desimone et al., 2002). Additionally, Desimone et al. (2002) found that using a reform type design, (i.e., study group, mentoring, or network) as part of the professional development sessions increased the level of the effectiveness of the professional development activity.

In contrast, Guskey (2003) presented a paper, at the annual meeting of the American Research Association, which determined that research based on several sources revealed a variety of elements associated with effective professional development. Using a process, Guskey (2003) called "a Synthesis of Lists" (p.2), twelve lists of essential elements of professional

development were analyzed to determine similarities and differences in their contents. Lists from multiple studies were created in differing ways including several based on empirical data or results of synthesizing empirical data, while others were developed through policy syntheses (Guskey, 2003). Results demonstrated that most of the lists reported components of content knowledge, time, participant collaboration, the use of assessment procedures, school-based sessions, and leadership capacity (Guskey, 2003). Each of these components were vital in creating an effective professional development (Guskey, 2003). In contrast to the previous research, Guskey (2003) observed that only three sources revealed the significance of concentrating on research-based practices. In his later work, Guskey (2014, 2017) posits that developers should modify how professional development is constructed rather than focus on a list of criteria for effective professional development.

Thorough planning focused on student outcomes should be stressed when developing effective professional development sessions (Guskey 2014, 2017). In both articles, Guskey terms this as reversed or backward planning. Guskey (2014) describes five steps in crafting professional development including: "(1) student learning outcomes, (2) new practices to be implemented, (3) needed organizational support, (4) desired educator knowledge and skills, and (5) optimal professional learning activities" (p. 13). Guskey (2017) theorizes that if the focus is on outcomes students should achieve, an effective plan for professional development becomes straightforward.

Online and Module Training

The use of online or module training is frequently used in place of face-to-face professional development sessions. As with face-to-face professional development sessions, the research indicates there are both benefits and weaknesses of using online or module training. In

several studies, online modules were used as a component of professional development studies each resulting in positive benefits to the teachers (Jimenez, Mims, & Baker, 2016; Little & King, 2008; Simpson, Qi, He, &Tao, 2016). In Jimenez et al. (2016), Modules Addressing Special Education and Teacher Education (MAST) modules were used with a population sample of twenty-six teachers who work with students with ASD or moderate to severe intellectual disabilities. The focus of the study was to determine if the use of the MAST modules positively impacted data collection and data-based decision making in the classroom setting. Jimenez et al. (2016) found that while online training alone did not have a significant impact on teacher knowledge and use of data-based decision making, teachers did demonstrate gains from pre- to post-test data. While results were not significant, Jimenez et al. (2016) pointed out that benefits of using online module training included ease of access to solid research-based instructional methods for teachers and other support personnel. In contrast, an earlier study conducted by Little and King (2008) found that online professional development increased teacher attitudes and knowledge of action research. Little and King (2008) used a mix of face-to-face classes and online modules focused on action research to determine their impact on teacher knowledge, attitude, implementation, and completion of action research. The population consisted of twenty-three graduate students working with students with disabilities (Little & King, 2008). Data collection was completed through a Satisfaction Survey, an Action Research Survey, activities from each module, and action research projects, as well as focus group and semi-structured interviews (Little & King, 2008). Results not only indicated increased fidelity of implementation of action research but positive outcomes for a blended model of professional development including online instructional modules (Little & King, 2008). Simpson et al. (2016) demonstrated a key benefit of online instruction, i.e., the ability for teachers to learn

effectively through distance education. Simpson et al. (2016) focused on a teacher education collaboration project meant to build teacher knowledge of teachers working with students with ASD in China. Through collaboration with a university in China, a university in the U.S., and a private center in China serving students with ASD, teachers were trained in assessment and evaluation procedure for developing individualized goals for students (Simpson et al., 2016). The study used online modules in a train-the-trainer design in which two teachers taught forty-nine additional teachers based on the modules (Simpson et al., 2016). The qualitative data demonstrated that the two teacher-trainers had positive impacts on their teaching, including writing goals which were individualized based on each students' needs, better instructional planning, and an increased use of classroom data collection (Simpson et al., 2016).

Another study by Marder and deBettencourt (2012), uses a blended model of face-to-face, online synchronous, and online asynchronous for pre-service instruction in a five-course graduate-level program designed to train teachers to use research-based instruction. While each reviewed study had significant limitations, the benefits of access to research-based instructional strategies, pre-and posttest data collection, and improved teacher knowledge of specific concepts demonstrate the need to include online or module training in the proposed intervention. Through participant and instructor satisfaction surveys analyzed by percentage distribution for each item, Marder and deBettencourt (2012), demonstrated participants were able to receive individualized and specialized training using the hybrid model. Additionally, the authors note that the use of the hybrid model could increase the number of teachers prepared to work with students with ASD (Marder & deBettencourt, 2012). Since the data collection relied on satisfaction data, it should be noted that a key limitation is lack of data collection regarding the increase of

participant knowledge. Each included study identified positive benefits for including online or module training as part of a professional development program despite their limitations.

Coaching

An intervention centered on instructional coaching can be used as a delivery technique or as a component of professional development (Desimone & Pak, 2017). Most instructional coaching models can be divided into two main types of coaching, expert coaching and reciprocal (or peer) coaching, depending on who is coaching the teacher (Kohler, Ezell, & Paluselli, 1999). Kohler et al. (1999) analyzed the effectiveness of reciprocal peer coaching using a multiple baseline design. While the study focused specifically on kindergarten teachers, the authors concluded that reciprocal peer coaching had positive effects on teaching practices, student outcomes, and teacher efficacy across a variety of subject areas (Kohler et al., 1999). In a more recent article, Desimone and Pak (2017) acknowledged that data to confirm the positive effect instructional coaching might have on the practice of teachers is limited. Nonetheless, Desimone and Pak (2017) hypothesized that by analyzing instructional coaching using the five key elements of professional development (i.e., content, active learning, coherence, duration, and collective participation) described by Garet et al. (2001), instructional coaching can positively impact teacher knowledge and practice.

In several studies, more specific to the field of ASD, instructional coaching was analyzed as a method of teaching teachers about the use of EBPs in the classroom (Ganz, Goodwyn, Boles, Hong, Rispoli, Lund, & Kite, 2013; Mason, Schmitz, Wills, Rosenbloom, Kamps, & Bast, 2017; Wilson, Dystra, Watson, Boyd, & Crais, 2012). Ganz et al. (2013) investigated how the combined approach of in-service training and instructional coaching was used to increase the effective use of an alternative communication method known as Picture Exchange

Communication System or PECs, with pre-school students with ASD. The goal of PECs is to increase communication in a functional manner for students, or others who do not use conventional voiced language. The study population included three pairs of students and therapists in a single-case design using multiple probes, over a 12-week period. The initial phase included a three-hour long training for the therapists including the goal of the PECS system, the stages of implementation of PECS, chances for therapists to practice each stage, and feedback from a PECS trained therapist (Ganz et al., 2013). Once the therapist-student pairs had been using the system for 12 weeks, the baseline data were collected and the instructional coaching began. Results indicated that use of a one-time training did not lead to effective implementation of the PECS system. Once given opportunities for instructional coaching the therapist-student pairs increased the use of PECS in specific situations but did not generalize its use outside of the classroom areas where the instructional coaching was received. Despite these limitations, the use of instructional coaching seemed to positively impact the use of PECS among the therapist-student pairs (Ganz et al., 2013).

While investigating a different EBP, Mason et al. (2017) also demonstrated an improved level of fidelity with the use of Practice-Based Coaching. The study focused examined the process of paraprofessionals learning and implementing discrete trial training (DTT) with students with ASD (Manson et al., 2017). DTT is a teaching method that focuses on teaching one student using a response-prompting procedure that is adult-led and follows specific steps to teach a variety of skills across multiple content areas (Manson et al., 2017). Manson et al. (2017) used a similar intervention to Ganz et al. (2013) including informational instruction followed by coaching sessions. Key differences in Mason et al. (2017) included the use of an instructional module on DTT, instead of face-to-face training, and coaching sessions led by the

special education teachers that worked with each paraprofessional. The study was developed using multiple-baseline design (Mason et al., 2017). Authors note that the design exhibited experimental control and internal validity (Mason et al., 2017). Manson et al. (2017) indicated a positive correlation between the use of Practice-Base Coaching and increased levels of fidelity among the paraprofessional participants implementing DTT in the classroom. While results of this study were mostly positive, authors noted that the study did not implement generalization or maintenance procedures (Mason et al., 2017).

Finally, Wilson et al. (2012) looked at the coaching of early childhood teachers of students with ASD. The study is considered a pilot study of the ASAP coaching model, which is based on the Advancing Social-communication and Play (ASAP) intervention program developed by Watson, Boyd, Baranek, and Crais (2011), and involves the process of observation, reflection, and action. The ASAP program is an intervention program designed to build the social communication and play skills of preschoolers with ASD, through one-on-one and group sessions (Watson et al., 2011). The initial study uses a mixed-methods design to evaluate ASAP implementation and participant perspectives of the process over seven months (Wilson et al., 2012). The population sample was divided into three groups who had access to differing levels of support throughout the process (Wilson et al., 2012). The group that received both ASAP training and ongoing coaching based on ASAP coaching model had the largest positive change in implementation frequency and quality (Wilson et al., 2012). Wilson et al. (2012) benefits of coaching including professional accountability, building new instructional skills and may increase interdisciplinary collaboration depending on who is involved in the coaching program. Moreover, the ASAP coaching process led to increased teacher content knowledge and changed teacher instructional practices (Wilson et. al, 2012). Overall, the benefits of instructional

coaching seem to outweigh the limitations of each study. Instructional coaching positively impacted implementation frequency, professional accountability, fidelity of implementation, and teacher efficacy (Ganz et al., 2013; Kohler et al., 1999; Mason et al., 2017; & Wilson et. al, 2012). Consequently, instructional coaching was integrated as an aspect of the intervention study.

Combined Approach

Importance of a combined approach. Using a combined approach of professional development that incorporates multiple methods, including face-to-face, online, and coaching models, of instructional delivery has been examined in several studies (Higginson & Chatfield, 2012; Marder & deBettencourt, 2012; Mueller & Brewer, 2013; Scheuermann et al., 2003; Stahmer et al., 2015). Examples of a combined approach are Higginson and Chatfield (2012) and Mueller and Brewer (2013) which both used a combination of training, coaching and collaboration to increase teacher knowledge of ASD and EBPs. Both studies focused on qualitative data, and the experiences of educators, who demonstrated positive attitudes towards the use of EBPs and receiving support through coaching (Higginson & Chatfield, 2012; Mueller & Brewer, 2013). Similarly, the work of Stahmer et al. (2015) used a combine approach of workshops, observation and coaching to instruct teachers on the use of three evidence-based practices: discrete trial training, PRT, and functional routines. While the participants increased their use of each EBP over the time of the study, the authors noted that the fidelity of use of each practice did not increase (Stahmer et al., 2015). The work of Scheuermann et al. (2003) recommends the use of teaching multiple research-based approaches and using consistent follow-up such as practice and feedback for the teacher during the learning process.

In summary, while there are a variety of professional development methods, research demonstrates that several factors are important to creating and implementing effective professional development. The works of Birman et al. (2000); Desimone et al. (2002); and Garet et al. (2001) recommend the use of sustained duration, specific content, active learning, coherence, and collective participation in all professional development activities. Furthermore, several studies established positive benefits for using online or module training to increase teacher knowledge (Jimenez et al., 2016; Little & King, 2008). While the work of Wilson et al. (2012) demonstrated the increase teacher content knowledge and changes in teacher instructional practices. Additionally, several studies reveal positive results related to teacher knowledge and attitudes using a combined approach of online module work and in class coaching (Higginson & Chatfield, 2012; Marder & deBettencourt, 2012). In conclusion, research establishes the combination of face-to-face sessions, online modules, and coaching have the potential to increase teacher knowledge and improve classroom practices when the factor of effective of professional development are incorporated (Birman et al., 2000; Desimone et al., 2002; Garet et al., 2001; Higginson & Chatfield, 2012; Jimenez et al., 2016; Little & King, 2008; Marder & deBettencourt, 2012; Wilson et al., 2012).

Quality Teacher Preparation in ASD

Scheuermann et al. (2003) posit that to effectively train teachers to work with students diagnosed with ASD, training should be based in research, proven to be effective, and grounded in specific competencies. The competencies were further clarified into seven essential elements of teacher preparation:

1) Knowledge of the disorder
2) Parent Involvement

3) Theoretical underpinnings of instructional approaches (multiple approaches)
4) Teaching language and communication, social competencies, adaptive behaviors and transitions
5) Classroom Structure
6) Behavior Management
7) Special issues (to fluctuate with the field) (Shyman, 2012, p. 190)

Using these competencies, the Council of Exceptional Children created a set of standards that guide the preservice preparation of teachers in the field of ASD (2015). Competency areas addressed by the standards include Learner Development and Individual Learning Differences, Learning Environments, Curricular Content Knowledge, Assessment, Instructional Planning and Strategies, Professional Learning and Ethical Practices, and Collaboration (Council of Exceptional Children, 2015). Each competency area includes standards that teachers beginning in the field of ASD are expected to know and practice in their daily context. Professional development grounded in the Core Conceptual Framework model and the Council of Exceptional Children standards could improve teacher knowledge and use of EBPs (Council of Exceptional Children, 2015; Desimone, 2009).

Impacting the Self-Efficacy of Teachers

Since the work of Bandura (1977) and Gibson and Dembo (1984) multiple studies have examined self-efficacy regarding teachers and their instruction. Studies have made connections between levels of self-efficacy in teachers and student growth, student motivation, teacher motivation, the achievement of goals, and retention of teachers, however the studies demonstrate varying levels of effectiveness (Bruce & Ross, 1994; Ross, 1994).

In a mixed-methods study of 7th, 8th, and 9th grade teachers Ross (1994) examined the possibility of increasing levels of self-efficacy in teachers through active participation in a planned in-service focused on the use of cooperative learning strategies. In an eight-month-long in-service, efficacy was measured using a 16-item Likert-type self-report questionnaire (Ross, 1994). Additionally, at the end of the in-service period two instruments measuring cooperative learning strategies were given, including the Cooperative Learning Self-Appraisal Form and the Cooperative Learning Telephone Interview (Ross, 1994). In a monthly assessment, teachers recorded how frequently they used the cooperative learning strategies in the classroom (Ross, 1994). Finally, qualitative data were collected using anecdotal notes taken during the in-service meetings, lesson plans of teacher, documents relating to the incorporation of cooperative learning strategies, and non-structured interviews with participants (Ross, 1994). Results demonstrated that active participants in the in-service increased aspects of efficacy but did not increase overall levels of self-efficacy (Ross, 1994). Ross (1994) noted the length of the professional development as a limitation.

In another study, authored by Bruce and Ross (2008) used a program of in-service training and peer coaching to attempt to change teacher efficacy and practice in the areas of math. The qualitative study examined a theoretical framework built on the idea that if students are not achieving and teachers are able to recognize the lack of achievement, teachers will make efforts to change their instructional practice if provided with a differing method of instruction that is perceived as effective. Results demonstrated positive changes in both instructional methods and efficacy.

In a quasi-experimental study by Tschannen-Moran and McMaster (2009), the authors examined if self-efficacy and strategy implementation would be impacted by the type of

professional development. The study used four different treatment methods to for instruction of the Tucker Signing Strategies for Reading (Tschannen-Moran & McMaster, 2009; Tucker, 2001). Ease of implementation and a smaller period of implementation were the reasons for using this particular strategy (Tschannen-Moran & McMaster, 2009; Tucker, 2001). The treatment methods included 1) information, 2) information and modeling, 3) information, modeling, and practice, and 4) information, modeling, practice, and coaching. Results established that the treatment of information and the treatment of information, modeling, practice, and coaching positively impacted teacher's levels of self-efficacy (Tschannen-Moran & McMaster, 2009). Additionally, when measuring both implementation and self-efficacy the final treatment model of information, modeling, practice, and coaching had a positive impact on both areas (Tschannen-Moran & McMaster, 2009).

The study by Jennett, Harris, and Mesibov (2003) focused specifically on teachers working in the field of autism. While the study did not aim to impact self-efficacy, results demonstrated that teachers who had knowledge and skills in a teaching method, (TEACCH and ABA), had relatively high levels of self-efficacy and were less likely to experience burnout. Additionally, Jennett et al. (2003) noted that there may be a positive connection between an increased level of knowledge or skills and the self-efficacy of teachers.

For the purpose of this dissertation, self-efficacy as the beliefs a teacher holds about their ability to use instructional practices in a way that leads to positive outcomes for their students (Corona et al., 2017). Studies demonstrate the importance of active learning, coaching with constructive feedback, building teacher knowledge, and access to effective teaching models in increasing the self-efficacy of teachers (Bruce & Ross, 1994; Jennett et al., 2003; Ross, 1994; Tschannen-Moran & McMaster, 2009). However, it is important to note that self-efficacy levels

may also be impacted by the length of time teachers are involved in the professional development (Bruce & Ross, 1994; Ross, 1994).

Essential Concepts Involved in Developing the Intervention Study

Definition and Importance of EBPs in Working with Students with ASD

In addition to considering the ways in which to develop effective professional development and the keys to increasing teacher self- efficacy, the student researcher examined the essential components in developing a professional development program for teachers of students with ASD. One essential component examined was the use and effective implementation of EBPs. EBPs are defined as instructional strategies or interventions, which have set procedures and have been thoroughly researched, and result in positive outcomes for students with ASD (Mesibov & Shea, 2011). Marder and deBettencourt (2015) explain that each EBP is systematically reviewed and has been developed through experimental, quasi-experimental, or single subject design research, and are published in professional peer-reviewed journals. Marder and deBettencourt (2015) recommend that special education teachers, and specifically teachers working with students diagnosed with ASD receive training that includes building teacher knowledge of EBPs, selection of appropriate EBPs, and implementation of EBPs in the classroom.

Challenges of Educators Specializing in ASD

Several studies have focused on the needs of educators in receiving professional development (Busby, Ingram, Bowron, Oliver, & Lyons, 2012; Corkum, Bryson, Smith, Giffen, Hume, & Power, 2014; Hughes, Combes, & Metha, 2012). Busby et al. (2012) centered around evaluating an education program for future teachers of students with ASD at Troy University in Alabama. In their investigation, the authors uncovered perceived challenges and professional

development needs for inclusion teachers (Busby et al., 2012). While the study centered on general education teachers' needs, one professional development need that resonated with all teachers, including special education teachers was the need for training on current research and best practices for students with ASD (Busby et al., 2012). In a similar study, Corkum et al., 2014 sought to examine the professional development needs of teachers working with students with ASD in the inclusion setting. Using a mixed method study focus groups and educator surveys, results revealed that participants viewed it challenging to meet the varying needs of students with ASD (Corkum et al., 2014). Additionally, Corkum et al. (2014), confirmed the need for professional development that includes a variety of access levels and methods of instruction. Hughes et al. (2012) also looked at the professional development needs of administrators regarding students with ASD. Through the use of a 3-point Likert scale, results indicated that administrators believed there was a need for professional development regarding best practices and educational programming for students with ASD.

In an additional study, Morrier et al. (2011) posit that teachers need training in a variety of teaching methods. Additionally, teachers need to be ready to collaborate with parents and multidisciplinary professionals within the education setting (Morrier et al., 2011). In an earlier study, Scheuermann et al. (2003) also outlines the professional needs of teachers working with students with ASD. According to Scheuermann et al. (2003), the professional developments needs in the field of ASD result from a lack of universal professional standards. Professional development should focus on the significant needs of students with ASD and specialized instructional strategies designed to meet those needs (Scheuermann et al., 2003).

Another study investigates the use of EBPs by public school teachers (Stahmer et al., 2015). In a randomized trial of a comprehensive program for students with ASD, Stahmer et al.

(2015) examined procedural fidelity of EBPs, including DTT and PRT. The research procedures include a combined approach to training, workshops, and coaching (Stahmer et al., 2015). Results indicated that teachers of students with ASD could learn and implement EBPs, although ongoing training and coaching are needed over longer periods of time to reach effective levels of implementation (Stahmer et al., 2015). Additionally, Morrier et al. (2011) explained that students with ASD are heterogeneous and consequently, the strategies that work for one student may not work for all students with ASD. Therefore, teachers may need extensive training in a variety of EBPs (Morrier et al., 2011; Scheuermann et al., 2003; Stahmer et al., 2015).

A Focus on Discrete Trial Training and Visual Supports, Evidence-Based Practices

While teachers need ongoing professional development in as many of the twenty-seven EBPs as possible, the intervention will narrow the professional development focus down to two specific EBPs. For the purposes of the dissertation intervention and the professional development program focused on the EBPs of discrete trial training and visual supports. The professional development included an explanation of the EBP, including its procedure and the evidence supporting the procedure. Discrete trial training and visual supports were chosen as each can be used across a variety of academic contexts.

Discrete Trial Training

Discrete trial training is an effective teaching tool designed for use with students diagnosed with ASD. Discrete trial training is an instructional method that is focused on the learner developing a response to a given stimulus (Sam, & AFIRM Team, 2016; National Autism Center, 2015; Taubman, Brierley, Wishner, Baker, McEachin, & Leaf, 1999; Wong et al., 2015). This method allows for quick repetitive trials based on individual, or discrete teaching units. When using a discrete trial procedure, the teacher introduces a stimulus, or the instruction,

allows time for the learner to respond to the stimulus, the teacher reinforces a correct response to increase the likelihood the correct response will be repeated, and records the data about the learner's response. This procedure is repeated a specific number of times based on the teachers' plan.

The discrete trial training, which is a teaching tool used in Applied Behavior Analysis, assist learners by segmenting material into easier sequenced steps. An advantage of using discrete trial training is that it allows for larger tasks to be broken down into single steps that are easier for the leaner to master. An additional advantage of discrete trial training is that learners are given immediate feedback which helps the learner determine if they were correct in their response. Moreover, since each trial is usually completed quickly, multiple trials of the same stimulus can be repeated to increase the chance of a correct response (Sam, & AFIRM Team, 2016; National Autism Center, 2015; Taubman et al., 1999, Wong et al., 2015). Discrete trial training is designed to be used in a one-on-one setting but could be used in small groups, within the classroom, community or home setting. This instructional method was used with multiple content areas including communication, behavior, and academic material. Finally, Wong et al. (2015) found significant evidence for the success of discrete trial training. In a systematic literature review, Wong et al. (2015) reviewed thirteen single case design studies that established discrete trial training as an EBP.

Visual Supports

Visual supports were established as an EBP by Wong et al. (2015) in the same systematic literature review. Through the review of eighteen single-case design studies, Wong et al. (2015) organized visual supports into three separate categories of 1) visual boundaries, 2) visual cues, and 3) visual schedules. In another systematic review of literature, the National Autism Center

(2015) confirms the establishment of visual schedules as an EBP. Visual supports use pictures, objects, labels, schedules, visual boundaries or other concrete cues that aid the learner in comprehending information about their environment, lesson, or expectations (National Autism Center, 2015; Sam & AFIRM Team, 2016; Wong et al., 2015). Visual supports can be used in classroom, home, or community settings, to support students in understanding their environments, navigating their day, and supporting their academic learning (MacDuff, Krantz, & McClannahan, 1993; Murdock & Hobbs, 2011; National Autism Center, 2015; Sam, & AFIRM Team, 2016; Wong et al., 2015). Furthermore, visual supports can assist the learner in understanding classroom procedures, expectations, and individual lessons (MacDuff et al., 1993; Murdock & Hobbs, 2011; National Autism Center, 2015; Sam, & AFIRM Team, 2016; Wong et al., 2015). Visual cues can be used as cues, in combination with other EBPs, including discrete trial training to address academic needs, communication, behavior, or social goals expectations (MacDuff et al., 1993; Murdock & Hobbs, 2011; National Autism Center, 2015; Sam, & AFIRM Team, 2016; Wong et al., 2015).

The Intervention Study

Both the literature review and the needs assessment demonstrated that teachers lack training focused on ASD. The intervention focused on teachers working in a public-school district, consisting of 28 schools in rural, suburban, and urban settings. This study recruited special education teachers working predominantly with students with ASD. Each of the teachers worked in the self-contained special education setting, or a single classroom setting designed for students with specialized educational needs, in either the elementary, middle, or high school setting. The intervention study emphasized increasing teacher knowledge of ASD and evidence-based practices. Additionally, teachers had the opportunity to incorporate the learned EBPs in

their professional context through coaching sessions. Each of the components allowed teachers to refine and improve their practices regarding students with ASD and increase the rate of use of discrete trial training and visual supports in the classroom setting. The intervention combined the use of professional development, online modules, and instructional coaching in a blended sequence.

Face-to-Face Professional Development

According to Hughes, Combes, and Metha (2012) and Simpson et al. (2007) teachers require an understanding of the compound needs of students with ASD in school settings. While these needs tend to be complicated, the first step in preparing teachers is to assist them in building their knowledge level about ASD. For this reason, the initial stage of the intervention consisted of an hour-and-a-half long professional development session. The professional development session centered on ASD, including diagnosis criteria, characteristics, and how these characteristics might impact school performance. An overview of student needs including academic, communication, and behavioral symptoms were covered. Additionally, an explanation of the EBPs, the development of the EBPs, and their use with students diagnosed with ASD were presented. The intended outcome of the initial stage of the intervention was to increase teacher knowledge of ASD, its characteristics, and their knowledge regarding EBPs. The second session professional development session focused on discrete trial training, including procedures for the EBP, when it should be implemented, how to plan for implementation, how to implement the practice with fidelity, and how to collect data. Participants' analyzed a case study, through small group collaboration they to reviewed, discussed, and planned for student example provided in a case study. Additionally, the participants planned a lesson using Discrete Trial Training. The third session focused on the use of visual supports in the classroom.

Features of this session were similar to the session on discrete trial. The session reviewed the procedures for the EBP, when it should be implemented, how to plan for implementation, how to implement the practice with fidelity, and how to collect data. Teachers participated in a case study review and used the study to plan for an example student. Furthermore, teachers developed a lesson plan incorporating visual supports for their classroom. The final professional development session focused on implementing the newly learned EBPs and assisted the teachers in solving any problems of implementation that were brought up. Teachers worked together to think through and problem-solve real situations from their peers' classrooms. Additionally, the participants reviewed and planned for an example student using a case study with several implementation barriers. The intended outcome of the professional development component of the intervention is to increase teacher knowledge of ASD, its characteristics, and increasing the procedural knowledge of the specific EBPs including, both discrete trial and visual supports in the classroom context.

Online Professional Development Modules

The second component of the intervention required each teacher to complete two online modules found on the Autism Focused Intervention Resources and Modules (AFIRM) focused on discrete trial training and visual supports (Autism Focused Intervention Resources and Modules, n.d.). Each module contains instruction on using an individual evidence-based practice, based on the work of Wong et al. (2015). Modules consist of four lessons including the basics, planning for the practice, using the practice, and monitoring the (Autism Focused Intervention Resources and Modules, n.d.). Each module was completed in about two hours to two-and-a-half hours and includes a pre- and posttest embedded in the module (Autism Focused Intervention Resources and Modules, n.d.). While studies regarding the effectiveness of these

modules had not yet been completed, multiple studies have shown that online learning can increase a teacher's knowledge of instructional practices (Jimenez et al., 2016; Little & King, 2008; Marder & deBettencourt, 2012). Additionally, Higginson and Chatfield (2012) demonstrated that combining professional development and teacher mentoring increased teacher knowledge about ASD and the importance of using research-based teaching strategies. The intended outcome of using the AFIRM modules was to increase teacher knowledge of specific evidence-based practices, of discrete trial training and visual supports, and to increase the use of the specific EBPs in the classroom setting.

Coaching Sessions

The final component of the proposed intervention process used coaching sessions to apply the learned evidence-based practice in the teachers' professional context. The coaching technique allowed for teachers to collaborate with participants while giving assistance, instructional feedback, and guidance as the teachers apply newly learned skills (Mueller & Brewer, 2013; Wilson et al., 2012). In the context of the intervention, four coaching sessions were implemented within the teacher's professional setting. The sessions were implemented following the online and professional development sessions. Each session focused on a period of observation by the student investigator, data collection by the student investigator, self-reflection by the teacher, and collaboration with the student investigator to review feedback, discuss evidence-based practice implementation, and problem-solve any barriers to implementation that arise (Mueller & Brewer, 2013; Wilson et al., 2012). The intended outcomes of the coaching sessions were to increase the use of discrete trial training, use of visual supports, and to increase levels of teacher self-efficacy in working with students with ASD.

Intended Outcomes

The overall goals for the proposed intervention were to increase teacher knowledge of ASD and EBPs while increasing the use of EBPs in the classroom setting and increasing teacher levels of self-efficacy. According to Marder and deBettencourt (2012) the use of a blended model, including face-to-face and online instruction, may increase the numbers of teachers who can successfully work with students with ASD. Moreover, Higginson and Chatfield (2012) demonstrate that a comprehensive approach, involving multiple intervention components, to educate teachers to work with students with ASD created positive outcomes for students with ASD. While the specific intervention components have not been studied together, the structure of the proposed intervention is comparable to the recommendation of the National Professional Development Center model, which centers on assessment, implementation, and outcomes (Autism Focused Intervention Resources and Modules, n.d.). The intended outcomes may increase the knowledge of teachers about ASD and evidence-based practices, the use of EBPs in the classroom, as well as positively impact the teachers' level of self-efficacy. While positively changing the self-efficacy of teachers tends to require a longer implementation phase, several studies have demonstrated the potential for increase through active participation in professional development programs (Bruce & Ross, 2008; Jennett et al., 2003; Ross, 1994). Additionally, intervention study may result in a distal outcome of increasing the achievement of students with ASD (Morrier et al. 2011; Wong et al. 2015).

Conclusion

The review of intervention literature demonstrated the need for a comprehensive combine approach to meet the needs of teachers working with students with ASD (Morrier et al., 2011; Scheuermann et al., 2003; Stahmer et al., 2015). The current intervention outcomes were

focused on increasing teacher knowledge of ASD and EBPs, as well as increasing the frequency of and fidelity of use of EBPs. The use of coaching and online modules, along with face-to-face professional development allowed for general learning, while giving participants a chance to practice newly learned EBPs in the classroom setting (Marder & deBettencourt, 2012); Ruef et al., 2009; Scheuermann et al., 2003; Shyman, 2012).

Chapter 4

Intervention Design: Method and Procedure

A gap exists between the research focused on instructional practices designed and the classroom teaching practices used for students diagnosed with autism spectrum disorder (ASD) (Cook & Odom, 2013; National Autism Center, 2015; Roth et al., 2014; Spencer et al., 2014; Wong et al., 2015). As discussed in Chapter 3, teacher training focused on ASD and evidence-based practices (EBPs) are essential to reducing the research-to-practice gap (Cook & Odom, 2013; National Autism Center, 2015; Roth et al., 2014; Spencer et al., 2014; Wong et al., 2015). There are limited opportunities for teachers to learn and implement EBPs designed specifically for students with ASD in both pre-service and in service contexts (Callahan et al., 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007). Consequently, many schools across the US are (a) using unproven instructional strategies, (b) failing to meet implementation fidelity for EBPs or (c) blending EBPs in ways unsupported by empirical research (Chasson et al., 2007; Cook & Odom, 2013; Iovannone et al., 2003; Stahmer et al., 2005). Teachers, therefore, need access to ongoing in-service training focused on EBPs designed for students with ASD (Callahan et al., 2008; Cook & Odom, 2013; Dingfelder & Mandell, 2011; Hollins, 2013; Lord et al., 2005; Smith et al., 2007; Stahmer, 2007; Strong, 2014).

This intervention aimed to contribute to teacher professional development needs and educate special education teachers working with students with ASD on two specific EBPs, Visual Supports and Discrete Trial Training (National Autism Center, 2015; Wong et al., 2015). The intervention program used a combination of face-to-face professional development sessions, online modules, and instructional coaching focused on visual supports and discrete trial training

(Autism Focused Intervention Resources and Modules, n.d.; Desimone & Pak, 2017; Desimone et al., 2002; Marder & deBettencourt, 2012; Wilson et al., 2012).

Purpose of the Study

The purpose of this study was to investigate the effect of using a combination of professional development, online modules, and instructional coaching, from here on referred to as the combined program, on the knowledge and beliefs of teachers working with students diagnosed with ASD and on the use and fidelity of the EBPs in the classroom. The study was based on the conceptual framework hypothesizing that if teachers participated in a professional development designed using the elements of content focus, active learning, coherence, duration, and collective participation, their knowledge and level of efficacy around EBPs would increase, which in turn would contribute to changes in instruction, and eventually, improve student learning (Desimone, 2009). The research questions for the study addressed both the process and outcome evaluations.

- To what extent was the combined program, including professional development, online modules and instructional coaching, implemented with fidelity including dose, reach, and adherence to the program?
- What was the participants' experience in the combined program?
- To what extent did the combined program increase teacher knowledge of ASD and EBPs?
- To what extent did the combined program increase the frequency of use of EBPs in the classroom setting?
- To what extent did the combined program increase teacher self-efficacy levels regarding working with students with ASD?

Research Design

This study was based on a concurrent design, in which researchers collected both qualitative and quantitative data during the same timeframes (Creswell & Plano Clark, 2011). The qualitative data collection included coaching logs, classroom observations, and semi-structured interviews. The quantitative data collection measured the changes in (a) teacher knowledge, (b) the frequency of use, and (c) in the level of the participants' self-efficacy. The quantitative data collection included professional development attendance, module completion, a social validity survey, the pre- and post-tests measures. The small sample for this study limited the extent to which statistical significance was examined. As a result, the emphasis was on the qualitative data collection and the quantitative data assisted in developing a clearer picture of the intervention process and its outcomes. Subsequently, the selected mixed-methods design allowed the student investigator to gain a clearer understanding of the participants' experiences with the combined program consider adding a citation for the value of MM here. Furthermore, combining the qualitative data with the quantitative data, gave the student investigator a broader picture of the key outcomes.

Process Evaluation Plan

Implementing programs and interventions is a complex process. Rossi, Lipsey, and Freeman (2004) acknowledged that even well-design programs and interventions may not be implemented as planned. To determine if the delivery of the combined program matched the intended design, the student investigator examined several components of fidelity (Dusenbury, Brannigan, Falco, & Hansen, 2003; Rossi et al., 2004). The focus of the process evaluation included reach, dose (delivered and received), and fidelity of implementation (see Table 10). When combined, each of the aspects of process evaluation guided the student investigator in

determining if the proposed intervention was implemented as intended. Moreover, the process evaluation aided in determining if the outcomes resulted from the planned intervention.

Table 10. Process Evaluation Concept Definitions

Concept	Definition
Reach	The proportion of intended target audience that participates in an intervention. If there are multiple interventions, then it is the proportion that participates in each intervention or component. It is often measured by attendance. Reach is a characteristic of the target audience.
Dose delivered	The number of intended units of each intervention or each component delivered or provided. Dose delivered is a function of the efforts of the intervention providers.
Dose Received	The extent to which the participants actively engage with, interact with, are receptive to, and/or use materials or recommended resources. Dose received is a characteristic of the target audience and it assesses the extend of engagement of the participants of the intervention.
Fidelity	The extent to which the intervention was delivered as planned. It represents the quality and integrity of the intervention as conceived by the developers. Fidelity is a function of the intervention providers.

(adapted from Linnan and Steckler, 2002, p. 12, Table 1.1)

Research questions one and two guided the process evaluation (see Table 11). These questions examined whether or not teachers participated in the intended number of professional development sessions, online modules, and coaching sessions based on the logic model (see Appendix I), and to determine the overall participant experiences. Research question one measured dose delivered, reach, and the adherence to the prescribed program.

Table 11. Process Evaluation Summary Matrix

Indicator	Instrumentation	Data Collection		
		Source	Frequency	Data Analysis
Dose (delivered)	Session anecdotal notes	Outside Observer	4 times (once per session)	Qualitative
	AFIRM Modules certificate of completion	Participants	8 times (one per module per participant)	Quantitative
	Coaching Logs (including implementation checklist & anecdotal notes)	Student Investigator	4 times (two sessions per participant)	Qualitative
Reach	Attendance Records	Student Investigator	4 times (once per session)	Quantitative
	AFIRM Modules certificate of completion	Participants	8 times (one per module per participant)	Quantitative
	Coaching Logs (including implementation checklist & anecdotal notes)	Student Investigator	4 times (two sessions per participant)	Qualitative
Fidelity of Implementation	Session anecdotal notes	Outside Observer	4 times (once per session)	Qualitative
	Coaching Logs (including implementation checklist & anecdotal notes)	Student Investigator	4 times (two sessions per participant)	Qualitative
Dose (received)	Coaching Logs (including anecdotal notes)	Student Investigator	4 times (two sessions per participant)	Qualitative
	Implementation Checklist	Participants	4 times (two sessions per participant)	Quantitative
		Outside Observer	3 times (prior to, immediately after, and 4 weeks after the completion of the combined program)	
Participant Experience	Social Validity Survey	Participants	1 time at the end of the program	Quantitative
	Semi-Structured Interviews	Participants	1 time at the end of the program	Qualitative

Dose delivered focused on the delivery of each component of the combined program (Dusenbury et al., 2003; Linnan & Steckler, 2002). The student investigator measured the adherence to the plan by comparing the professional development presentations to the anecdotal notes taken after each session, determining the percentage of completion of the online modules, and analyzing anecdotal notes taken during coaching session to determine if all planned elements were delivered as proposed.

Research question two focused on measuring dose received and participant experience. The student investigator measured dose received by analyzing the participant experiences through the data collected in the classroom observations and implementation checklists created during each coaching session, mentioned above, as well as, in the semi-structured interviews conducted at the end of the program. The student investigator used semi-structured interviews to gather information including participants expectations for the combined program, its contributions to teacher instruction, ways to improve the combined program, and participant described issues that emerged during the combined program.

Outcome Evaluation Plan

The outcome evaluation examined three short-term outcomes including the change in (a) teacher knowledge of ASD and EBPs, (b) use of EBPs in the classroom setting, and (c) teacher self-efficacy (see Table 12). Theory of Treatment (TOT) (see Appendix H) and Desimone's (2009) conceptual framework (see figure 2) supported the relevant outcomes and demonstrated that a professional development program that included elements of active learning, adherence, content focus, and collective participation contributes to building teacher knowledge, increasing EBP use, and raising teacher self-efficacy (see Table 12).

Table 12. Outcome Evaluation Summary Matrix

Indicator	**Instrumentation**	**Data Collection**		
		Source	**Frequency**	**Data Analysis**
Knowledge of ASD	Knowledge of ASD Survey- 13 questions, true/false type (Schwartz & Drager, 2008; Small, 2012)	Participants	2 times (pre- and post-program)	Quantitative
Knowledge of EBPs	Evidence-Based Practices Checklist- first question (Strong, 2014; The National Professional Development Center, n.d.)	Participants	2 times (pre- and post-program)	Quantitative
Frequency of Use of EBPs	Frequency Data sheet	Participants	3 times (pre- and post-program, and 4 weeks after program completion)	Quantitative
Teachers' Level of Self-efficacy	Evidence-Based Practices Checklist, second question (Strong, 2014; The National Professional Development Center, n.d.)	Participants	2 times (pre- and post-program)	Quantitative
	ASSET Survey- 30 question Likert-type survey (Ruble et al., 2011)	Participants	2 times (pre- and post-program)	Quantitative

To address research question three, teachers responded to a pre-program and post-program survey to determine the change in their knowledge of ASD and its' characteristics. To evaluate teacher use of the EBP practices, data collection included frequency data collected by the participants regarding the use of EBPs in their classrooms. Data were collected prior to the

beginning of the combined program, as well as, immediately after program completion, and one month after the program concluded. The frequency of use protocol included recording their frequency of use, at a specific time each day over a span of a week-long period. Research question five examined the change in the participants' level of self-efficacy in working with students with ASD over the course of the combined program.

Method

This section describes the participants, measurements, and the procedure including detailed explanations of the intervention, data collection processes, and the data analysis approaches.

Participants

Participants were recruited from the population of self-contained Exceptional Children's (EC) (Special Education) teachers within Stone Run County Schools. Participants received an email announcement and the Stone Run County Schools' EC professional development calendar. Potential participants were required to meet two inclusion criteria including being an EC teacher currently assigned to a self-contained classroom and having at least one student diagnosed with ASD on their current caseload. Due to these inclusion criteria and the maximum number of self-contained classrooms in Stone Run County Schools, the expected sample was 3-10 teachers. During the recruitment period, four special education teachers volunteered to participate in the combined program. Each of the four participants who attended the introductory session signed a consent form that explained the purpose of the study, participant time requirements, methods for data collection, and the process for protecting, storing, and reporting the data and findings.

The participants included four self-contained special education teachers, three of whom worked in elementary classrooms designed for students with a diagnosis of ASD. The fourth

participant worked in a middle school classroom designed for students with intellectual disabilities, down syndrome, ASD, or other disabilities. Based on the data collected on the Background, Experience, and Demographic survey, teachers reported fewer than 10 years of experience with two teachers in their first year of teaching (see Table 13). Additionally, while all the participants reported earning a Bachelor's degree, none of the participants had earned a Master's degree (see Table 14). The collected result demonstrated that each of the four participants were in the beginning of their teaching careers.

Table 13. Number of Years of Experience of the Participants

Years of Experience	Number of Reporting Teachers
0- 1 years	2
2- 5 years	1
6- 10 years	1
11- 15 years	0
16- 15 years	0
20 + years	0

Table 14. Highest Degree Earned by the Participants

Degree	Number of Reporting Teachers
Bachelor's Degree	3
Some graduate coursework	1
Master's Degree	0
Doctoral Degree	0

The Background, Experience, and Demographic form also collected information about each participants' level of training specific to ASD. One question on the survey focused on the number of credit hours the participants had earned that were dedicated to learning about ASD, while a second question focused on the amount of credit hours earned through professional development focused on ASD. Participants reported very few credits pre-service credit hours

related to ASD (see Table 15). While all but one participant reported some professional development hours focused on students with ASD (see Table 16). Only one participant indicated they had more than 13 hours of professional development specific to ASD. A hand-written comment on the participant's survey explained that all of the hours were earned in a TEACCH week-long training. As with education and experience level, the collected data demonstrated that the four participants had a relatively low level of training specific to ASD and EBPs.

Table 15. Number of Pre-Service Credit Hours Specific to ASD

Number of Credit Hours	Number of Reporting Teachers
0 credit hours	3
1-5 credit hours	1
6-12 credit hours	0
13 + credit hours	0
While I did not receive any credit hours, 1 or more of my class sessions were focused on ASD.	0

Table 16. Number of Professional Development Hours Specific to ASD

Number of PD Hours	Number of Reporting Teachers
0 credit hours	1
1-5 credit hours	1
6-12 credit hours	1
13 + credit hours	1
While I did not receive any credit hours, part of my PD session was focused on ASD	0

Instrumentation and Measures

For this study, both qualitative and quantitative measures were used to examine the process and intervention outcomes. The qualitative measures examined the process elements of

fidelity of implementation and participant experience. Data were collected by comparing intended professional development topics to the actual information received, anecdotal notes collected during classroom observations, and semi-structured interviews with participants. The quantitative measures examined process and outcome elements including participant attendance, module completion, knowledge of ASD, knowledge and comfort level with using EBPs, and teacher self-efficacy. Several individual pretest-posttest surveys were used to measure each of the concepts previously mentioned. In addition, a short survey containing quantitative demographic and educational experience questions were given as part of the pre-test survey. Finally, both qualitative and quantitative methods were used to examine the elements of dose (delivered), dose (received), and fidelity of implementation, including anecdotal notes taken during face-to-face sessions, anecdotal notes taken during coaching session observations, and online module completion certificates.

Qualitative measures. The qualitative measures examined the dose received and participant experience and the student investigator took anecdotal notes during the classroom observations as part of the coaching logs. The notes gave a fuller picture of the fidelity of implementation of the learned EBPs.

To measure dose delivered, the outside observer used copies of each power point presentation to determine whether presenter covered all the intended information. The observer was a member of Stone Run County Schools' Exceptional Children's Department, who had previously been an EC teacher and currently help the role of Program Specialist. During each of the four professional development sessions the observer had a copy of the PowerPoint program including the agenda, and recorded anecdotal notes about topics covered, questions asked, and if

any agenda items were not discussed. In addition, the observer recorded if any participant left the professional development session early and the time they left.

Semi-structured interviews were completed at the end of the intervention. The interviews were based on a set of thirteen initial questions about the overall experience of the intervention program and its influence on the classroom. Additionally, the student investigator asked unplanned questions based on the participant responses. The interviews were recorded and transcribed.

Quantitative measures. The quantitative measures examined both the process and the outcomes of the combined program. The quantitative measures investigated the dose received, reach, dose delivered, and fidelity of implementation as well as the participants' knowledge of ASD, their use of EBPs in the classroom setting, and their levels of self-efficacy.

Process evaluation included participant attendance and completion of each intervention element. Consequently, data collection included attendance sheets, a record of completion of online certificates, and coaching logs. Participants signed in at the beginning of each professional development session. If a participant did not attend the entire session, the outside observer noted the discrepancy on the attendance sheet. The attendance sheets measured if each participant received the entire amount of professional development given. For the online portion of the intervention, participants received a completion certificate for each online module completed and these were not issued until the participant had completed each section of the entire module including a pre-and post-module assessment of the specific EBP. For the online portion of the intervention, participants received a completion certificate for each online module completed and these were not issued until the participant had completed each section of the entire module including a pre-and post-module assessment of the specific EBP. In addition, the

student investigator completed the National Professional Development Center Coaching Logs (n.d.) (see Appendix O) during each coaching session. Along with a record of each individual's participation in each coaching session, the logs included anecdotal notes taken during classroom observation, areas of focus, and discussion notes.

As part of the coaching sessions, the student investigator completed the coaching logs and an implementation checklist during the observation section of the session (see Appendix P). These forms were created by the National Professional Development Center (n.d.) to evaluate the implementation each EBP, including discrete trail training and visual supports. The checklist asked an observer to indicate whether a list of essential elements has been seen. The checklist is comprised of statements that focus on how the EBP was planned, used, and progress monitored in the classroom setting. The coaching log section of the forms also included a section for anecdotal notes and areas of focus. The student researcher used the forms during each coaching session, twice for discrete trial training and twice for visual supports. In addition, an outside observer visited each participants' classroom one time prior to the intervention, one time at the end of the intervention, and again, six weeks after the intervention. During each visit the outside observer completed both the discrete trial training and the visual supports implementation checklists.

Participants completed The Frequency of Use form (see Appendix Q) to report the number of times they used each EBP over the period of an hour across multiple occasions. Teachers recorded their frequency levels using tally marks in the appropriate box and submitted the form at the end of the week to the student researcher. Teachers completed the form prior to the intervention, at the end of the intervention, and again, six weeks after the intervention. Using a google reminder sent to the participants' email account, the student investigator reminded the

participant to record frequency data on the use of specific EBPs, three times a day, across a five-day period.

The participant data were collected from six questions included in the pre-program surveys (see Appendix L). The questions focused on the participants' role in the school district and the type of classroom in which they worked, their years of experience, their highest level of education, and whether they had received training specific to ASD during pre-service education or as part of any professional development.

The participants' knowledge of ASD was examined through the use of the Knowledge of ASD survey (Schwartz & Drager, 2008; Small, 2012). This survey was modified from the Schwartz and Drager (2008) survey used to investigate knowledge of autism in speech language pathology. The original survey contained 52 Likert-type items designed to evaluate a respondents' background information, clinical and educational training, knowledge of the characteristics of autism, and competency in developing goals for students' autism. A modified version of the survey developed by Small (2012) served as the instrument for this study work (see Appendix L). The modified version contained thirteen questions with a true or false design. In addition, the term autism was changed to ASD as that was the terminology used throughout the work. The survey questions focused on characteristics, diagnostic criteria, and myths regarding ASD. The student investigator obtained permission from Drs. Small and Drager, as well as the American Speech-Language-Hearing Association to adapt and use the survey.

To examine the participants' familiarity and efficacy with each of the 27 EBPs, this study relied on the National Professional Development Center (n.d.) checklist which represented a modified version of Strong's (2014) checklist (see Appendix M). The Likert-type checklist collected data on two separate questions for each of the 27 EBPs using a three-scale range, "not

familiar/comfortable", "somewhat familiar/comfortable", or "very familiar/comfortable." The first question asked the participants to evaluate their perceived knowledge of each EBP, by asking their level of familiarity with the individual EBP. The second question asked the participants to evaluate their perceived comfort level with implementing the individual EBP in their classroom setting. The checklist was given both pre-program and post-program, and data were evaluated for participant changes in perceived knowledge and comfort levels with EBP. The student investigator obtained permission from Dr. Strong (see Appendix P) to use the modified version of the checklist.

While research demonstrated that significant changes in self-efficacy tend to take longer, several studies demonstrated that positive changes in knowledge and skill building were connected to positives changes in self-efficacy (Bruce & Ross, 2008; Jennett et al., 2003; Ross, 1994). To examine self-efficacy among the participants in this study the Autism Self-Efficacy Scale for Teachers or ASSET, (see Appendix F) was used (Ruble et al., 2011). The ASSET was a 30-item survey focused on teacher self-efficacy in working with students diagnosed with autism spectrum disorder. It relied on a 0-100 Likert-type scale (Ruble et al., 2011). The ASSET tool had a high level of internal consistency with a .98 Cronbach's alpha (Corona et al., 2017). The ASSET had not been widely used beyond the work of Ruble et al. (2011) and Corona et al. (2017), so the reliability of this survey has yet to be fully investigated. Additionally, it is important to note that the length of the combined program was likely to reduce the likelihood of observing change in self-efficacy during and immediately following this intervention.

Finally, a social validity survey (see Appendix N) was developed to measure the process evaluation aspect of participant experience. In addition, data collected from the survey was used

to develop or adapt questions on the semi-structured interview protocol for each participant. Questions included ten Likert-type statements based on a 6-point scale ranging from strongly disagree to strongly agree, in addition four open-ended questions were included. Questions and statements were based on the social validity survey developed by Lane et al. (2002). The statements focused on the participants' beliefs about whether the combined program was beneficial to their instruction or their students, if they felt the combined program met the needs of their students, and if they used the practices learned in the combined program in their classrooms. Open-ended questions asked about components that were perceived as beneficial, the impact of the program on the participants' daily instruction, and improvements that could be made.

Combined Program Resources

The combined program blended a series of face-to-face sessions, online modules, and coaching sessions which were intended to increase teacher knowledge and use of EBPs in the classroom setting, as well as the teacher self-efficacy in working with students diagnosed with ASD. The student investigator gathers the combined program resources by examining the collected literature. The next section reviews each resource individually and explains its role in the combined program.

Professional development PowerPoint presentations. A PowerPoint presentation was developed by the researcher for each of the four face-to-face professional development sessions. The presentations included information on ASD including characteristics, diagnostic criteria, an introduction to the EBPs, information on discrete trial training, information on visual supports, and case study information. The presentations were used as a guide during each session.

AFIRM modules. The AFIRM modules were online modules developed by the National Autism Center on Autism Spectrum Disorders at the Franklin Port Graham Center of the University of North Carolina. Each module was a 2-3 hour long asynchronous learning session that was designed to instruct teachers on the use of specific EBPs. Each module followed a similar process of introduction, the procedure for planning, using the EBP in the classroom context, and how to monitor the EBP. Each module contained a pre- and post-assessment.

AFRIM module resource tools. The tools were developed by The National Professional Development Center (n.d.). The AFIRM module resource tools contained documents used to plan, implement, and monitor each EBP. The resources included lesson planning forms, data collection forms, information for teachers and parents, and a list of journal articles that supported the practice.

Procedure

Participant Recruitment

Participants were recruited from the population of self-contained Exceptional Children's (EC) (Special Education) teachers within Stone Run County Schools. Initially an introductory email announcement was sent from the Exceptional Children's Department. The intervention information was placed on the Exceptional Children's Department's professional development calendar. An additional information email was sent by the Exceptional Children's Director to teachers enrolled in Stone Run County Schools' beginning teacher program. This program targeted beginning teachers in their first, second, or third year of teaching. The letter described the intervention program and explained that participation in the intervention program would meet the professional development requirements in the area of special education for the beginning

teacher program. An additional email announcement was sent one week prior to the first professional development session.

Combined Program

The combined professional development activities and outcomes are outlined in the logic model in Appendix I. The intervention procedures followed the Combined Program Sequence of Activities diagram found in Figure 3. Descriptions of each activity are discussed in the order they occurred throughout the combined program.

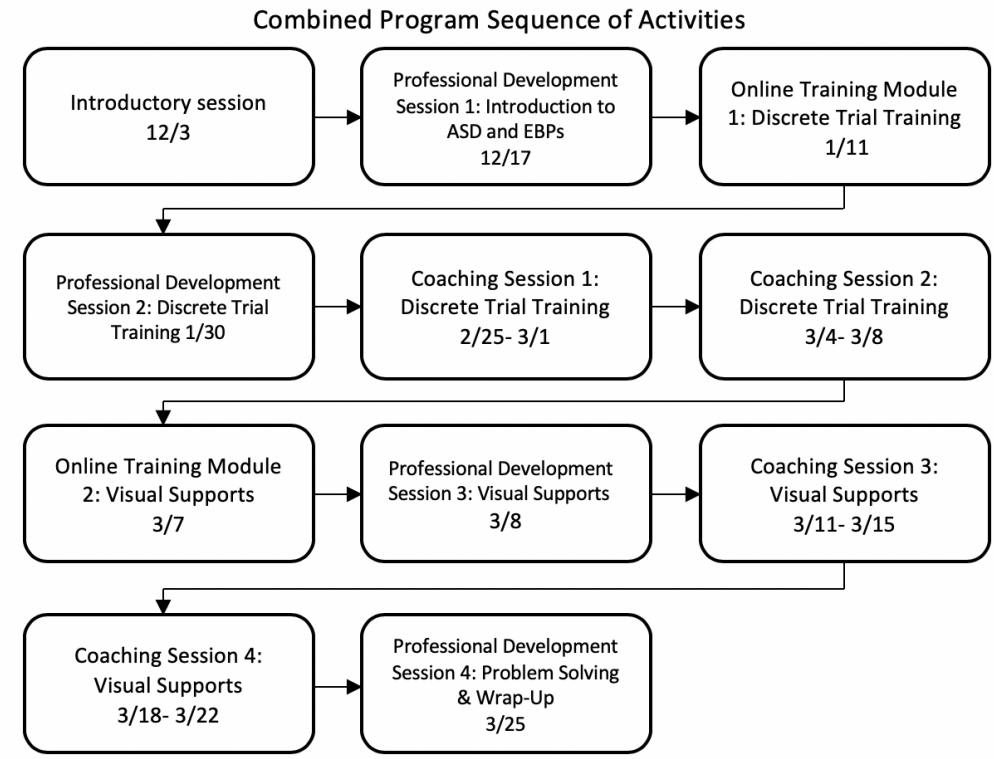

Figure 3. Combined Program Sequence of Activities. The following figure demonstrates the sequence of intervention activities included within the combined program.

Introductory session and data collection.

The one-hour long session included a PowerPoint presentation to review the time requirements, activities, and expectations of the intervention, followed by a review of the consent form. Participants were given time to sign the consent form and then asked to complete the pre-

program survey, including the background, experience, and demographic sections, Knowledge of ASD (Schwartz & Drager, 2008; Small, 2012), the Evidence-Based Practice Checklist (Strong, 2014; The National Professional Development Center, n.d.), and the ASSET (Ruble et al., 2011) sections of the survey. In addition, the outside observer toke anecdotal notes throughout the session which focused on the topics covered.

Prior to the beginning of the intervention, participants self-reported their use of discrete trial training and visual supports on a frequency data sheet. To guide the participants in collecting accurate data participants were reminded, through google calendar to record the frequency of use for each EBP. Each time the reminder sounded the participants recorded how many times they had used each EBP in the past hour. The participants were asked to collect the data three times a day, across a five-day period.

The outside observer visited each participants' classroom during the same week that frequency data was being self-reported. The observer used the implementation checklist form to determine if the EBPs were being used in the classroom (see Appendix P). The observer data was used to confirm each participants' self-reported frequency data.

Initial session.

The first one-and-a- half hour face-to-face session focused on reviewing the characteristics of ASD, the ways these characteristics may manifest in the classroom, and an introduction to the 27 EBPs developed for students diagnosed with ASD. The session was facilitated by the student investigator, who created a PowerPoint presentation designed for specifically for the session using the core literature collected through the dissertation process. The session focused on the definition of ASD and the characteristics of ASD (APA, 2013; IRIS Center, 2014). Additionally, the group examined how these characteristics might impact the

classroom (APA, 2013; IRIS Center, 2014). The group discussed the impact of ASD on education across the U.S. focusing on the rise of prevalence rates, current comorbidity rates, and the overall costs of ASD in the U.S. From there, the presentation focused on introducing the participants to the EBPs designed for students diagnosed with ASD (National Autism Center, 2015; Wong et al., 2015). The presentation focused on the definition of an EBP, the importance of using EBPs in the classroom including discussions on the effectiveness and the laws that mandate their use (National Autism Center, 2015; Wong et al., 2015). Finally, the group wrapped up the session by reflecting on their learning about the characteristics, their impact on the classroom, and the EBPs. At the end of the session, the student investigator guided the participants through the registration process for the AFIRM online modules (Sam & AFIRM Team, 2016).

Discrete trial training sessions.

In the next phase, the participants completed the discrete trial training (DTT) module independently. The modules were developed by the National Professional Development Center on Autism Spectrum Disorder (Sam & AFIRM Team, 2016). The DTT module, as with the other modules accessible through AFIRM is offered free of charge (Sam & AFIRM Team, 2016). The DTT module is comprised of five sections for a total of 125 minutes of instruction (see Table 17). Each section uses a series of videos, activities, and examples to instruct the user in the use of DTT and check for understanding. Additionally, the module contains a pre- and post-assessment which is used to demonstrate comprehension of the learned material. Each participant had to earn a score of 70 or higher to meet the completion criteria of the module. After each participant completed the module, they submitted the completion certificate to the

student investigator. A reminder notice was sent out one week after session one and again one week prior to the module due date.

Table 17. An Overview of the DTT Module

Section Title	**Estimated Time for Completion**
A Case for DTT	10 minutes
Lesson 1: The Basics of DTT	20 minutes
Lesson 2: Planning for DTT	20 minutes
Lesson 3: Using DTT	45 minutes
Lesson 4: Monitoring DTT	20 minutes
Applying DTT	10 minutes

Adapted from the work of Sam and AFIRM team (2016).

The second one-hour and a half long session was held after each participant completed the DTT online module. The student investigator led the session which focused on the use of DTT and planning a lesson using DTT. The session began with a brief review of the EBPs, which led into the discussion of what DTT was and how to use it in the classroom setting (Sam & AFIRM Team, 2016). The student investigator reviewed the core components of DTT, including presenting the stimulus, observing the student for their response, and delivering the feedback. The group reviewed a pre-created case study in small groups and discussed how the use of DTT would be beneficial for the subject (Sam & AFIRM, 2016). In addition, the participants determined how they would implement DTT in a similar situation, using the resource pages developed by the National Professional Development Center (Sam & AFIRM, 2016). At the end of the session, the student investigator reviewed the scheduling and procedures for the instructional coaching sessions. Participants were asked to determine which

student or students were working on skills that might be taught using DTT. The student investigator arranged with each participant to come observe while the participant was teaching a DTT lesson.

The initial coaching session was 1-hour long which was divided into 30-minute intervals. First the student investigator observed the participant in the classroom setting. The second interval the participant and the student investigator met and discussed the initial observation, use of the EBP, and any concerns of the participant. The participant and student investigator collaborated on planning a lesson using discrete trial training.

As before, the second coaching session lasted for 30 minutes and was divided into 30-minute intervals. As in the first session procedures, the student investigator observed the participant in the classroom setting. The second interval the participant and the student investigator met and discussed the initial observation, use of the EBP, and any concerns of the participant. The participant and student investigator worked together to solve the participants concerns. The student investigator assigned the next module, visual supports and provided a due date for the module.

Visual supports sessions.

The participants completed the visual supports (VS) module independently. As with the previous module, the VS module was developed by the National Professional Development Center on Autism Spectrum Disorder and is offered free of charge to those who register for an account (Sam & AFIRM Team, 2015). The VS module was contained five parts which totaled 115 minutes of instruction time (see Table 18). Each part uses of the VS module instructs the learner using videos, activities, and examples of VS in practice. Similarly, to the DTT module, the VS module contains a pre- and post-assessment which is used to evaluate the understanding

of the learner. To meet the module's completion criteria, each participant needed to earn a score of 70 or higher on the post-assessment. Each participant submitted a copy of their completion certificate to the student investigator once they had finished the VS module. The student investigator sent out a reminder notice one week after session one and again one week prior to the module due date.

Table 18. An Overview of the VS Module

Section Title	**Estimated Time for Completion**
A Case for VS	10 minutes
Lesson 1: the Basics of VS	20 minutes
Lesson 2: Planning for VS	25 minutes
Lesson 3: Using VS	25 minutes
Lesson 4: Monitoring VS	25 minutes
Applying VS	10 minutes

Adapted from the work of Sam and AFIRM team (2015).

The one-and-a-half hour long face-to-face session focused on reviewing VS, including the definition of VS, the types of VS that are used in the classroom, and the types of skills or behaviors that VS can support. At the beginning of the session, student investigator reviewed the definition of VS. The group reviewed examples of VS and how it was used in the classroom setting (Sam & AFIRM Team, 2015). The participants, in small groups, then used a case study to practice analyzing and developing VS based on the needs of a particular student (Sam & AFIRM Team, 2015). The participants reviewed examples of pre-made VS available to the public (Indiana University Bloomington, n.d.). Additionally, the participant used the documents contained in AFIRM resource tools (The National Development Center, n.d.) to develop a lesson

plan the incorporated VS for their classroom. Finally, the participants had a chance to ask questions and discuss any concerns they had with implementing VS in their classrooms.

The third coaching session was 1-hour long, which was divided into 30-minute intervals. First the student investigator observed the participant in the classroom setting. The second interval the participant and the student investigator met and discussed the initial observation, use of the EBP, and any concerns of the participant. The participant and student investigator collaborated on planning a lesson using Visual Supports.

The final coaching session was divided into 30-minute intervals. As in the first session procedures, the student investigator observed the participant in the classroom setting. The second interval the participant and the student investigator met and discussed the initial observation, use of the EBP, and any concerns of the participant. The participant and student investigator worked together to solve the participants concerns.

Combined program wrap up.

The final professional development session was guided by a PowerPoint presentation. The session focused on problem-solving including discussion on problems the participants have encountered as they have incorporated the EBPs in their classroom. The participants would collaborate on solving their problems in small groups. Additionally, a case study with several difficulties built-in would be presented. The participants collaborated in small groups on how to solve the issues within the case studies. Participants would share how they plan to use the newly learned EBPs during the remainder of the year. During the final half-hour of the session, the participants completed the post-program surveys including the Knowledge of ASD (Schwartz & Drager, 2008; Small, 2012), the Evidence-Based Practice Checklist (Strong, 2014), and the

ASSET (Ruble et al., 2011) sections of the post-program survey. Additionally, the participants completed the social validity survey.

Similarly, to the beginning of the combined program, the participants self-reported their use of discrete trial training and visual supports on a frequency data sheet. To guide the participants in collecting accurate data participants were reminded, through google calendar to record the frequency of use for each EBP. Each time the reminder sounded the participants recorded how many times they had used each EBP in the past hour. The participants were asked to collect the data three times a day, across a five-day period.

The outside observer visited each participants' classroom during the same week that frequency data was being self-reported. The observer used the implementation checklist form to determine if the EBPs were being used in the classroom. The Observer data was used to confirm each participants' self-reported frequency data.

Semi-structured interviews were completed at the end of the intervention, over a several week period. The student investigator used a thirteen-question protocol to guide the interview which examined the participant's experiences within the combined program. Based on the responses the student investigator asked unplanned individualized follow-up questions. The interviews were completed with each participant individually. The interviews were recorded and transcribed. Data were compared to the data collected through the social validity survey.

Maintenance data collection.

Similarly, to the beginning and end of the combined program, the participants self-reported their use of discrete trial training and visual supports on a frequency data sheet one month after the completion of the combined program. To guide the participants in collecting accurate data participants were reminded, through google calendar to record the frequency of use

for each EBP. Each time the reminder sounded the participants recorded how many times they had used each EBP in the past hour. The participants were asked to collect the data three times a day, across a five-day period.

The outside observer visited each participants' classroom during the same week that frequency data was being self-reported. The observer used the implementation checklist form to determine if the EBPs were being used in the classroom. The Observer data was used to confirm each participants' self-reported frequency data.

Data Collection

Process Evaluation

To evaluate the process of implementation, data were collected from multiple sources. The student investigator took attendance using the Attendance Sheet at each of the four professional development sessions. The Attendance Sheet was designed to measure both dose delivered and dose received. Attendance was recorded at the beginning of the session and the observer took note of any early departures at the conclusion. Data measuring dose delivered and received was collected using the Online Modules Completion Certificates and the Coaching Logs. Participants submitted the Online Modules Completion Certificates to the student investigator via Stone Run County Schools' courier or email, at the completion of each online module. The coaching logs were completed by both the student investigator and the participant. Finally, semi-structured interviews were conducted with each participant after the completion of the combined program.

Outcome Evaluation

To determine if the teachers' increased their level of knowledge about ASD, the participants completed the Knowledge of ASD survey section during the pre-program session

and the combined program wrap-up session. Additionally, data focused on the participants' knowledge and comfort level with EBPs, was collected using the EBPs Inventory, during the pre-program session and the combined program wrap-up session. To confirm, the change in the frequency of EBPs, the participants' recorded their use of discrete trial training and visual supports in the classroom context. The data were recorded three times each, across a five-day period using reminders from Google Calendar. The frequency of use data were collected during the pre-program session, after the final wrap-up session and in the beginning of May 2019 as a maintenance measure. An outside observer was used to confirm the use of EBPs in the classrooms of the participants. The observer collected data using the implementation checklist during several visits to each of the participants' classrooms. Each visit occurred during the same weeks as the participants were self-reporting their frequency of use data. The observer was a program special within the special education department of Stone Run County Schools. The observers' job within the school district involved regular visits to all self-contained classes who serve students with ASD, which allowed for less disruption during classroom visits. The pre-program and post-program sessions data were collected on knowledge, use/familiarity, and self-efficacy. All three sections of the survey were combined with the Background, Experience, and Demographic Information which was only given during the pre-session. All data were analyzed using descriptive statistics of frequency and central tendency.

Data Analysis

This section describes the how the student investigator managed and analyzed the data collected during the combined program. This section includes detailed descriptions of how data were stored, reviewed, and examined.

Data Management

All data for the intervention was handled and stored in a secure manner. Surveys were completed on paper and submitted. Interview data were recorded and transcribed using the software program InqScribe (Inquirium, 2015). All electronic data were kept on a password-protected laptop or web-based account. All paper, audio, and non-electric copies of the data were kept in secure location. Prior to analysis all student identifiers were removed from both paper and electronic data.

Data Analysis

The research questions guided the data analyzation process. The data were analyzed based on the type, either quantitative or qualitative. The data analyzation plan was outlined in the Summary Matrix (see Appendix J).

The qualitative data included the coaching, observation logs, and the semi-structured interview transcripts. Prior to the analyzation process, qualitative data were transcribed. All participant identifiers were removed. The student investigator transcribed interview data and reviewed the transcription twice for accuracy before analysis. In addition, all interview transcripts were member checked by sending copies of the original transcript of each interview to the individual participant for review. The student investigator examined the data for predetermined codes including EBP, discrete trial training, visual supports, increase, improve, change, issue, problem, plan (planning), confidence, comfort, and difference by hand using a color-coded system. The transcript data were reviewed several times, which allowed the student investigator to code and recode, as well as categorize the data based on the predetermined codes (Miles, Huberman, & Saldaña, 2014; Saldaña, 2015). After completion, data were examined twice for emergent codes. Several codes emerged from the data including schedules, problem-

solving, and better understanding. Then student investigator analyzed the coded data for patterns including changes in practice, access to EBPs, and the participants future plans for the use of EBPs in their classrooms.

The quantitative data included the entire pre-program and post-program survey, the attendance logs, the certificates of completion, and the overall program survey. Survey data was analyzed using descriptive statistics focusing on frequency and central tendency. The student investigator examined the quantitative frequency of use data by comparing pre-program data to post-program data to maintenance data.

The qualitative and quantitative data were examined together to gather a clearer picture of the overall combined program. As part of the examination, the student investigator compared the qualitative data collected from the semi-structured interviews to the data collected in the social validity survey.

Chapter 5

Findings and Discussion

Following a review of the research questions, this chapter discusses the process of implementation and the findings from the combined program. In addition, this chapter identifies the limitations of the combined program and the opportunities for future research and applications of the combined program.

The following research questions guided the investigation of the combined program through the lens of process and outcome evaluations:

- To what extent was the combined program, including professional development, online modules and instructional coaching, implemented with fidelity including dose, reach, and adherence?
- What was the participants' experience in the combined program?
- To what extent did the combined program increase teacher knowledge of ASD and EBPs?
- To what extent did the combined program increase the frequency of use of EBPs in the classroom setting?
- To what extent did the combined program increase teacher self-efficacy levels regarding working with students with ASD?

The Process of Implementation

The study took place from December through March of the 2018-2019 school year. Participants included four special education teachers (N=4) who taught self-contained classes. Three of the teachers worked in elementary classrooms designed for students with ASD, while one teacher worked in a middle school self-contained class made up of students with a variety of

disabilities including several students with an ASD diagnosis. The following discusses the process of implementation in terms of components of the program in sequence (see Figure 3).

Face-to Face Sessions

Based on the sign-in forms completed at the beginning of the introductory session all for participants attended the one-hour long introductory session. The anecdotal notes taken by the outside observer, demonstrated that the student investigator gave a detailed overview of the professional development program. The observer noted that the participants had a chance to ask questions about the program. At the end of the session the anecdotal notes showed that the participants were free to leave while anyone interested in becoming a participant reviewed and signed the consent for participation if they agreed to commit to the combined program. Finally, each of the participants completed the pre-program surveys.

The attendance sign-in sheets confirmed that all of the participants attended each of the one and a half-hour long instructional face-to-face sessions in their entirety. The anecdotal notes collected by the outside observer demonstrated that each of the face-to-face sessions covered the planned topics in their entirety including the characteristics of ASD, the detailed procedures for DTT and VS, as well as chances to discuss the procedures, and discuss any classroom implementation issues. In addition, at the final wrap-up session each participant completed the post-program surveys and the social validity survey.

Online Professional Development Modules

Each of the teachers fully completed the AFIRM DTT and VS online modules as measured by their completion certificates (Sam & AFIRM Team, 2016). The completion certificates confirmed that each participant engaged in the modules by viewing the videos, finishing each activity, and passing the post-assessment with a score of 70 or higher. All of the

completion certificates for both the DTT and VS modules were submitted to the student investigator by the individual participants.

The Coaching Sessions

The data collected from the coaching logs confirms that during each of the eight individual coaching sessions the student investigator observed all of the participants teaching using either DTT or VS. Anecdotal notes indicated that each participant developed by lessons using DTT or VS which focused on the individual academic needs of each student. As a result, lessons were not centered around consistent topics or subjects. Furthermore, the participants usually worked with several different students, which were not consistent from session to session. However, the coaching procedures were similar throughout the program. Each session contained a 30-minute observation section followed by the participant and the student investigator meeting to discuss the observation, the EBP processes, as well as reviewing the planning process, discussing the use data collection, and working through any issues the participant might be having related to the use of DTT or VS.

Findings

The study was based on the conceptual framework developed by Desimone (2009) which suggests that the use of professional development that includes content focus, active learning, coherence, duration, and collective participation leads to increased teacher knowledge, skills, and beliefs, and in turn has the potential to change the teacher's instruction which may eventually improve the learning of students with ASD (p.185). The research questions investigated the process of implementation as well as the changes in participant knowledge, classroom instruction, and self-efficacy (see Table 12). The section that follows describes the findings of research questions one through five.

Examining the Data for the Elements of Process Evaluation

The first research question focused on determining to what extent reach, dose, and adherence were implemented with fidelity (Dusenbury et al., 2003; Linnan & Steckler, 2002). To investigate these elements the student investigator focused on whether the participants received the program as planned, if the participants actively participated in the program, and whether the program adhered to the proposed plan. Data were collected through attendance logs, observer notes, coaching logs, completion certificates (see Table 11). Each component of the data was analyzed to determine the extent that the elements of process evaluation were met. The following findings focus on each element individually.

Dose delivered, or the amount of sessions and modules prescribed for the participants, was assessed by reviewing professional development presentation notes taken by the observer, analyzing the percentage of modules that were completed, and examining the coaching notes taken by the student investigator demonstrating the topics covered. According to the notes taken by the outside observer, each of the pre-planned topics were covered in full for each of the four face-to-face sessions. The notes taken by the outside observer indicated that during face-to-face sessions participants worked in groups to analyze case studies. The participants planned lessons with the guidance of the student investigator and had chances to discuss any issues they were having with implementing DTT or VS in the classroom, as described in the anecdotal notes. In addition, the notes confirmed that none of the participants left early during any of the sessions. All of the participants completed the online modules for both DTT and VS, as measured by the submission of 100% of the discrete trial training and visual supports completion certificates. The student investigator also reviewed the anecdotal notes taken as part of the coaching logs during each individual coaching session and determined that each coaching session had covered the

planned material. By triangulating each piece of the qualitative data, the student researcher determined that the criteria for dose delivered had been met for the combined program.

Dose received, or the extent to which a participant was engaged in the combined program was evaluated by coaching logs including the implementation checklists, and notes on the observations and discussions. The data collected within the coaching logs established that each of the participants were actively involved in each of the coaching sessions, by creating and implementing DTT lessons including the core components of DTT, by developing and using VS within the classroom, collecting data on, implementing recommendations, and engaging in discussions with the student investigator. The data collected by the outside observer using the implementation checklists supported the data collected in the coaching logs. The implementation checklist data demonstrated improvement between the pre-program and post-program collection periods in the areas of planning, delivering DTT instruction, and monitoring instruction for 100% of the participants. During final collection period, four weeks after the combined program was completed, the data demonstrated that 100% of the participants were continuing to use DTT in their classrooms. Similarly, 100% of the participants grew in the areas of planning for VS, using VS, and monitoring VS from the beginning to the end of the combined program. However, while the outside observer noted that 100% continued to use previously seen VS in their classrooms, no new VS were observed during the final collection period.

The following descriptions detail how each teacher participated within the coaching sessions, as recorded in the coaching logs and implementation checklists completed by the student investigator.

Participant A1.

Participant A1 was actively engaged throughout each of the coaching sessions, as indicated throughout coaching logs. During the first two coaching sessions, focused on DTT, the participant incorporated DTT as part of several differing lessons using topics of community helpers, identifying coins, recognizing and reading sight words, and identifying numbers by numeral representation and quantity for several different students. Each participants' lesson included the consistent use of the core elements of DTT including stimulus delivery, interpretation of the students' behavior, and the participants responding with the reinforcer or corrective feedback when appropriate, as outlined in the implementation checklists. During the feedback and discussion portion of the sessions, participant A1 was involved in the conversations, asking for recommendations, ways to refine the data collection process, and ways to help the students generalize the skills they learned during DTT lessons. In addition, the implementation checklists indicated the participant consistently collected data about their students' success during the lessons.

The third coaching session, focused on the participant's use of VS. While the coaching logs noted the use of VS, through the use of visual schedules, a visual timer, and visual boundaries, it was also noted that the students needed assistance to follow their visual schedules and several students moved between areas during instruction time. During the discussion part of the coaching session, the participant discussed using VS in the classroom. The participant mentioned that they use schedules and boundaries daily, "…but the students don't always stay where they are supposed to...". The student investigator guided the participant in filling out the VS Pre-Assessment for Learner developed by the Sam and AFIRM Team (2015) to determine what implementation changes might increase the students' use of visual boundaries. As a result

of using the VS Pre-Assessment for Learner, the student investigator encouraged the participant to spend some time actively teaching the students where to be during each allotted time in their schedule (Sam & AFIRM Team, 2015). Additionally, the student investigator recommended using a system of reinforcement and corrective feedback when expecting students to abide by the visual boundaries (Sam & AFIRM Team, 2015). The participant was encouraged to incorporate the use of visual schedules when teaching students to follow visual boundaries, so students have an extra reminder of where they were supposed to be. In the last coaching session, the students were working in academic and independent small group rotations. Furthermore, the student investigator observed both the teacher and the TA teaching the students how to follow the visual boundaries using verbal and using tangible reinforcement along with corrective feedback in four different instances. During the feedback and discussion section the participant explained that her plans included explicitly teaching the student how to use visual boundaries and visual schedules. When asked how she was teaching them, she explained that "[we] spend 15-20 minutes each morning where we use our visual schedules just to go to independent centers for 5-6 minutes and we talk our way through it, using the timer, reinforcement, and feedback. Then during the rest of our schedules each day, we continue using the reinforcement and feedback". The student investigator noticed that most of the students stayed in their assigned areas as based on their visual schedules, in comparison to the previous observation. During the discussion, the participant noted that she felt the students were understanding the visual schedules and boundaries but had not worked out a data collection system to support her thoughts. The student investigator encouraged her to continue focus teaching and using the VS each day and assisted her in developing a data system to monitor her students use of their schedule.

Participant B2.

The coaching logs noted consistent engagement by participant B2 in all of the coaching sessions. During the first DTT session, Participant B2 indicated their uncertainty at how to use DTT with their students. As a result, the participant and student investigator used the planning resources to build a DTT lesson designed to teach new vocabulary words to the students. In the second coaching session, which also focused on DTT, the participant used the EBP to teach word identification and pronunciation. The participant demonstrated use of the stimulus, observing the student's response, and administering the reinforcement and feedback throughout both lessons. The participant used the pre-design data collection sheets, from the AFIRM module, to record how each student responded to each trial. During the feedback and discussion section the participant and student investigator discussed using DTT for math facts, word recognition, matching words to their corresponding pictures.

The third and fourth coaching sessions focused on the use of VS. The student investigator observed the use of a visual class schedule and two different individual visual cues already in place. The participant regularly pointed to the class schedule with the students when transitioning to different work rotations. Additionally, one student had a visual cue on his desk that read "I need help" and had a corresponding BoardMaker picture. BoardMaker is a software program allows users to create picture cards the use a standardized set of pictures matched to words in the English language (Mayer-Johnson, Inc., 2002). The EC teachers in the Stone Run County Schools had access to the BoardMaker software through their assigned Speech/Language Therapist. At one point during the 30 minute observation, the student took the help card off his desk and brought it to the teacher assistant indicating that he needed help. In addition, another student had a consequence reminder card on his desk that consisted of four 2-inch square boxes

in a horizontal row with the reminders Strike 1, Strike 2, Strike 3, No Computer, written on it. During the feedback and discussion section the teacher explained that if the student earned a strike on the classroom behavior system, the teacher would add a strike card. If the student earned three strikes, then the teacher would place the no computer card on the visual cue to remind them that they would not receive computer during free time. In addition, the participant discussed the idea of using a visual cue with another student, of a walk card, that could be carried in the hallway as a reminder to walk rather than run. The student investigator recommended taking several walks during the first week or two of use to teach the student how to respond to the card. During the final coaching session, the student investigator observed the participant using the consequence reminder VS when a student was poking the student in front of them. The participant came over to the student, reminded them to keep their hands to themselves, showed them the strike card, told them that he now had a strike, and had them place the strike card on the VS attached to their desk. In the feedback and discussion section of the session, the participant mentioned that they had started using the walk card that was discussed in the previous section. When asked how it had been implemented, the participant stated that it took a couple of days to get a walk card made, since teachers do not have direct access to the BoardMaker software (Mayer-Johnson, Inc., 2002). As a result, the participant had to wait several days until a Speech/Language Therapist made symbol card. On the first two days they used the card, the student and the participant went on a teaching walk three times a day, where they practiced using the card and practiced walking. After the first two days, they started taking a practice walk every morning, and then using the card any time they were in the hallway. The participant mentioned that by that point the student had only practiced the skill with the participant, but they were planning on having the teaching assistants' practice with the student as well. The student

investigator suggested continuing with these ideas, and to consider adding another staff member or two, as well as a peer to assist the process of generalizing the use of the VS.

Participant C3.

Participant C3 was actively involved in both the observation and discussion sections of each of the coaching sessions. During the first session the participant demonstrated the ability to administer the stimulus and look for the student's response, the feedback given to the student was not always immediate, which gave inconsistent signals to the student. During the feedback and discussion section, the participant and the student investigator discussed ways to improve the use of DTT, making sure to reduce each task into a specific single step and to provide immediate feedback to the learner, including reinforcement, prompting, or corrective feedback (Sam & AFRIM Team, 2016). Additionally, the participant and the student investigator developed a system to collect data for the lesson. In the second coaching session, the student investigator observed the participant getting the attention of the learner, allowing the learner to choose the reinforcer they were working towards, providing the stimulus and immediate feedback in a DTT lesson on word recognition. In a different lesson, with another student the participant used DTT to teach shape recognition. Similarly, to the previous lesson each of the core components of DTT were used consistently. During the feedback and discussion section the participant discussed difficulty in gaining the attention of a specific student. The student investigator encouraged the participant to review the reinforcers or allow the student to choose his/her own reinforcer at the beginning of each session.

During the third coaching session, which focused on VS, the student investigator saw the participant used a color-coded visual schedule system. The visual schedule system included an individual color background for each student that matched their visual boundaries in the group

area and the waiting area by their schedule. Additionally, each academic and independent area on the schedule was color-coded to assist students in understanding what area to go to next. The classroom was set-up using shelving, furniture and rugs for use as visual boundaries to separate the teacher, academic, independent, and snack areas. During the feedback and discussion section the participant noted that "The previous teacher had set-up the visual schedules and left them". She further explained that she used a similar system to create schedules for new students by using the schedules of students' who had transitioned to different schools. During the discussion, participant C3 explained that while the color-coding seemed to make sense in the beginning of the year, she felt like the system made much more sense now that she had learned about VS and had used the VS Pre-Assessment for Learner tool (Sam & AFIRM Team, 2015). All of the students seemed to understand how to use the visual schedules to transition between activities, which they demonstrated throughout the observation. The participant also mentioned the one student was having difficulty facing the toward the teacher when working at one of the teacher stations. The student investigator described how using a VS cue of placing a picture of pair of feet down on the floor, in front of where the student would sit, might help them understand which way to sit down. The student investigator reminded the participant, to spend time teaching the student how to use VS before expecting the student to use it independently. In the final coaching session, one of the students was distracted by the facilities staff working in the yard next to large classroom windows. The participant explained that they were installing a new playground area for their classroom, and that it had been a big distraction for several of the students over the past few day. Together the student investigator and the participant decided to try a first, then schedule which would allow the student 5 minutes to watch the workers after they completed their work at each station (see Figure 4).

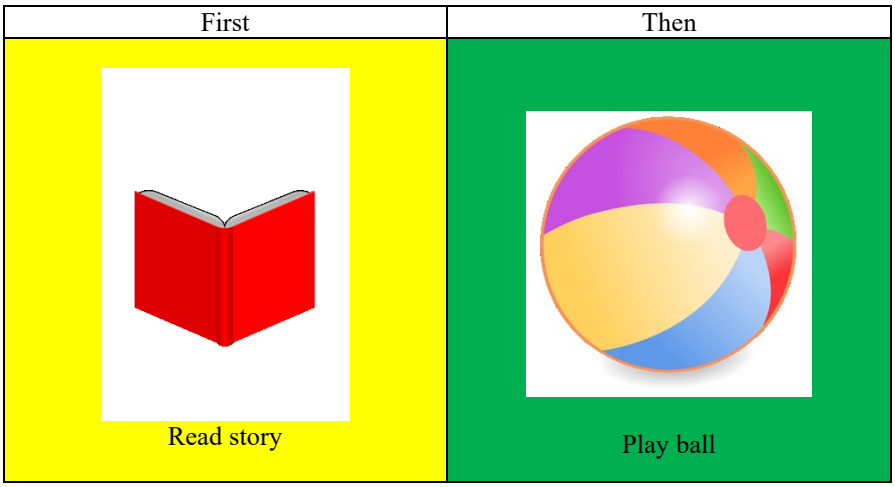

Figure 4. An example of a first, then schedule.

The participant made a hand drawn version, due to the quick turnaround time and attempted to use the first, then card. In addition, the student investigator suggested pointing to the work side of the first, then schedule, or using a picture card with the word work, during the time the student was working if they started to get distracted. The participant mentioned that classroom access to BoardMaker, the same symbol-based software that was mentioned by participant B2, as an issue when making VS, as the district provided licenses to the Speech/Language Pathologists rather than teachers (Mayer-Johnson, Inc., 2002). The coaching logs indicated that at the end of the coaching session, the participant was instructing the student how to follow the first, then schedule.

Participant D4.

In the first coaching session, the participant demonstrated the ability to deliver the stimulus, observe the student's response, and give immediate feedback in each situation. However, the reinforcement did not change for each student. During the feedback and discussion section of the coaching session, the student investigator encouraged the participant to determine specific reinforcers for each student based on the students' individual interests. Additionally, the participant and the student investigator discussed breaking down instructional

goals into single steps, as well as, the use of corrective feedback, prompting, and multiple trials, in addition to positive feedback. During the second session, the participant used DTT in individual lessons focused on identifying letter names and initial sounds of words. During the lesson, the participant would show letter cards as the stimulus, and the student would give the letter name which was either reinforced or corrected, which demonstrated the core components of DTT. In a lesson with a different student, the participant used DTT to teach the initial sounds of consonant-vowel-consonant words. Similarly, to the other lesson the participant demonstrated the proper DTT procedure including showing the stimulus, receiving the response, and giving immediate feedback. Additionally, the participant used the pre-designed data sheets to record data for each lesson.

During the third coaching session, the participant noted the use of visual boundaries, visual cues for assisting students when lining up, and a visual class schedule displayed on the interactive whiteboard. However, in another area, there were individual picture/written schedules, that could be manipulated by each student, but were they not used while the student investigator was there. Simultaneously, the students still needed a variety of verbal, gestural, and physical reminders to check their schedule and go to their assigned areas. During the feedback and discussion, the participant explained that the students were having difficulty following individual schedules, typically they would get their individual picture off their schedule but then wander around the room instead of going to the assigned area. The participant and the student investigator used the visual schedule section of the VS Pre-Assessment for Learner to determine any changes that might improve the scheduling system (Sam & AFIRM Team, 2015). Based on the use of the tool, the student investigator recommended allotting more time to reteaching visual schedules, using a consistent clear signal to check schedules, and a system of

reinforcement and corrective feedback that aids students in following their schedule. As a result, the participant decided to use a timer on the interactive whiteboard and to spend the several weeks allotting time to teach visual schedules.

In the first part of the observation, the students used the central visual schedule shown on the interactive whiteboard to follow the direction to line up, with the exception of one student who had an individualized picture schedule. A two of the students using the centralized schedule and the one student using the individualized needed a single verbal reminder to follow the schedule and line up. All but one student seemed to follow the visual schedule during the second half of the observation. During the second half of the observation, the student investigator went with the two students and the participant to a neighboring classroom that served as a sensory and quiet work area. On the far wall, was bulletin board that explained the classrooms' procedures and behavior system. During the discussion section of the visit the participant and student investigator discussed the implementation and ideas for visual schedules. The participant expressed interest in explicitly teaching the students individualized visual schedules and visual boundaries at the beginning of the next school year. In addition, she posited the idea of a before-school orientation during one or two of the workdays at the beginning of the year, to have small groups of her students come for a few hours at a time to learn how to use each of the VS. The participant had mentioned the possibility of the before school orientation but had not secured approval yet.

Summary.

In summary, each of the participants actively demonstrated the use of DTT multiple times across the length of the combined program. By the second coaching session, coaching logs indicated that participants were consistently using the core components of DTT and using a data

collection system to keep track of student progress. In regard to VS, each of the participants used an individualized combination of visual schedules, visual boundaries, and visual cues throughout the duration of the combined program. All the participants, either used the VS Pre-Assessment for Learner tool prior to the student investigator observing or as a result of the observation (Sam & AFIRM Team, 2015). In two of the four observations, specifically with participant A1 and D4, the student investigator recommended that the participants set aside instruction time to teach or reteach how to use visual schedules. The coaching logs indicated that both participants implemented the recommendations. Overall, the coaching logs established consistent active engagement in the combined program by each of the participants.

Reach.

Reach, or the percentage of the combined program elements completed by each participant was measured by analyzing the sign-in sheets from each professional development session, online module completion certificates, and coaching logs from each session to determine how much of each element each participant completed. When examined, the student researcher found that 100% of the participants had attended each of the face-to-face modules, based on the sign-in sheets from each session. In addition, all of the participants had completed the online modules for both DTT and VS, as indicated by the 100% submission of the completion certificates. The coaching logs indicated that each participant took part in four coaching sessions, including two focused on DTT and two focused on VS. Notes taken as part of the coaching logs during each of the sessions demonstrated that each participant attempted to implement both DTT and VS. After analyzing the collected data, the student investigator determined that reach had been met for all four participants, measured by the participants

attendance at the face-to-face sessions, completion of the online modules, and participation in each coaching session.

Adherence.

Adherence, or the measure of fidelity to the planned program was examined through the notes written by the outside observer, at the face-to-face sessions and the notes contained in the coaching logs and the implementation checklists completed during the coaching sessions. The notes taken during each face-to-face session matched the original presentation slides regarding topics covered. In addition the notes, demonstrated that each participant had the opportunity to work in small groups to discuss case studies and were given guided support in developing lesson plans that incorporated DTT and VS. Similarly, the coaching logs and implementation checklists demonstrated that the focus of each coaching session was either DTT or VS as planned. In summary, the data in the notes demonstrated that 100% of the pre-planned topics were covered and that 100% of the coaching sessions focused on both DTT and VS. As a result, the student investigator adhered to the combined program as originally planned.

In summary, each measured aspect of research question one was fully met, as evidenced by participant attendance and anecdotal notes collected in the face-to-face sessions, as well as the coaching logs and implementation checklists completed during coaching sessions and the online module completion certificates. Measures demonstrated that 100% of the participants attended each face-to-face session and completed each of the online modules. In addition, the coaching logs demonstrated that 100% of the participant were involved in all four coaching sessions. Consequently, in answer to research question one the measures of dose, reach, and adherence were fully achieved.

Examining the Experiences of the Participants

The second research question examined the participants overall experiences within the combined program. Each participants' experience was measured through data collected in the Social Validity survey and individual semi-structured interviews (see Table 11). The Social Validity survey asked participants to report their level of agreement with a series of ten statements about the programs benefits and procedures as well as answer a series of four open ended questions about benefits and ways to improve the combined program. The semi-structured interviews expanded on this by individually asking each participant a series of thirteen questions as well as additional follow-up questions. Both of these measures were completed at the end of the combined program.

The Social Validity survey data was analyzed for the percentage of agreement with each of the items. Out of the ten Likert-type items results indicated that with the exception of question nine, 100% of the participants expressed some level of agreement with each item on the survey. All of the participants reported that the combined program was effective in meeting its goals of increasing teacher knowledge, skills, and beliefs. Likewise, all of the participants responded that they would recommend the combined program to their peers. For seven of the items, the results demonstrated that 75% of the participants strongly agreed, while 25% simply agreed. These statements included items such as "I used the practices taught in the combined program in the classroom setting, the combined program was appropriate for the needs of my students", and "overall the combined program was beneficial for students with ASD". The only item that demonstrated any level of non-agreement was: "Most participants found the combined program suitable for the described purposes and mission", which one person (25%) indicated a neutral feeling toward the item, while the rest of the participants (75%) strongly agreed with the

statement. In contrast, the same participant also strongly agreed that "the combined program was effective in meeting its goals". The open-ended questions indicated that participants thought several of the program components were the most beneficial including meeting with other professionals during face-to-face sessions, one-on-one help in coaching, and the use of hand-on problem solving across face-to-face sessions and in coaching. In addition, all of the participants confirmed that there was not a component they would label as least beneficial. When asked if they thought their participation in the program impacted classroom practice each participant responded with a yes. Further explanation revealed that the program made them more aware of effective strategies and improved their use of those strategies. The only recommendations given for improving the program were adding more EBPs, increasing the length of duration of the program, and moving the face-to-face sessions to workdays to increase participation.

Consistent with the survey results, participants reported positive experiences with the program during their semi-structured interviews. Participant D4 explained

> I think the positive was just the access to knowledge, the access to information. And knowing I was on the right track. That was very positive to me, the oh, I am actually doing pieces of this. I didn't know the name, but I was actually doing the right thing. That was really cool to be affirmed in that way. That I am actually doing okay. (personal communication, April 30, 2019)

Later in the same conversation participant D4 observed "I don't have any negatives [about the combined professional development program], it was only positive for me" (personal communication, April 30, 2019). In discussing her experience with the coaching sessions, participant C3 emphasized "Umm, there is nothing that I didn't like" (personal communication, April 15, 2019). She continued by discussing a coaching example

> …when I was struggling to get through a specific task through a student, um how you gave me insight down to trying to follow [instructional] framework, like what I could use as my learning purpose, and as my anticipatory set, like being able to use that and implement that while teaching using DTT. (personal communication, April 15, 2019)

Simultaneously, several participants mentioned the importance of learning new strategies that are evidence-based. Participant B2 explained how her knowledge had grown especially "knowing that what I am doing is evidence-based because that is such a big deal with the population we work with" (personal communication, April 10, 2019). While participant D4 expressed the importance of having "practical and research-verified methods to implement in the classroom, to better support my students" (personal communication, April 30, 2019). In another interview, when asked if there was anything else about the program or your participation that you would like to share, participant B2 suggested "…just to tell people how beneficial it was. I mean just because it gives you reason for doing what you are doing, I think, I hope they would implement it [in the future]" (personal communication, April 10, 2019). When asked if the participant had made any changes in their classroom practice based on their participation in this study most of the participants agreed that they have made changes in their use of DTT and VS (Participant A1, B2, C3, & D4, personal communication, April 10, 15, 17, & 30, 2019). Participant C3 shared "We have added more visual supports in the classroom, including cues for sitting, scheduling, and stop/break cards. And I am using DTT more when working with students individually" (personal communication, April 15, 2019). While participant D4 commented that "…with both practices actually, um I am still trying to get the hang of the discrete trials…I do like the discrete trials method because I definitely feel that it is actually very effective for my students" (personal communication, April 30, 2019).

Together these data suggest that participants were engaged throughout the combined program and all of the participants seemed to have a positive experience with the combined program. This was characterized by the fact that each of the participants strongly agreed with the statement that stated "I would suggest this combined program to other teachers" in addition to making positive comments throughout the semi-structured interviews about the combined program. Consequently, 100% of the participants had a positive experience in the combined program as measured by the Social Validity Survey and the semi-structured interview data.

Examining Teacher Knowledge of ASD and EBPs

As part of the outcome evaluation, research question three examined any increase in teacher knowledge of ASD and EBPs across the duration of the combined program (see Table 12). Research question three was measured quantitatively using the Knowledge of ASD Survey and the EBP checklist. The surveys were given pre- and post-program and then scored individually. The scores were then compared for growth by participant and by the population sample (N=4). Both the pre- and post- surveys and checklists were then compared for growth.

The Knowledge of ASD was a thirteen question survey that asked respondents to assess statements about ASD as either true or false. Of the four participants, three of them scored a 92 or higher on the pre-program assessment, only one participant missed more than one question on the pre-assessment (see Table 19). On the post-program assessment, two of the participants missed a single question on the assessment, which decreased their scores from the pre- to post-program. Simultaneously, two of the participants earned a perfect score. Participant C3, who had the lowest score on the pre-assessment, demonstrated the most growth in knowledge with a 44% increase in their score from pre- to post-program.

Table 19. Pre- and Post-Test Scores for the Knowledge of ASD Survey

Participant	Pre-Score	Post-Score
A1	92.3%	100%
B2	100%	92.3%
C3	69%	100%
D4	100%	92.3%
Total average score:	90.3	96.2

While 100% of the participants answered 11 of the questions correctly on the post-program assessment, it should be documented that different participants incorrectly answered important questions that focused on key areas of the diagnosis definition of ASD (APA, 2013). These questions focused on children with ASD exhibiting communication difficulties and repetitive or restricted behaviors.

EBP checklist.

The results for the EBP checklist (Strong, 2014), indicated that the participants' reported an increased familiarity with the EBPs and level of comfort with implementation (see Appendix R for full results table). While the participants responded to questions about all of the 27 EBPs, the combined program only focused on building knowledge and practice in DTT and VS. The survey data indicated that 100% of the participants indicated that they were very familiar with DTT at the end of the program (see Table 20). These scores were up from the pre-program assessment which reported that three of the participants were not familiar with DTT and the remaining participant was only somewhat familiar with DTT. Comparatively, all of the participants reported they were very familiar with VS at the end of the program. This score was

up from the pre-program scores which revealed that three of the participants were somewhat familiar with VS and only one of the participants was very familiar with VS.

Table 20. Participants Familiarity with the Targeted EBPs.

Evidence-Based Practices	Pre-Assessment			Post-Assessment		
	Not Familiar	Somewhat Familiar	Very Familiar	Not Familiar	Somewhat Familiar	Very Familiar
Discrete Trial Training (DTT)	75%	25%	0%	0%	0%	100%
Visual Supports (VS)	0%	75%	25%	0%	0%	100%

In the same way, all of the participant demonstrated a higher level of comfort with implementation at the end of the program, as measured by the EBPs Checklist. The data analysis revealed that two of the participants reported they were somewhat comfortable with implementing DTT at the end of the program, while the other two participants reported that they were very comfortable implementing DTT at the end of the program (see Table 21). In contrast, all of the participants reported that they were very comfortable implementing VS at the conclusion of the program.

Table 21. Percentage of Participants Who are Comfortable Implementing the Targeted EBPs.

Evidence-Based Practices	Pre-Assessment			Post-Assessment		
	Not Comfortable	Somewhat Comfortable	Very Comfortable	Not Comfortable	Somewhat Comfortable	Very Comfortable
Discrete Trial Training (DTT)	100%	0%	0%	0%	50%	50%
Visual Supports (VS)	0%	75%	25%	0%	0%	100%

In summary, while the average scores on the Knowledge of ASD survey increased between the pre- and post-program administration, this was mostly attributed to the growth of participant C3, as participants B2 and D4 scores decreased. On the other hand each of the participants reported a higher level of familiarity and comfort in implementation of both DTT

and VS, with the exception of Participant A1 whose familiarity and level of comfort of implementation of VS remained at the highest level throughout the duration of the program.

Frequency of Use of EBPs

Research question four investigated the frequency of use of DTT and VS across the length of the combined program. To examine this question the student investigator collected frequency of use data focused on DTT and VS by measuring the number of times a participant used a particular EBP in one hour, three times a day, across five days (see Appendix Q). This data was collected in December 2018, April 2019, and May 2019 by participant self-report. The data was analyzed by totaling up the number of instances in a recorded week and divided by the number of days recording (due to several missed days) to find the participants average use per day (see Table 22).

Table 22. Average Use of DTT per Day per Participant

Participant	Average Use of DTT Per Day		
	Pre-Program	Post-Program	Maintenance Data
A1	5.8	10.25	11
B2	0	3	1.75
C3	9.3	11	7.25
D4	0	5.2	4.33

It should be noted that the participants' December 2019 (Pre-Program) data, was collected before the beginning of the combined program, so any data collection was based on the participants own interpretation of the definitions of the terms DTT and VS. The according to the anecdotal notes recorded by participants on their data sheets, the average use fluctuated based on multiple factors, events that changed instruction such as elective classes, swimming fieldtrips, workshop attendance, and end-of-grade test administration as noted by the participant in handwritten notes on the Frequency of Use data sheets.

Overall, the frequency of use of DTT varied by participant. Participant A1 reported an in increase in use of DTT both in the post-program and again in the maintenance (follow-up) period (see Table 22). All of the participants demonstrated an increase in the frequency of using DTT between the pre-program and post-program times periods. In the case of participant A1, the average frequency of DTT use increased by 4.45 times per day, between the first two recording periods. Participant D4 also increased their frequency of use by 5.2 times per day, between the beginning and the end of the program. Participant B2 and C3 also demonstrated an increased use of DTT between the pre-program and post-program recordings. Participant B2 increased their overall use of DTT to 3 times per day at the conclusion of the combined program, then dropped to 1.75 times per day four weeks later. While the increase was minimal, the Background, Experiences, and Demographic form indicated that the make-up of the classroom population that Participant B2 worked with was cross-categorical which means the classroom includes students with a range of disabilities like ASD, Down-Syndrome, Multiple-Disabilities, and Intellectual-Disability of varying ranges. Therefore, depending on the exact population of the classroom there may have only been a couple of students that would have been appropriate for using DTT. While each participant had a positive gain in the use of DTT between the pre- and post-program recordings all but one participant had decreased their use of DTT by the time of the maintenance data collection period was held four weeks later. However, the decreased average collected during the maintenance period was still higher than the original average collected at the beginning of the program.

Participant C experienced a 22% decrease from the pre-program period to the maintenance period of the combined program. This may be explained by an initial misunderstanding of DTT during the pre-program period resulting in an overestimate in the

average use per day at the beginning of the program. However, there are other reasons for the decrease including the lack of support at the conclusion of the program at the end of the combined program or the school-wide events happening around the same time as the maintenance data collection period.

Frequency of VS use. In just the same way as DTT, participants self-reported their use of VS during three distinct periods across the intervention. A similar pattern emerged during a review of the data for the period between the pre-program and the post-program. All of the participants with the exception of D4 demonstrated an increase in the frequency of use of VS (see Table 23). Participant B2 reported the highest frequency of VS with an increase of frequency of use of 7.4 times per day.

Table 23. Average Use of VS per Day per Participant

Participant	Average Use of VS Per Day		
	Pre-Program	Post-Program	Maintenance
A1	17	22	17.75
B2	1.4	8.8	4.25
C3	8	9	13.5
D4	12	6.4	4

However, a review of the time between post-program and maintenance revealed that all of the participants decreased their frequency of use of VS. The literature that examines the effective implementation process of EBPs described this decline as a somewhat common occurrence, as implementation support declines (Cook & Odom, 2013). It should also be noted that several of the participants wrote anecdotal notes on their data collection spreadsheets, which demonstrated that the reduction in the use of DTT and VS might have been due to reduced instructional time, which resulted from class fieldtrips, teacher absences, and state assessments. Additionally, the

initial misunderstanding as to what constitutes a VS, which may have led to an overestimation of the frequency of use in the beginning of the combined program.

In final consideration, the data demonstrated that the combined program increased the overall use of DTT all the participants, even though most of the participants reported a decline in use between the post-program and maintenance period data collections. However, the overall average frequency of use of DTT per day did increase for participant A1 continuously throughout the combined program. Comparatively, the overall average frequency of use of VS per day increased for participant C3 and the average frequency of use per day increased between the pre-program and the post-program period for participants A1 and B2.

Examining the Self-Efficacy of the Participants

The final research question examined the participants' self-efficacy levels. Participants completed the ASSET survey pre- and post-program to measure the growth in their levels of self-efficacy in working with students diagnosed with ASD. As with the other pre- and post-surveys the data was self-reported and the self-efficacy score represents an average of all of the items included in the survey. The process was repeated for both pre- and post-program scores and then the student investigator calculated the percent increase in scores for each. Findings demonstrated all of the participants' pre- and post-program scores increased between the beginning and the end of the combined program meaning that participant self-efficacy in working with students diagnosed with ASD increased during the intervention.

Table 24. Comparison of Pre- and Post-ASSET Scores

Participant	Average Pre-Program Score	Average Post-Program Score	Percent of Increase
A1	85.33	97	13.68%
B2	84	88	4.76%
C3	75.67	83.67	10.57%
D4	50.67	66.33	30.91%

Additionally, the data demonstrated a positive change in the level of self-efficacy across all of the participants in 23 of the 30 items including the participants' ability to teach the student academic skills, write measurable objectives, create a teaching plan, and use visual structure to increase the independence of a student. While they were multiple areas of growth, several specific areas should be highlighted. Specifically, there were eight statements, on the post-program survey, where all participants reported a score of 100%, demonstrating that the participants believed they were "highly certain they can do" (Ruble et al., 2011). Each statement focuses on key elements of teaching students diagnosed with ASD including several of which might have been influenced by the work done in the combined program. One key statement that might have a connection to the combined program was "Organize the classroom to increase opportunities for learning for this student" (Ruble et al, 2011). This might have been influenced by the participants' work using VS during the combined program, as VS assists by building visual structures to increase student learning (Wong et al., 2015). Pursuing this further, the participants may have indicated higher levels of self-efficacy regarding the statement "Use visual structure to increase this student's independence" based on their experiences developing VS in their classrooms (Ruble et al., 2011). In the same way, the statement "Teach this student academic skills" may have been scored higher by the participants as a result of learning and implementing DTT, which can aid students in learning a wide variety of academic skills (Ruble et al., 2011; Wong et al., 2015). In contrast, it should be noted that on the statement, "describe parental concerns regarding this student", all of the participants scores stayed in the range of 80-100% for both the pre- and post-program surveys, but the overall total raw score of all the participants for that question decreased by 10 points on the post-program survey. The participants' did not report a decrease in self-efficacy in any other areas. As a result, data

analysis revealed that the participants' level of self-efficacy increased over the span of the intervention as measured by the percent of increase from the pre-program to the post-program surveys.

Conclusions

The study establishes a foundation for further research in teaching and applying the EBPs for students with ASD in the classroom setting. The findings demonstrated that combining quality face-to-face instruction, with online learning modules, and instructional coaching can change the knowledge and instruction of special education teachers. Through the use of focused content material, active learning, coherence between the face-to-face sessions, online module, and coaching, in addition to collective participation, the participants felt more confident in their ability to instruct students diagnosed with ASD. Consistent attention to the EBPs across the three learning methods led to an increase in familiarity and the level of comfort of implementation in both DTT and VS for all participants, as measured by the EBP pre- and post-program data. Each participant noted that the coaching sessions were helpful in applying the EBPs into their classroom setting, during the semi-structured interviews. Additionally, the coaching sessions allowed each participant to think through how they implemented both DTT and VS, as well as additional ways to incorporate them in the classroom, as indicated in the anecdotal notes collected in the coaching logs. Moreover, each participant explained that working as a small group assisted each them in thinking through specific issues that they were dealing with during implementation. It is important to note, that all participants demonstrated an increased use of DTT from the beginning to the end of the intervention. In addition, all participants with the exception of D4 demonstrated an increased use of VS over the length of the intervention. While the average overall frequency of use did not increase for each participant, by

the end of the combined program, all of the participants were using both DTT and VS with their students daily. In addition, when the pre-program weekly frequency was averaged and compared to the average of the maintenance frequency of use, the data demonstrated an average increase of DTT use, to a frequency of 6.08 times per week. While minimal, the VS data revealed the overall average weekly frequency of use went up by 0.27.

Within the classroom setting, participants and the student investigator noted a better student understanding of how to use VS, especially in visual schedules and boundaries to transition between activities and to remain in a single classroom area for instruction, as indicated in the coaching logs. Participant B2 explained, in the semi-structured interview, that the use of both DTT and VS guided teachers in a better understanding of their students and how their ASD might affect them in the classroom. Finally, the data indicated that when teachers of students with ASD are actively participating in learning about EBPs and applying them in the classroom setting, their levels of self-efficacy may improve.

To summarize, this study hypothesized that the use of the combined program would impact the participants' knowledge of ASD and EBPs, change the participants instruction, and improve their level of self-efficacy based on the information examined in the research questions. Research question one addressed the components of the intervention program, including the face-to-face sessions, online modules and coaching sessions were implemented with fidelity, as evidenced by the attendance data, the completion certificates for the online modules, anecdotal notes taken during face-to-face sessions and in the coaching logs. The collected sign-in sheets, completion certificates, and coaching logs demonstrated that reach had been achieved. Additionally, dose delivered and received were shown by analyzing the data collected as part of observer data, coaching logs, and interview transcripts. Each of the process data points

demonstrated the intervention was implemented with fidelity. As a result, the components of fidelity were fully met. The data collected for research question two, including data collected from the Social Validity survey and the semi-structured interviews demonstrated that the participants overall response to the program was positive and they believed the combined program was meaningful to their classroom work. Individual question data revealed that all of the participants felt the intervention improved teacher knowledge, skills, and beliefs about students with ASD. In reference to research question three, the data showed growth in knowledge in both ASD and EBPs based on the Knowledge of ASD Survey and the EBP Checklist data. However, the growth on the Knowledge of ASD survey was minimal. The data collected for research question four demonstrated an increase of use of DTT in the classroom setting across all participants, based on the Frequency of Use data sheet, when comparing the pre-program results to the post-program results. While all participants increased their use of DTT from the pre-program to the post-program data, the frequency of use decreased between the post-program and the maintenance data collection, once implementation support was reduced. Similarly, in the use of VS all of the participants increased their frequency of use between the pre-program and post-program period, with the exception of participant D4. Additionally, only one participant increased their use of VS between the post-program and maintenance period, participant C3. Finally, the data for research question five demonstrated an increase in each participants' level of self-efficacy in working with students diagnosed with ASD over the course of the combined program, based on the ASSET survey.

Discussion

The combined program was built through examining research in the areas of professional development, teacher training especially in regard to working with students diagnosed with ASD,

the need for continued training, the use of EBPs, and self-efficacy. In this section, the findings will be discussed in terms of these areas of research. Additionally, the limitations of the study are discussed along with the implications for future research and practice.

Conceptual Framework

The findings of this study were grounded in the core conceptual framework developed by Desimone (2009). The core conceptual framework helped to situate each component and outcome of the study into a logical pathway (see Figure 2). In the examination of the components that lead to changes in the teacher and the instruction, Desimone (2009) noted the importance of teachers experiencing effective professional development as the beginning of the path towards changed knowledge, beliefs, instruction, and improved student achievement (184-185). The works of both Desimone (2009) and Garet et al. (2001) agreed that effective professional development require the use of content, coherence, duration, and collective participation. For this reason, the study's components were built to focus on a specific content related to an understanding of ASD and building participant knowledge surrounding EBPs. The study participants concentrated on learning about the basics and procedures of DTT and VS with the intention of using each EBP in the classroom. While the online modules, provided participants a period of active and independent learning about DTT and VS, the face-to-face session provided time to review, discuss, plan, and problem solve their use (Desimone, 2009; Garet et al., 2001; Sam & AFIRM Team, 2015; Sam & AFIRM Team, 2016). When coupled with coaching, the participants were able to implement each EBP with guidance and feedback in the classroom (Desimone & Pak, 2017). In the same way, the study was designed with coherence as shown through the sequence of intervention activities (see Figure 3), in which the different instructional components were interwoven across length of the combined program. The

sequencing allowed the participants to focus on improving their use of one of the EBPs, before learning about the next. While the duration was limited to only five months, the sequencing of the combined program seemed to help participants stay on track and finish the program, based on the 100% completion of each component by all four participants. Finally, while combined program did not allow for collective participation within each component, each participant noted during the semi-structured interview that working with the other three participants was beneficial to them. The comments by participant C3 illustrated this, when asked about any positive or negative experiences within the study, participant C3 responded

> …when we used to come and meet as a group, um the different experiences that they have in their classroom, and I'm like, oh wow so it is not just me! And how we were able to talk through the things and figure out what could possibly work for us (personal communication, April 15, 2019).

While participant B2 reflected "And it was just helpful to know how everyone else was doing in their room, to see if you could maybe take an idea" (personal communication, April 10, 2019).

Following these ideas further, the core conceptual framework concludes that when teachers participate in effective professional development it results in changes in the knowledge and beliefs of teachers (Desimone, 2009). This view aligns with the findings of growth on the Knowledge of ASD survey, which demonstrate that out of 13 questions, all of the participants answered 11 out of 13 questions correctly up from 9 out of 13 questions prior to the beginning of the combined program. It should be noted however, that the two questions that were missed involved key pieces of knowledge related to the definition of ASD. This may be attributed the amount of time spent on the definition of ASD, as the definition was only discussed in one face-to-face session at the beginning of the combined program. By the same token, the participants

grew in their familiarity and level of comfort with implementing EBPs, which again coincides with the work of Desimone (2009). The findings demonstrated an increase in both DTT and VS in the area of familiarity, as well as in the area of comfort level. In addition, the participants reported an increase in both familiarity and comfort level across several of the twenty-seven EBPs included in the checklist (see Appendix R). These findings are interesting considering only two, DTT and VS, specific EBPs out of twenty-seven were formally discussed and implemented. Perhaps, participants had a better working knowledge of the EBPs as they were discussed as a whole in the first face-to-face session, or perhaps participants were more familiar with the each EBP from spending time working on the AFRIM modules, or maybe participants realized they knew about several of them based on their more familiar names, such as modeling, prompting, or functional behavior assessment (Autism Focused Intervention Resources and Modules, n.d.; Wong et al., 2015). For the time being, the direct causes cannot be answered, only that there was growth across the program.

The results support the concept that changes in knowledge and beliefs lead to changes in teacher instruction discussed by Desimone (2009). The collected frequency data demonstrated while the use of DTT did not improve for every participant across all the collection periods, participant A1 had an overall increase of daily use by 86.9% and all of the participants increased their average daily use of DTT between the pre-program and post-program period. Furthermore, the data collected regarding VS for participant C3 showed an increase of use over the entire length of the combined program, while participants A1and B2 increased their use of VS between the pre-program and post-program period. In other words, each of these findings confirm the process that lead changes in teacher instruction and attitudes described in the conceptual framework (Desimone, 2009).

Teachers' Preparation and Needs

Multiple studies demonstrate the need for more and better preparation for teachers who work with students diagnosed with ASD (Donaldson, 2015; Morrier et al., 2011; Ruef et al., 2009). The results of Morrier et al. (2011) demonstrated that less than 15% of their sample had previously received university level training regarding ASD. The results of the combined program corroborated the finding, as only one of the participants had received prior training on ASD at the university level. According to their self-report on the Background, Experience, and Demographic survey, the same participant indicated they had somewhere between one and five credit hours total. The data confirmed the overall lack of previous training specific to ASD, and consequently why the use of effective professional development training was crucial.

In addition to the components of effective professional development laid out by Desimone (2009), Garet et al. (2001), and Brock et al. (2014) reported that 37% of the teachers surveyed in their study received their training during in-service professional development. Clearly then, it was not surprising that only three of the participants had an in-service training specific to ASD, none of which focused on EBPs. This included participant A1 who indicated 6-12 hours, participant C3 who indicated 1 to 5 training hours, and participant D4 recorded 13+ training hours and explained in an anecdotal note, that all the hours were from a week-long TEACCH training.

As with the general professional development work of Desimone (2009) and Garet et al. (2001), there is a call for quality professional development specific to ASD based in research and grounded in key competencies (Scheuermann et al., 2003; Shyman, 2012). These competencies included three which were specifically addressed in the combined program including knowledge of the disorder, theoretical underpinnings of instructional approaches, and classroom structure

(Shyman, 2012, p. 190). More precisely, knowledge of the disorder was addressed in the first face-to-face session, while the theoretical underpinnings of instructional approaches were addressed by both the AFRIM modules and the all of the face-to-face sessions. Finally, the participants focused on classroom structure throughout the study on VS, including the online module, coaching, face-to-face sessions.

The Use of EBPs in the Classroom

One of the goals of this study was to increase the knowledge and use of EBPs in the classroom. This was based on research that demonstrated the importance of building teacher knowledge, building an understanding of why and when to choose an EBP, and implementing the EBPs into the classroom (Marder & deBettencourt, 2015). As there were 27 distinct EBPs, the duration of this study did not allow for a focus on all of them, instead choosing two EBPs, DTT and VS, that were commonly used in classroom settings and had the potential to be used regularly in the school day (Wong et al., 2015). Data including Frequency of Use recording, the Social Validity surveys, outside observer data, and semi-structured interviews confirmed that each participant used DTT and VS each day during the program and after the program ended. Consistent use was illustrated by the Frequency of Use data collected throughout the program which showed an increase in use across all of the participants for DTT and three of the participants for VS. In addition, the growth shown across the pre-program and post-program EBP checklists was supported by comments made throughout the coaching sessions. Likewise, in the Social Validity survey data participants acknowledged that the combined program made them more aware of the EBPs and improved their overall use of DTT and VS. In discussing the EBPs, participant D4 noted that the clarity of the AFIRM modules made it easy to learn (Autism Focused Intervention Resources and Modules, n.d.; personal communication, April 30, 2019). In

a different interview, participant C3 explained that learning the EBPs gave them a better understanding of what they should be doing with their students and why it should be done (personal communication, April 15, 2019).

Using the Combined Approach to a Professional Development Program

The study used a combined approach of face-to-face sessions, online modules, and coaching to guide participants through learning about ASD and EBPs to implementing them in the classroom. This approach was supported by several studies which used a blend of multiple instructional methods to build the knowledge of their participants (Higginson & Chatfield, 2012; Marder & deBettencourt, 2012; Mueller & Brewer, 2013; Scheuermann et al., 2003; Stahmer et al., 2015). The participants seemed to benefit from the use of multiple instructional methods as reflected in both the quantitative results that demonstrate growth in knowledge of ASD and growth in familiarity and the level of comfort in implementing EBPs, as well as the qualitative data which suggests that participants found each component of the program important to their learning. As an example, when asked what do you feel was the most beneficial aspect of the combined program and what was the least beneficial, each participant mentioned a different component as most beneficial while none of the participants were able to give an example of the least beneficial component.

Self-Efficacy

The final goal of this study was to increase the self-efficacy levels regarding working with students diagnosed with ASD. While the duration of the combined program was only five months long, previous studies had improved aspects of self-efficacy with similarly short durations and using similar methods (Ross, 1994; Tschannen-Moran & McMaster, 2009; Tucker, 2001). Like the Tschannen-Moran & McMaster (2009) study, the combined program included

chances for participants to learn basic information, see the procedures being modeled, implement the EBPs, and receive feedback through coaching. Another study focused specifically on teachers working with students diagnosed with ASD indicated the possible connection between increased knowledge or skills and the level of self-efficacy in teachers. In this situation, the increased level of knowledge and skills may also have led to the positive results of the ASSET survey.

Limitations

There are several limitations to this study which would hinder generalization and future replication. There were only four participants took part in this study. Consequently, it would be difficult to generalize the findings or the conclusions to other populations, which may have differing characteristics. The population size made the use of a control group impossible, since it would require using and even smaller population size in the experimental group. In addition, without the use of a comparison group, it is difficult to know if the positive changes seen in the participants were due to the intervention study or merely growth over time. There were also limitations in using quantitative data which was collected through self-report. Both the pre- and post-surveys, as well as, the frequency data was collected through the participants evaluating and reporting their interpretations. As a result, participants may have rated their skills and beliefs higher than the actually were or may have attempted to demonstrate a higher increase in frequency of EBP use than there actually was. The combined program relied on participant self-report for Frequency of Use data and survey data which may be subjective. In addition, the frequency of use of DTT and VS was recorded prior to the beginning of the intervention, which may mean the participants might have understood the definitions of DTT or VS differently in the beginning versus at the end of the combined program. As a result, the quantitative data may not

be entirely accurate or objective. Another limitation of the combined program was the individualized nature of each coaching session. As a result, information shared with one participant may not have been shared with the other participants. Consequently, the individualized sessions would also make future replication difficult. In the same way, the participants used DTT and VS to teach as variety of skills, which were not consistent between sessions or participants which would be difficult to replicate in future research studies. In the future, developing a standardized list of skills might improve the consistency across participants. It is also important to note that the student investigator was a colleague of each of the participants, which may have skewed how individual participants answered survey questions, especially social validity questions or interview questions. Finally, the combined program only spanned from December 2018 through May 2019, which is only five months long. The shortness of the program and the multiple factors the impeded each participants classroom instruction time may have impacted the frequency of use of both DTT and VS. Moreover, research demonstrates that a consistent program of at least six months or more is needed to see a significant impact on self-efficacy (Gibson & Dembo, 1984; Tschannen-Moran & McMaster, 2009).

Implications for Practice

This study had the potential to change practice within Stone Run County Schools for multiple years. Each participant noted the importance of the continued use of this program and their willingness to recommend this program to other EC teachers. In the Social Validity survey participant B2 mentioned adding more EBPs to the program in the future as a way of extending the training into the following school year. In addition, with the rate of teacher turn over, and the newness of our teachers to the field of ASD, continued use of a similar or expanded program could build teacher capacity. Additionally, while not measured in this study, the core conceptual

framework demonstrated the potential for a long-term connection between changes in teacher knowledge and skills, which eventually impact might student achievement levels (Desimone, 2019). Furthermore, Jennett et al. (2003) indicated the possibility of a connection between teacher knowledge and skills to higher levels of self-efficacy, which in turn led to less teacher burn out. This finding is important as Stone Run County Schools continues to work toward improved teacher outcomes and retention. This study provided implications for similar school districts dealing with issues of capacity and retention, as well as for those districts whose teachers require further training regarding ASD.

Implications for Future Research

There are several implications for future research based on the findings of this study. First, the sample population in this study was very small (N=4). Consequently, future studies should consider a using a larger sample population to determine if findings are generalizable to larger groups. The addition of a control group would confirm that the growth seen in the pre-program and post-program surveys regarding the participants knowledge and skills could be attributed specifically to the combined program. Moreover, to see the full extent of the impact of student achievement, future studies should take into consideration using methods of collecting student data, such as the data taken as part of the DTT or VS procedures. Future research should increase the length of the program, to determine if a longer focus on the newly learned skills might fully increase frequency of use of the EBPs as well as continue to increase teachers' levels of self-efficacy. Furthermore, it would be beneficial to look at standardizing the way DTT and VS would be used in the classroom throughout the study, which might aid in understanding the impact of instructional change through on both the use of the frequency of use and quality of implementation. To continue standardizing the Frequency of Use data, future researchers might

want to collect frequency data during coaching session observations. Finally, future research should incorporate more of the 27 EBPs to gain more information the implementation process, as changes in implementation may differ depending on which EBP is used.

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Appendix A

Needs Assessment

Phase 1: Interview Protocol

Overview questions:

1. How big is the Stone Run County Schools?
2. How many children with ASD are enrolled in the Stone Run County Schools?
3. What is your role within Stone Run County Schools?
4. How long have you been in that role?
5. What is your professional background?
6. What is your educational background?
7. What is the highest degree you have earned?
8. Have you ever had coursework on ASD? If so, what types of information did the courses cover?
9. What professional development or trainings regarding students with ASD have you had?
10. How has your knowledge-base regarding students with ASD developed? Where have you gained this knowledge from?
11. How do you use that knowledge-base in decision making?
12. Have you ever taught students with ASD? If so, in what types of classrooms or in what role?

Questions about professional goals:

1. What are your overall goals for students with ASD enrolled in Stone Run County Schools?
2. How do you plan to achieve those goals?

Questions about teachers of students with ASD:

1. What areas of knowledge do you expect teachers of students with ASD to have?
2. What are the expectations of teachers in the self-contained ASD classroom regarding instructional practices?
3. What factors are looked for in hiring special education teachers in the self-contained adaptive classroom?

Questions about effective instruction for students with ASD:

1. What characteristics impede the learning of students diagnosed with ASD?
2. What are the best practices in autism? How do we know?
3. What types of effective instruction are being used within the self-contained classrooms in Stone Run County Schools?
4. What resources and supports are available in our district to support teachers in using evidence-based practices?
5. What are the barriers when implementing evidence-based practices within Stone Run County Schools?
6. What factors are considered at the district level when implementing a new method or strategy in the self-contained classrooms?
7. How does Stone Run County Schools assist teachers in improving their instruction?
8. What types of professional development are accessible to your teachers?

Questions about beliefs:

1. What are Stone Run County Schools' strengths regarding educating students with ASD?
2. What are Stone Run County Schools' weakness' regarding educating students with ASD?
3. In what ways can you motivate your teachers of students with ASD?
4. In what ways can you improve instruction for students with ASD?

District level questions:

1. What prompts you to make changes?

2. What kinds of data does Stone Run County Schools collect?

Appendix B

Approved March 21, 2018 Protocol Number: HIRB00006803

Johns Hopkins University
Homewood Institutional Review
Board (HIRB)

Informed Consent

Title:	Examining teacher knowledge of autism spectrum disorders, research-based practices, and self-efficacy.
Principal Investigator:	Dr. Christine Horel
Student Investigator:	Melissa J. Armstrong
Date:	March 26, 2018

PURPOSE OF RESEARCH STUDY:

The purpose of this research study is to investigate the knowledge base of teachers regarding autism spectrum disorders, research-based practices designed for students diagnosed with autism spectrum disorders, and the self-efficacy of teachers working with students diagnosed with autism spectrum disorders.

PROCEDURES:

There is one component for this study: You will participate in an electronic survey, consisting of three sections. Survey data will be collected electronically through Qualtrics. Surveys will

take an estimated 10-20 minutes to complete.

RISKS/DISCOMFORTS:

There are no anticipated risks or discomforts to you.

BENEFITS:

Potential benefits include an increased awareness of teacher's understanding of autism spectrum disorder, its characteristics, the research-based practices available to support students with autism spectrum disorder, and individual self-efficacy levels of teachers working with students who are diagnosed with autism spectrum disorder. Additionally, the surveys may lead to the development of interventions to assist teachers in educating students with autism spectrum disorder.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:

Your participation in this study is entirely voluntary. You choose whether to agree to take part in the study. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.

You can stop participation in the study at any time, without any penalty or loss of benefits. If you want to withdraw from the study, please contact Melissa J. Armstrong via phone or email: (XXX)XXX-XXXX or XXXXXXXX@jhu.edu

CONFIDENTIALITY:

The study involves an anonymous survey. We will not know the identities of respondents.

All measures will be examined by the Principal Investigator and the Student Investigator and research affiliates only (including those entities described above). No identifiable information will be included in any reports of the research published or provided to school administration.

All research data will be kept in a locked office. Electronic data will be stored on the Student Investigator's computer, which is password protected. Any electronic files will be erased and paper documents shredded, seven years after collection.

COMPENSATION:

You will not receive any payment or other compensation for participating in this study.

IF YOU HAVE QUESTIONS OR CONCERNS:

You can ask questions about this research study at any time during the study by contacting Melissa J. Armstrong via phone or email: (XXX)XXX-XXXX or XXXXXXXX@jhu.edu

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (XXX)XXX-XXXX.

"By completing this survey, you are consenting to be in this research study. Your participation is voluntary and you can stop at any time."

Click HERE to take the survey

Appendix C

January 22, 2018

To Johns Hopkins University, Homewood IRB:

Melissa J. Armstrong, a doctoral student at Johns Hopkins University in the Ed.D. Program has our permission to conduct a needs assessment research study in during the Spring semester of 2018.

We are aware of her dissertation research focused on minimizing the research-to-practice gap within the classroom for students with autism spectrum disorder (ASD). We have given her permission to conduct the needs assessment designed to gage the current knowledge of EC teachers working with students diagnosed with ASD.

We understand that data will be collected via electronic survey from all EC teachers, who willingly participate, serving in the general and adapted curriculums about ASD. We understand that the survey is designed to examine each teachers' role within the district, whether they serve students with ASD, their educational background, whether they have received pre-service and in-service training regarding working with students with ASD. In addition to this, we are aware that the electronic survey would include questions regarding the teachers' knowledge of ASD and its characteristics, knowledge of interventions designed for ASD, including evidence-based practices, and the teachers' levels of self-efficacy in working with students with ASD.

We are aware participation would be voluntary and an electronic consent form will be collected at the beginning of the survey. Furthermore, we are aware all research will be conducted through an electronic survey, and any names or identifying information will be removed to preserve the anonymity of each participant. In addition to this, we are aware the survey should take no longer than 15-20 minutes to complete. Finally, we are aware there will be no risks to the participants.

If you have any questions of please contact me at:
Mrs. M. Christy Grant

Sincerely,

Ms. Christy Grant
Exceptional Children's Program Director,

Appendix D

Phase 2: Background and Experience Section

1. What is your title or role in the district?
2. How long have you been in that role?
3. What is your professional experience?
4. What is the highest degree you have earned?
5. In what areas are you certified?
6. Have you ever had coursework on ASD? If so, what types of information did the courses cover?
7. What professional development or trainings regarding students with ASD have you had?
8. Have you ever taught students with ASD? If so, in what types of classrooms or in what role?

Appendix E

Autism Knowledge Questionnaire

Corona, L. L. 1. Christodulu, K. V. 1., & Rinaldi, M. L. 1. (2017). Investigation of school professionals' self-efficacy for working with students with ASD: Impact of prior experience, knowledge, and training. *Journal of Positive Behavior Interventions, 19*(2), 90-101. doi:10.1177/1098300716667604

1. The Center for Disease Control currently estimates that _____ individuals have an autism spectrum disorder.
    - 1 in 50
    - 1 in 68
    - 1 in 88
    - 1 in 110
2. In May 2013, the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013) was published. What statement is not true according to the new criteria?
    - There are three core characteristics of an autism spectrum disorder.
    - Autism, Asperger, and pervasive developmental disorder-not otherwise specified (PDD-NOS) are collapsed into one single diagnosis.
    - Although symptoms of autism must begin in early childhood, they may not be reorganized fully until social demands exceed capacity.
    - Symptom severity for each of these areas of diagnostic criteria is now defined.
3. What IS an empirically validated and evidence-based intervention?

- Facilitated communication
- Chelation
- Positive behavior support
- Auditory integration training

4. What of the following related characteristics primarily involves a difficulty in regulating emotion and carrying out goal-directed behavior?
    - Executive functions
    - Adaptive skills
    - Sensory processing
    - Communication skills
5. It is very important that the team select at least one Prevent, Teach, and Reinforce (PTR) intervention when creating a behavior support plan.
    - True
    - False
6. A Functional Behavior Assessment includes the following:
    - Prevention strategies
    - Definitions of behavior
    - Teaching of new behavior or skills
    - Antecedent interventions
7. The ability to understand another person's perspective, feelings, and emotions, and attribute them as the cause of (or contributing to) that person's actions is,
    - Executive functioning
    - Theory of mind

- Central coherence
- Social cognition

8. What is most important when choosing a reinforcer for an individual with autism spectrum disorder (ASD)?
    - Cost
    - You (the provider) find it reinforcing
    - The individual with ASD finds it reinforcing
    - The rest of his or her classmates find it reinforcing
9. Sometimes when implementing supports and interventions, you may see an increase in undesired behaviors. This is known as,
    - Delayed reinforcement
    - Delayed gratification
    - Extinction burst
    - Extinction bubble
10. The following describes the PTR process except,
    - PTR is a model or Positive Behavior Support (PBS)
    - PTR is a Tier 3 intervention, meaning supports put in place will be intensive and individualized.
    - Research supports the effectiveness of the PTR process with individuals with autism, but may not be as effective with those who have other types of behavioral challenges.
    - PTR is aligned with principles of Applied Behavior Analysis (ABA)
11. Which of the following statements is true?

- There is no longer a formal diagnosis of Asperger Syndrome according to the DSM-5
- Girls are more likely to be given a diagnosis of autism
- The rate of autism has stayed the same over the past decade
- All children with ASDs have a delay in verbal behavior

12. One new skill that is essential to teach is the elimination of the individual's restricted patterns of behavior, interests, or activities.
    - True
    - False
13. "He is disobedient" is an operational definition.
    - True
    - False
14. When going through the Person Centered Plan (PCP) process, it is not advised to include the individual with ASD.
    - True
    - False
15. The "A-B-Cs" of behavior stand for,

16. If the performance of a skill is too hard for a student, you would,
    - Identify the components of a skill in order in which they occur and teach them
    - Provide modifications and/or supports necessary to promote them
    - Identify prerequisite skill deficits and begin teaching them
    - All of the above

Appendix F

Autism Self-Efficacy Scale for Teachers

Ruble, L. A., Usher, E. L., & McGrew, J. H. (2011). Preliminary investigation of the sources of self-efficacy among teachers of students with autism. *Focus on Autism and Other Developmental Disabilities, 26*(2), 67-74. doi://doi.org/10.1177/108835761039734

Name:_____Date:_____

This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers of students with autism. Please rate how certain you are that you can do the things discussed with regard to the student with autism. Write the appropriate number in the space provided.

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

1. Conduct an assessment of this student's developmental skills/learning skills

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

2. Describe this student's characteristics that relate to autism

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

3. Describe the implications for intervention based on this student's characteristics of autism

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

4. Translate assessment information into teaching goals and objectives for this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain

can do

5. Write a measurable objective for this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

6. Write a teaching plan for this student based on goals and objectives

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

7. Generate teaching activities for this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

8. Organize the classroom to increase opportunities for learning for this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

9. Use visual structure to increase this student's independence

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

10. Help this student understand others

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

11. Help this student be understood by others

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

12. Provide opportunities for communication in the classroom throughout the day for this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

13. Assess the causes of problematic behaviors of this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

14. Design positive behavioral supports for this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

15. Implement positive behavioral supports for this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

16. Collect data to monitor this student's progress toward objectives

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

17. Make use of data to re-evaluate this student's goals or objectives

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

18. Assess this student's social interaction skills

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

19. Assess this student's play skills

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

20. Teach this student social interaction

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

21. Teach this student play skills

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

22. Train peer models to improve the social skills of this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

23. Describe parental concerns regarding this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

24. Communicate and work effectively with this student's parent(s) or caregiver

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

25. Describe parental priorities for learning with regard to this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

26. Help this student remain engaged

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

27. Sustain this student's attention

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

28. Motivate this student

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

29. Help this student feel successful

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

30. Teach this student academic skills

0	10	20	30	40	50	60	70	80	90	100
Cannot do at all					Moderately can do					Highly certain can do

Appendix G

Table 25. Certifications Reported by the Respondents

Years of Experience	Number of Reporting Teachers
Behavior/ Emotional Disability	5
Deaf Education	2
Specific Learning Appendix Disabilities	5
Special Education-Adaptive	9
Special Education- General	25
Lateral Entry	1
Elementary Education	9
ELA (reg. ed.)	8
Math (reg. ed.)	4
Sci (reg. ed.)	3
SS (reg. ed.)	5
K-12 Administration	1

*many respondents reported multiple areas of certification

Appendix H

Theory of Treatment

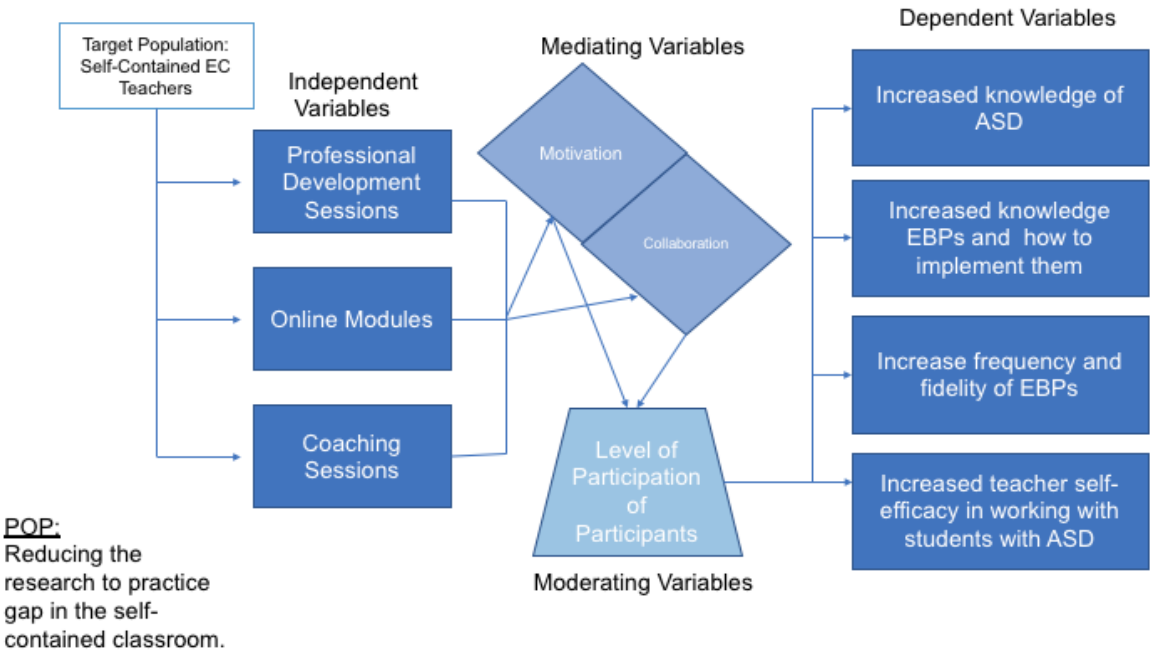


Figure 5. Theory of Treatment for the Intervention Study. This figure uses a causal diagram to represent the relationships between the intervention components (IVs), Mediating Variables, Moderating Variables, and the expected outcomes (DVs).

Appendix I

Logic Model

Inputs	Activities	Outputs	Short-Term Outcomes	Medium- Term Outcomes	Long- Term Outcomes
Participants: • Special Education Teachers (n=3-10) • Include Elementary, Middle, or High School Special Education Teachers Staff: • Student Researcher (PD leader, peer coach) Resources: • Online EBP modules, (AFIRM) • Existing technology platform access and use (including teacher laptops and projectors) • Access to district meeting space • Ability to award teachers CEUs for participation Time: • PD: overview of program, data collection • PD: after school sessions, 4 (an intro, one after each module, final), 2 hrs. each • Modules: on discrete trial training and	Professional Development sessions: • Educators will participate in 1 PD sessions focused on an Introduction to ASD & EBPs, 2 sessions focused on specific EBPs (discrete trial training & visual supports), and 1 session focused on classroom implementation & problem-solving • Pre-/post- ASD knowledge survey, EBP Inventory Checklist, ASSET self-efficacy survey Modules: • Educators will complete 2 pre-developed modules (using AFIRM) focused on 2 specific EBPs (roughly 2 ½ hours per module) • Pre-/post- EBP knowledge assessment within the module • Completion certificate Coaching sessions: • Educators will participate in 4 coaching sessions (2 per EBP) • Educators will receive constructive feedback focused on the implementation	Participant Engagement in: • Engagement in knowledge building focused on the characteristics of ASD • Engagement in knowledge building on the process and procedures of specific EBPs • Engagement in collaborative coaching sessions focused on the implementation of EBPs in the classroom Professional Development: • 4 sessions: 1 as an introduction, 2 created that align with the online modules, and 1 focused on problem-solving and implementation Data: • Background/Experience Survey • Pre/Post Surveys: Knowledge of ASD, EBPs Checklist, ASSET • Frequency of Use • Coaching Logs • Implementation Checklist • Certificates of completion • PD Sign-in • Social Validity Survey • Semi-structured Interviews	Increased Knowledge of ASD: • Educators will increase their knowledge of ASD and its characteristics Increased Knowledge of EBPs: • Educators will increase their knowledge of EBPs and their specific procedures Increased Frequency of use and fidelity of implementation of EBPs: • Educators will use EBPs with fidelity • Educators will increase their frequency of use of learned EBPs Increased Teacher Self-Efficacy implementation of EBPs: • Educators will increase their level of self-efficacy regarding EBPs	Consistent use of EBPs: • Educators will regularly plan lessons incorporating learned EBPs	Increased Student Achievement: • Consistent implementation of EBPs with fidelity will lead to the increased achievement of students with ASD

visual supports 2, roughly 2 ½ hrs. each • Coaching: 4 sessions, 2 for each EBP	of each EBP using the Implementation Checklist and Coaching Logs Focus Group/Semi-Structured Interview: • Educators will participate in one (60-minute maximum) semi-structured interview to reflect on the process				
Assumptions: (1) Teachers will be open to learning, coaching, and change in their daily instruction. (2) That the school district, specifically the special education department will allow teachers the time to attend session and allow me the time to support teachers through coaching. (3) That through PD and coaching, teachers will increase their use of instructional techniques designed for students with ASD. (4) That through this process teachers would feel better equipped to teach students with ASD. (5) That increased use of instructional techniques designed for students with ASD will provide better learning outcomes for our students over time.					
External Factors: (1) Level of teacher participation in all aspects of the intervention. (2) Amount of required professional development may limit teacher participation. (3) Changes in staff or leadership (unknown). (4) Level of motivation of participants. (5) Level of quality collaboration between student investigator and participants.					

Figure 6. The Logic Model. This logic model defines the inputs, activities, outputs and outcomes for the proposed intervention.

Appendix J

Evaluation Summary Matrix

Research Question	Indicator	Data Source	Frequency	Data Analysis
RQ1. To what extent was the combined program implemented with fidelity including dose, reach, and fidelity of implementation?	**Dose (delivered)** Definition: The number of intended units of each intervention or each component delivered or provided (Linnan and Steckler, 2002, p. 12, Table 1.1).	Professional Development-presentation PPT & observer notes demonstrating what was presented	4x- once per session	Qualitative analysis- compare PPT presentation to observer notes to determine each topic was fully covered
		Online Modules-certificates of completion demonstrating the online modules were presented (Autism Focused Intervention Resources and Modules, n.d.)	2x- submitted after completion	Quantitative- Confirm that both online modules have been completed
		Coaching Logs- Anecdotal notes contained in logs that demonstrate what was discussed during the coaching session (The National Professional Development Center, n.d.)	4x- after each session	Qualitative analysis- using pre-determined codes reviewing data 2x Data coded for emergent codes and patterns.
	Reach Definition: The proportion of intended target audience that participates in an intervention.	Attendance-professional development sign-in sheets	4x- once per session	Quantitative analysis- descriptive statistics (frequency, percentage of completion)
		Online Modules-certificates of completion	2x- submitted after completion	

	(Linnan and Steckler, 2002, p. 12, Table 1.1).	Coaching Logs- Record of participation	4x- once per session	
	Fidelity of Implementation	Professional Development- presentation PPT & observer notes demonstrating what was presented	4x- once per session	Qualitative analysis- compare PPT presentation to observer notes to determine each topic was fully covered
		Coaching Logs- Anecdotal notes contained in logs that demonstrate what was discussed during the coaching session (The National Professional Development Center, n.d.)	4x- after each session	Qualitative analysis- using pre-determined codes reviewing data 2x Data coded for emergent codes and patterns.
RQ2. What was the participants' experience in the combined intervention program?	**Dose (received)** Definition: The extent to which the participants actively engage with, interact with, are receptive to, and/or use materials or recommended resources (Linnan and Steckler, 2002, p. 12, Table 1.1).	Classroom Observations- implementation checklist & anecdotal notes (The National Professional Development Center, n.d.)	4x- after each coaching session	Quantitative- Descriptive statistical analysis (frequency, central tendency) of implementation checklist Qualitative analysis- anecdotal notes deductive analysis reviewing data 2x Data coded for emergent codes and patterns.

	Participant Experience	Semi-Structured Interviews (using 10 question interview protocol)	1x- at final professional development session Qualitative analysis-	Transcribe interviews, review transcription 2x Deductive analysis reviewing data 2x Data coded for emergent codes and patterns.
		Social Validity Survey- Likert-type electronic survey of 10 questions and 4 open-ended questions (Lane et al., 2002).	1x- at the end of the program	Quantitative- Descriptive statistical analysis (frequency, central tendency) of implementation checklist Qualitative analysis- open-ended questions using pre-determined codes reviewing data 2x Data coded for emergent codes and patterns.
RQ3. To what extent did the combined intervention program of professional development, online modules, and coaching sessions increase teacher knowledge of ASD and EBPs?	Knowledge of ASD	Knowledge of ASD Survey- 13 questions, true/false type (Schwartz & Drager, 2008; Small, 2012)	2x- pre- and post-program	Quantitative- Descriptive statistical analysis (frequency, central tendency)
	Knowledge of EBPs	Evidence-Based Practices Checklist- Likert-type checklist of 27 EBPs, first question (Strong,	2x- pre- and post-program	Quantitative- Descriptive statistical analysis (frequency, central tendency)

		2014; The National Professional Development Center, n.d.)		
RQ4. To what extent did the combined intervention program of professional development, online modules, and coaching sessions increase the frequency of use of EBPs in the classroom setting?	Frequency of use of EBPs	Frequency Data sheet	3x- Participants used the form prior to the intervention, at the end of the intervention, and again, six weeks after the intervention. Using a google reminder in the participants' email account, the student investigator reminded the participant to record frequency data on the use of specific EBPs, three times a day, across a five-day period.	Quantitative-Descriptive statistical analysis (frequency, central tendency)
RQ5. To what extent did the combined intervention program of professional development, online modules, and coaching sessions increase teacher self-efficacy levels regarding working with students with ASD?	Teacher Level of Self-Efficacy	Evidence-Based Practices Checklist- Likert-type checklist of 27 EBPs, second question: How confident are you in implementing these practices? (Strong, 2014; The National Professional Development Center, n.d.)	2x- pre- and post-program	Quantitative-Descriptive statistical analysis (frequency, central tendency)

		ASSET Survey- 30 question Likert-type survey (Ruble et al., 2011)	2x- pre- and post-program	Quantitative- Descriptive statistical analysis (frequency, central tendency)

Appendix K

Background, Experience, and Demographic Information

1. What is the highest degree you have achieved?

   ____ Bachelor's Degree
   ____ Some graduate course work
   ____ Master's Degree
   ____ Doctoral Degree
   ____ Other (Please explain_____)

2. What is your role in the District?

   ____ EC teacher
   ____ General Education teacher
   ____ Other (Please explain_____)

3. In which type of classroom do you work?

   ____Inclusion Classroom
   If inclusion, please choose which type:
   _____ Pre-Kindergarten
   _____ School-Age (Kindergarten-12th)
   ____Self-Contained Classroom
   If self-contained, please choose which type:
   _____ Cross-Categorical
   _____ Autism Spectrum Disorder

4. How many years of experience do you have?

   ____ 0-1 year
   ____ 2-5 years
   ____ 3-10 years
   ____ 10- 15 years
   ____ 16- 20 years
   ____ 20 + years

5. While completing your pre-service teacher education program did you receive any training specific to ASD? If so, please choose the option that best describes how much pre-service training related to ASD you received.

   _____ 0 credit hours
   _____ 1-5 credit hours
   _____ 6- 12 credit hours

_____ 13+ credit hours
_____ while I did not receive any credit hours specific to ASD, 1 or more of my class session focused on ASD

6. Have you received any professional development training specific to ASD since being employed? If so, please choose the option that best describes how much professional development training related to ASD you received.

_____ 0 training hours
_____ 1-5 training hours
_____ 6- 12 training hours
_____ 13+ training hours
_____ while I did not receive any training hours specific to ASD, 1 or more of my class session focused on ASD

Appendix L

Knowledge of ASD Survey

1. Children must exhibit impaired social interaction to receive a diagnosis of ASD.

True False

2. Children must exhibit self-injurious behaviors to receive a diagnosis of ASD.

True False

3. Children must exhibit behaviors and interests that are repetitive and stereotyped to receive a diagnosis of ASD.

True False

4. Children must exhibit impaired communication skills to receive a diagnosis of ASD.

True False

5. Some children with ASD exhibit over-sensitivity or under-sensitivity to pain.

True False

6. More boys are diagnosed with ASD than girls.

True False

7. Some children with ASD demonstrate uneven gross motor and fine motor skills.

True False

8. Children with ASD never make eye contact.

True False

9. Children with ASD are deliberately negative and noncompliant.

True False

10. Children with ASD do not show emotional attachment, even to parents.

True False

11. Most children with ASD do not talk.

True False

12. ASD exist only in childhood.

True False

13. With proper treatment, most children can outgrow ASD.

True False

Citations:

Small, S. (2012). Autism spectrum disorders (ASD): Knowledge, training, roles and responsibilities of school psychologists.

Schwartz, H. & Drager, K. (2008). Training and knowledge in autism among speech-language pathologists: a survey. *Language, Speech & Hearing Services in Schools*, 39(1), 66-77.

Appendix M

Evidence-Based Practices Checklist

Directions: Please read each of the evidence-based practices in the checklist. For each practice, indicate how familiar you are with the practice and how comfortable you are implementing the practice in your classroom setting. Use a checkmark to indicate your choices.

Evidence-Based Practice	How familiar are you with these practices?			How confident are you in implementing these practices?		
	Not Familiar	Somewhat Familiar	Very Familiar	Not Comfortable	Somewhat Comfortable	Very Comfortable
Antecedent-based intervention (ABI)						
Cognitive Behavioral Intervention (CBI)						
Differential Reinforcement (DR)						
Discrete Trial Training (DTT)						
Exercise (ECE)						
Extinction (EXT)						
Functional Behavior Assessment (FBA)						
Functional Communication Training (FCT)						
Modeling (MD)						
Naturalistic Interventions (NI)						
Parent-implemented Interventions (PII)						
Peer-mediated Instruction and Intervention (PMII)						
Picture Exchange Communication System (PECS)						
Pivotal Response Training (PRT)						
Prompting (PP)						
Reinforcement (R+)						
Response Interruption/Redirection (RIR)						
Scripting (SC)						

Evidence-Based Practice	How familiar are you with these practices?			How comfortable are you with implementing these practices?		
	Not Familiar	Somewhat Familiar	Very Familiar	Not Comfortable	Somewhat Comfortable	Very Comfortable
Self-Management (SM)						
Social Narratives (SN)						
Social Skills Training (SST)						
Structured Play Groups (SPG)						
Task Analysis (TA)						
Technology-aided Instruction and Intervention (TAII)						
Time Delay (TD)						
Video Modeling (VM)						
Visual Supports (VS)						

Citations:

National Professional Development Center. (n.d.) Retrieved October 5, 2017, http://autismpdc.fpg.unc.edu

Strong, J. E. (2014). *Preparing teachers of students with autism spectrum disorder: Evidence-based practices and teacher self-efficacy*. Virginia Commonwealth University.

Appendix N

Social Validity Survey for the Combined Program

Directions: Now that you have completed the combined program, please complete this survey to obtain information that will aid in determining the effectiveness and usefulness of the combined intervention in meeting the needs of teachers working with students diagnosed with ASD. . Please read the following statements regarding the combined program and circle the number that best describes your agreement or disagreement with each statement.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. The practices taught in the combined program were appropriate for use with my students.	5	4	3	2	1
2. The combined program was effective in meeting its goals.	5	4	3	2	1
3. I would suggest this combined program to other teachers	5	4	3	2	1
4. The combined program was appropriate to meet the needs of my students.	5	4	3	2	1
5. I used the practices taught in the combined program in the classroom setting	5	4	3	2	1
6. This practice used in the combined program did *not* result in negative side-effects for the students.	5	4	3	2	1

7. I liked the practices used in the combined program.	5	4	3	2	1
8. The monitoring procedures were manageable.	5	4	3	2	1
9. Most participants found the combined program suitable for the described purposes and mission	5	4	3	2	1
10. Overall, the combined program was beneficial for students with ASD.	5	4	3	2	1

Open-Ended Questions:

1. What do you feel was most beneficial aspect of the combined program? What was least beneficial?

2. Do you think that you and your students' participation in the combined program impacted your classroom practice for students with ASD? If so, how?

3. What would you change about the combined program (components, design, implementation, etc.) to make it more teacher-friendly?

4. What other information would you like to contribute about the combined program?

Adapted from:

Primary Intervention Rating Scale – Elementary Teacher Version (Lane et al., 2002; Adapted from Witt & Elliott, 1985 Intervention Rating Profile-15; IRP-15)

Appendix O

Coaching Log

THE NATIONAL PROFESSIONAL DEVELOPMENT CENTER ON
AUTISM SPECTRUM DISORDERS

Contact Form

Your Name: _____ **Date of Contact:** _____

Your Role on the NPDC on ASD Project

○ State TA Provider (in state working with model sites) ◉ NPDC University Staff (at FPG, Waisman, or M.I.N.D.)

What state and model site were you working with? _____

Who is the primary person you worked with? _____

What were the role(s) of the people you worked with?

○ Special Ed. Teacher ○ Related Services ○ Paraprofessional ○ Family Member
○ Regular Ed. Teacher ○ State TA Provider ○ Administrator ○ Other _____

How did you contact/interact?

○ In person/site-visit ○ Phone ○ Email ○ Other _____

How much time did you and each of the other TA providers spend during this contact?

TA Provider (name or initials)	Time (in hours and minutes)

Check any of the following that were a focus of your contact:

☐ GAS ☐ Implementing EBPs ☐ EBP Training ☐ General Quality of Instruction
☐ APERS ☐ Modeling/Coaching ☐ EBP Fidelity Check ☐ Summer Institute/State Training
☐ Families ☐ Classroom Management ☐ Other _____

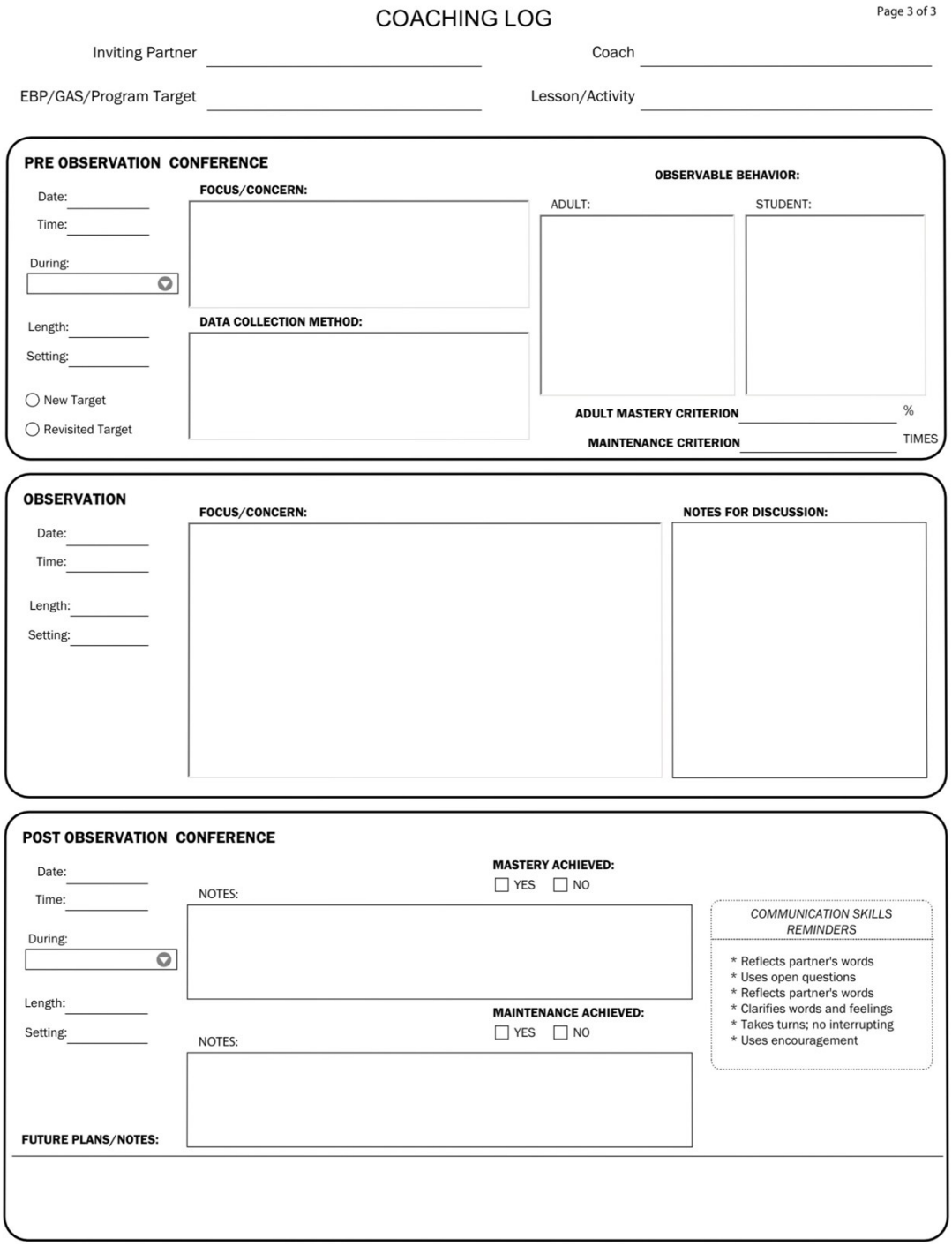
What EBPs were focused on during this contact? Check all that apply.

☐ Antecedent-based interventions ☐ Differential reinforcement ☐ Discrete trial training
☐ Computer-aided instruction ☐ Functional behavior assessment ☐ Functional communication training
☐ Extinction ☐ Parent-implemented interventions ☐ Peer-mediated instruction/intervention
☐ Naturalistic interventions ☐ Pivotal response training ☐ Prompting
☐ Picture exchange communication system ☐ Response interruption/redirection ☐ Self-management
☐ Reinforcement ☐ Social skills training groups ☐ Speech generating devices/VOCA
☐ Social narratives ☐ Structured work systems ☐ Task analysis
☐ Time delay ☐ Video modeling ☐ Visual supports
☐ None. This contact was focused on something that does not directly relate to EBPs.

Type/write notes below, or attach notes separately.
If needed, notes can be continued on next page.

☐ My notes are on an attached page

Type/write notes below (continued from last page).



COACHING LOG

Page 3 of 3

Inviting Partner _____ Coach _____

EBP/GAS/Program Target _____ Lesson/Activity _____

PRE OBSERVATION CONFERENCE

Date: _____
Time: _____
During: _____
Length: _____
Setting: _____
○ New Target
○ Revisited Target

FOCUS/CONCERN:

DATA COLLECTION METHOD:

OBSERVABLE BEHAVIOR:

ADULT:

STUDENT:

ADULT MASTERY CRITERION _____ %

MAINTENANCE CRITERION _____ TIMES

OBSERVATION

Date: _____
Time: _____
Length: _____
Setting: _____

FOCUS/CONCERN:

NOTES FOR DISCUSSION:

POST OBSERVATION CONFERENCE

Date: _____
Time: _____
During: _____
Length: _____
Setting: _____

MASTERY ACHIEVED: ☐ YES ☐ NO

NOTES:

MAINTENANCE ACHIEVED: ☐ YES ☐ NO

NOTES:

FUTURE PLANS/NOTES:

COMMUNICATION SKILLS REMINDERS

* Reflects partner's words
* Uses open questions
* Reflects partner's words
* Clarifies words and feelings
* Takes turns; no interrupting
* Uses encouragement

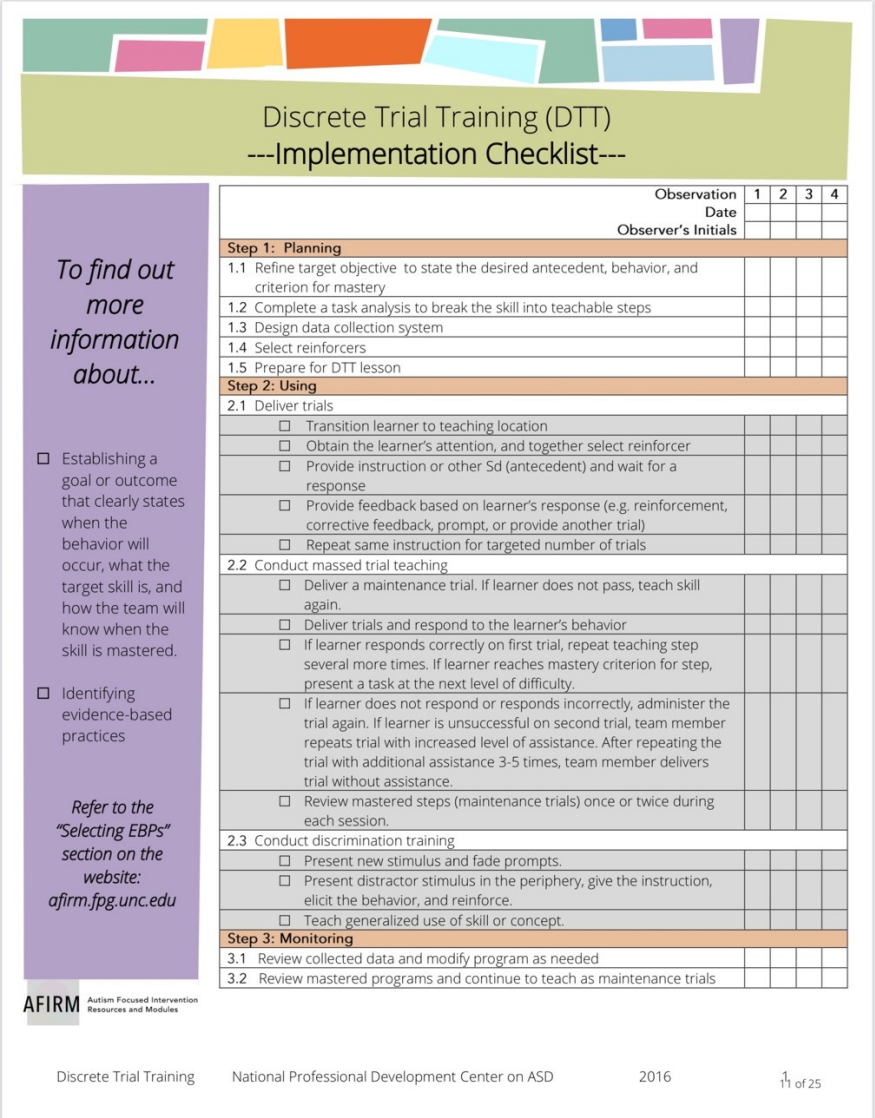
Citation:

National Professional Development Center. (n.d.) Retrieved October 5, 2017, http://autismpdc.fpg.unc.edu/npdc-model

Appendix P

Implementation Checklist

Discrete Trial Training



Discrete Trial Training (DTT)
---Implementation Checklist---

To find out more information about...

- ☐ Establishing a goal or outcome that clearly states when the behavior will occur, what the target skill is, and how the team will know when the skill is mastered.
- ☐ Identifying evidence-based practices

Refer to the "Selecting EBPs" section on the website: afirm.fpg.unc.edu

AFIRM Autism Focused Intervention Resources and Modules

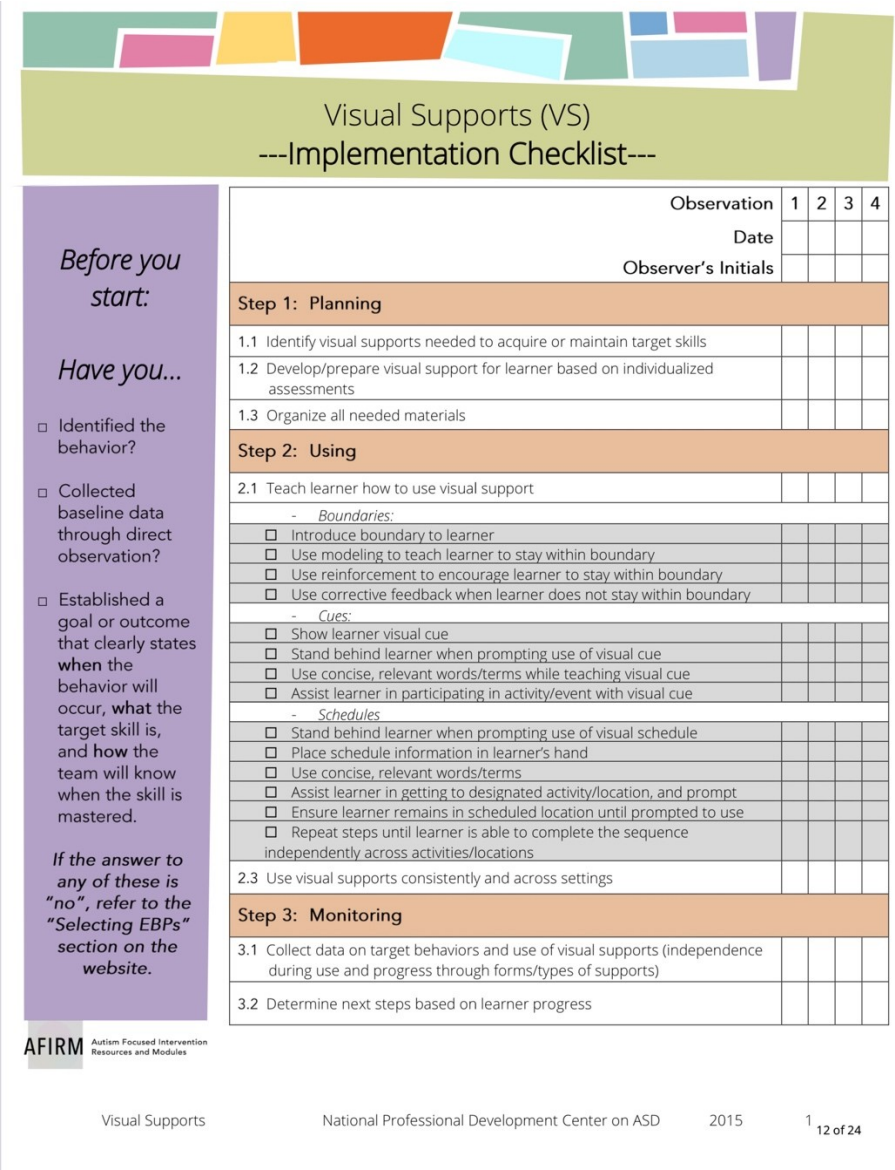
Observation / Date / Observer's Initials	1	2	3	4
Step 1: Planning				
1.1 Refine target objective to state the desired antecedent, behavior, and criterion for mastery				
1.2 Complete a task analysis to break the skill into teachable steps				
1.3 Design data collection system				
1.4 Select reinforcers				
1.5 Prepare for DTT lesson				
Step 2: Using				
2.1 Deliver trials				
☐ Transition learner to teaching location				
☐ Obtain the learner's attention, and together select reinforcer				
☐ Provide instruction or other Sd (antecedent) and wait for a response				
☐ Provide feedback based on learner's response (e.g. reinforcement, corrective feedback, prompt, or provide another trial)				
☐ Repeat same instruction for targeted number of trials				
2.2 Conduct massed trial teaching				
☐ Deliver a maintenance trial. If learner does not pass, teach skill again.				
☐ Deliver trials and respond to the learner's behavior				
☐ If learner responds correctly on first trial, repeat teaching step several more times. If learner reaches mastery criterion for step, present a task at the next level of difficulty.				
☐ If learner does not respond or responds incorrectly, administer the trial again. If learner is unsuccessful on second trial, team member repeats trial with increased level of assistance. After repeating the trial with additional assistance 3-5 times, team member delivers trial without assistance.				
☐ Review mastered steps (maintenance trials) once or twice during each session.				
2.3 Conduct discrimination training				
☐ Present new stimulus and fade prompts.				
☐ Present distractor stimulus in the periphery, give the instruction, elicit the behavior, and reinforce.				
☐ Teach generalized use of skill or concept.				
Step 3: Monitoring				
3.1 Review collected data and modify program as needed				
3.2 Review mastered programs and continue to teach as maintenance trials				

Discrete Trial Training National Professional Development Center on ASD 2016 11 of 25

Citation:

Sam, A., & AFIRM Team. (2016). *Discrete trial training*. Chapel Hill, NC: National Professional Development Center on Autism Spectrum Disorder, FPG Child Development Center, University of North Carolina. Retrieved on October 12, 2017 from http://afirm.fpg.unc.edu/discrete-trial-training

Visual Supports



Visual Supports (VS)
---Implementation Checklist---

Before you start:

Have you...

- ☐ Identified the behavior?
- ☐ Collected baseline data through direct observation?
- ☐ Established a goal or outcome that clearly states **when** the behavior will occur, **what** the target skill is, and **how** the team will know when the skill is mastered.

If the answer to any of these is "no", refer to the "Selecting EBPs" section on the website.

AFIRM Autism Focused Intervention Resources and Modules

	Observation	1	2	3	4
	Date				
	Observer's Initials				
Step 1: Planning					
1.1	Identify visual supports needed to acquire or maintain target skills				
1.2	Develop/prepare visual support for learner based on individualized assessments				
1.3	Organize all needed materials				
Step 2: Using					
2.1	Teach learner how to use visual support				
	- *Boundaries:*				
	☐ Introduce boundary to learner				
	☐ Use modeling to teach learner to stay within boundary				
	☐ Use reinforcement to encourage learner to stay within boundary				
	☐ Use corrective feedback when learner does not stay within boundary				
	- *Cues:*				
	☐ Show learner visual cue				
	☐ Stand behind learner when prompting use of visual cue				
	☐ Use concise, relevant words/terms while teaching visual cue				
	☐ Assist learner in participating in activity/event with visual cue				
	- *Schedules*				
	☐ Stand behind learner when prompting use of visual schedule				
	☐ Place schedule information in learner's hand				
	☐ Use concise, relevant words/terms				
	☐ Assist learner in getting to designated activity/location, and prompt				
	☐ Ensure learner remains in scheduled location until prompted to use				
	☐ Repeat steps until learner is able to complete the sequence independently across activities/locations				
2.3	Use visual supports consistently and across settings				
Step 3: Monitoring					
3.1	Collect data on target behaviors and use of visual supports (independence during use and progress through forms/types of supports)				
3.2	Determine next steps based on learner progress				

Visual Supports National Professional Development Center on ASD 2015 1 12 of 24

Citation:

Sam, A., & AFIRM Team. (2015). *Visual supports*. Chapel Hill, NC: National Professional Development Center on Autism Spectrum Disorder, FPG Child Development Center, University of North Carolina. Retrieved on October 12, 2017 from http://afirm.fpg.unc.edu/visual-supports

Appendix Q

Frequency of Use of the Evidence-Based Practices

Participant Code: _____

Week of: _____

Directions: Please use tally marks to record the number of times you used Discrete Trial Training or Visual Supports over the last hour, each time you receive a google calendar reminder.

Discrete Trial Training

	Tuesday	Wednesday	Thursday	Friday	Monday
Time 1					
Time 2					
Time 3					

Visual Supports

	Tuesday	Wednesday	Thursday	Friday	Monday
Time 1					
Time 2					
Time 3					

Appendix P

Permissions for Survey Use

PA

Permissions Asha
Mon 10/21/2019 8:33 AM
Melissa J. Armstrong

Dear Ms. Armstrong:

Thank you for contacting ASHA. Permission is granted to reprint the adapted Characteristics of Autism survey used in Schwartz and Drager (2008) in your forthcoming thesis.

Best regards,

Libby

Libby Bauer
Director of Operations & Product Management
Serial Publications
American Speech-Language-Hearing Association

SJ

Strong, Jane
Mon 7/9/2018 2:11 PM
Melissa Armstrong

Dear Ms. Armstrong,

I absolutely support your use of my version of the instrument. I look forward to reading your study!

Best wishes,
Jane

Jane Strong, Ph.D.
Director of Special Ed Procedural Support
Fairfax County Public Schools
Sent from my iPhone

On Jul 9, 2018, at 3:20 PM, Drager, Kathryn D R wrote:

Hi Melissa,
Thanks for contacting me. You only need permission from one of the authors, so you shouldn't need to locate Heatherann Schwartz. I have no problem with you using any of the survey. However, depending on what you want to do, or how similar the modified version is, my understanding is that you also need the permission of the publisher, which in this case is the American Speech-Language-Hearing Association. They have given this permission in the past, but you'll have to get that directly from them.

Good luck in your work!

Kathy

~~~~~~

Kathryn Drager, PhD, CCC-SLP

Interim Dean

Associate Dean for Research and Graduate Education

Professor of Communication Sciences and Disorders
College of Health and Human Development
The Pennsylvania State University

SS

Stacey Small
Mon 7/9, 3:51 PM
Melissa Armstrong

Reply all

Hi Melissa,

You have my permission to use my survey for your dissertation. Good luck!

Best,

Stacey Small

Sent from my iPhone
~~~~~~

Appendix R

EBP Checklist Survey Results for Familiarity by EBP

Evidence-Based Practices	How familiar are you with these practices?						
	Pre-Assessment			Post-Assessment			
	Not Familiar	Somewhat Familiar	Very Familiar	Not Familiar	Somewhat Familiar	Very Familiar	Percentage of Increase
Antecedent-based intervention (ABI)	3	1	0	1	2	1	75%
Cognitive Behavioral Intervention (CBI)	1	3	0	1	3	0	0%
Differential Reinforcement (DR)	2	2	0	0	4	0	50%
Discrete Trial Training (DTT)	3	1	0	0	0	4	100%
Exercise (ECE)	2	2	0	2	2	0	0%
Extinction (EXT)	2	2	0	2	1	1	25%
Functional Behavior Assessment (FBA)	0	3	1	0	1	3	50%
Functional Communication Training (FCT)	3	1	0	3	1	0	0%
Modeling (MD)	0	2	2	0	0	4	50%
Naturalistic Interventions (NI)	3	1	0	2	1	1	25%
Parent-implemented Interventions (PII)	3	1	0	3	1	0	0%
Peer-mediated Instruction and Intervention (PMII)	3	1	0	4	0	0	-25%
Picture Exchange Communication System (PECS)	1	2	1	0	3	1	50%
Pivotal Response Training (PRT)	3	1	0	3	0	1	25%
Prompting (PP)	0	3	1	0	3	1	0%
Reinforcement (R+)	0	3	1	0	2	2	25%
Response Interruption/ Redirection (RIR)	2	2	0	4	0	0	-50%
Scripting (SC)	2	2	0	0	4	0	50%
Self-Management (SM)	2	2	0	2	2	0	0%
Social Narratives (SN)	1	3	0	1	1	2	50%

Social Skills Training (SST)	2	2	0	1	3	0	25%
Structured Play Groups (SPG)	1	3	0	3	1	0	50%
Task Analysis (TA)	2	2	0	0	3	1	75%
Technology-aided Instruction and Intervention (TAII)	3	1	0	4	0	0	-25%
Time Delay (TD)	3	1	0	2	1	1	50%
Video Modeling (VM)	2	2	0	2	1	1	25%

Appendix S

EBP Checklist Results for Comfort Level by EBP

Evidence-Based Practices	How comfortable are you with implementing these practices?						
	Pre-Assessment			Post-Assessment			
	Not Comfortable	Somewhat Comfortable	Very Comfortable	Not Comfortable	Somewhat Comfortable	Very Comfortable	Percentage of Increase
Antecedent-based intervention (ABI)	4	0	0	2	2	0	50%
Cognitive Behavioral Intervention (CBI)	3	1	0	3	1	0	0%
Differential Reinforcement (DR)	4	0	0	2	2	0	50%
Discrete Trial Training (DTT)	4	0	0	0	1	3	75%
Exercise (ECE)	4	0	0	3	1	0	25%
Extinction (EXT)	4	0	0	3	0	1	25%
Functional Behavior Assessment (FBA)	2	2	0	0	2	2	50%
Functional Communication Training (FCT)	4	0	0	3	1	0	25%
Modeling (MD)	0	3	1	0	1	3	75%
Naturalistic Interventions (NI)	4	0	0	2	1	1	50%
Parent-implemented Interventions (PII)	4	0	0	4	0	0	0%
Peer-mediated Instruction and Intervention (PMII)	4	0	0	4	0	0	0%
Picture Exchange Communication System (PECS)	2	2	0	1	3	0	25%
Pivotal Response Training (PRT)	4	0	0	3	1	0	25%
Prompting (PP)	0	3	1	0	3	1	0%
Reinforcement (R+)	0	3	1	0	2	2	25%
Response Interruption/ Redirection (RIR)	2	2	0	4	0	0	-50%
Scripting (SC)	4	0	0	0	4	0	0%
Self-Management (SM)	3	1	0	1	3	0	50%

Social Narratives (SN)	3	1	0	1	1	2	50%
Social Skills Training (SST)	4	0	0	1	3	0	25%
Structured Play Groups (SPG)	3	1	0	4	0	0	25%
Task Analysis (TA)	3	1	0	0	3	1	75%
Technology-aided Instruction and Intervention (TAII)	4	0	0	4	0	0	0%
Time Delay (TD)	3	1	0	2	1	1	50%
Video Modeling (VM)	3	1	0	2	1	1	50%
Visual Supports (VS)	0	3	1	0	0	4	75%

MELISSA J. ARMSTRONG

Education

Ed.D. The Johns Hopkins University, Mind, Brain, and Teaching — May 2020
Dissertation: "Reducing the Gap: Preparing Teachers to Use Evidence-Based Practices in Autism"
Committee: Dr. Christine Accardo (chair), Dr. Carey Borkoski, Dr. Tamara Marder

M.Ed. University of Massachusetts Lowell — May 2016
Curriculum and Instruction, with an Autism Focus
Thesis: "Teacher Work Sample: Improving Literacy Instruction for Students Diagnosed with Autism Spectrum Disorders"

B.S.Ed. Temple University, Early, Elementary, and Special Education — January 1999
Graduated Cum Laude

Honors and Awards

Educator of Excellence — 2019
Selected by Nash-Rocky Mount Schools as a North Carolina Educator of Excellence

Teaching Experience

Nash-Rocky Mount Schools, NC — Aug 2009 to Present
Exceptional Children's Teacher

- Designed daily instruction for students incorporating the use of the Evidence-Based Practices in Autism, to meet individual student IEP goals
- Work with the multidisciplinary team to create and execute IEPs, behavior plans, and three-year reevaluations.
- Communicate progress and current learning objectives regularly with parents.
- Maintain the Exceptional Children's and cumulative records.
- Supervised two assistant teachers.

Pitt County Schools, NC — October 2005 to July 2009
Exceptional Children's Teacher

- Wrote and taught daily classroom lessons for a kindergarten through fifth grade self-contained classroom for students with autism.
- Designed individual and group lessons based on IEP goals and NC Standard Course of Study.
- Worked with the multidisciplinary team to create and execute IEPs, behavior plans, and three-year reevaluations.
- Communicated progress and current learning objectives regularly with parents.

- Maintain the Exceptional Children's and cumulative records.
- Supervised two assistant teachers.

Pitt County Schools, NC July 2008 to July 2009
Exceptional Children's Contact

- Attended monthly meetings with the Exceptional Children's Director and Program Staff.
- Met monthly with school EC team to disseminate information, and discussed school-related issues.
- Supervised the initial eligibility/reevaluation process and semiannual DPI headcount for the school.
- Maintained the Exceptional Children's and CECAS records for all EC students.
- Compiled monthly reports for county EC department.
- Supervised a staff of six EC teachers and four assistants.

Christ Covenant School, NC July 2004 to June 2005
Second Grade Teacher

- Wrote and taught daily classroom lessons for a second grade class of twenty students.
- Designed yearly, weekly, and daily plans for the subjects: Reading, Phonics, English, Math, History, Science, and Bible.
- Researched and wrote curriculum for the subjects Science and History using the Classical Teaching Method.
- Administered admission tests for prospective students.
- Maintained classroom and school records for twenty students.

Pitt County Schools, NC August 2002 to July 2004
Exceptional Children's Teacher

- Wrote and taught daily classroom lessons for resource fourth, fifth, and sixth grade language arts and mathematics classes.
- Designed lessons based on IEP goals and NC Standard Course of Study goals.
- Worked closely with the regular education teachers to plan and modify classroom assignments based on individual student needs.
- Worked with the multidisciplinary team to create and execute IEPs, behavior plans, and three-year reevaluations.
- Communicated progress and current learning objectives regularly with parents.
- Maintain the Exceptional Children's and cumulative records.
- Supervised one assistant teacher.

William Penn School District, PA October 2000 to June 2002
Special Education Teacher

- Wrote and taught daily classroom lessons for a part-time learning support class of seventh, eighth, and ninth grade students.
- Worked with the multidisciplinary team to create and carry out behavior plans, IEPs, and three-year reevaluations.
- Communicated progress and current learning objectives regularly with parents.
- Maintain the Special Education and cumulative records.

- Supervised one assistant teacher.

William Penn School District, PA January 2000 to June 2002
Special Education Liaison

- Organized and managed the special education department for the school.
- Supervised the IEP and evaluation process for all special education students.
- Placed special education students into appropriate classroom assignments according to their IEPs.
- Maintained the records for all special education students.
- Supervised 13 special education teachers.

Northwest Children's Services, PA September 1999 to August 2000
Special Education Teacher

- Wrote and taught daily classrooms lessons for a multiple age emotional support classroom for children with a history of psychiatric problems in a residential treatment facility.
- With the clinical team, formulated and executed behavior plans, ISPs, and IEPs.
- Maintained school records for all children residing within the treatment unit.
- Supervised the school and mental health staff.

Accomplishments

Governor's Teacher Network, May 2014- Present

North Carolina

Autism Support Team, Chair August 2012- Present

Nash-Rocky Mount Public Schools

Autism Support Team, Member/ Trainer August 2011- Present

Nash-Rocky Mount Public Schools

Exceptional Children's Curriculum Team, Member/ Trainer November 2014- Present

Nash-Rocky Mount Public Schools
