Group Training of Applied Behavior Analysis Knowledge Competencies to School-Based

Paraprofessionals for Students in Substantially Separated Classrooms

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Nicole Grube-Benson

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Committee Members

Committee Chair: Dr. Toni Mild

      Department Chair of Special Education Department

      Slippery Rock University

Committee Member: Dr. Ashlea Rineer-Hershey

      Doctorate Program Coordinator of Special Education Department

      Slippery Rock University

Committee Member: Dr. Tyler Ferguson

      Professor of School Psychology

      Northeastern University

Abstract

This study explores the efficacy of Applied Behavior Analysis (ABA)-based training for paraprofessionals supporting students with Autism Spectrum Disorder (ASD) in specialized educational settings. The research, conducted in an urban northeastern public school district, assessed historical data. Using a pretest/posttest quasi-experimental design, thirty-five first-year paraprofessionals underwent structured training across three modules. Results demonstrated significant knowledge gains: Module One saw a 14% increase, Module Two a 16% increase, and Module Three an 8% increase. These findings underscore the importance of targeted professional development in enhancing paraprofessionals' effectiveness in ABA-based classrooms for students with ASD.

Keywords: paraprofessional, applied behavior analysis, autism, evidence based practice

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I would like to give a big thank you to all my family and friends for supporting me, listening to my ideas, and trying new interventions out as I went through school. Thank you to my professors for their insight into special education. A special thank you to my chair and dissertation committee for supporting me through the process. To my family, thank you for your patience and support while you delivered meals to me at the computer. Thanks, Mom, for being here. To Todd, what can I say that I have not already expressed? Thankfully, we both said yes to going bowling. Who would have ever thought, at 17-years-old, we would be where we are now? Look at all the accomplishments and wonderful moments we have had over the years. And we both know there have been many! It is wild to think back to 1989. Did you know, "Three old ladies…." Would lead to, "Do you own a vacuum?" Ending into years of the moving trucks growing in size. I believe the first move PA to MO move we only had a pull along for Zachary's toys, clothes, and a mattress. Soo many wonderful moments with the kids. Remember our first pets? How the frogs would play hide and seek with Zachary. Then came Jasmine, Brianna, Miles, and Moe! Lunches in the car for nap times. Countless hours of watching the same DVD movies on the portable television. Leading into the came the minivan. Yup, we were top notch parenting in the minivan with hid away seats and the extended back version! We definitely need to update our book *The Places You will Go*! Fabulous birthday parties, kids' sports, kids' music concerts (OMG middle school), amazing trips, confirmations, kids' graduations, your doctorate, and countless trips to the emergency room for home construction projects. Time to start another adventure!

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Chapter 1

Introduction

Before the 1970s, over 4.5 million US children with disabilities were denied public education (Wright & Wright, 2021). These children remained at home or institutionalized due to medical, developmental, or mental-health challenges, such as emotional disturbance, intellectual disability, or visual or auditory impairment. At the time, because each state could develop unique laws for educating students with disabilities (USDOE, 1973), several states denied such students from receiving education or participating in activities in schools (Mills v. Board of Education, 1972; P.A.R.C. v. Commonwealth of Pennsylvania, 1972: USDOE, 2010; Wright et al., 2021). As such, the Rehabilitation Act of 1973 dictated the treatment and educational rights of students with disabilities in public schools (*Pub. L. 93–112*, Rehab. Act), including students with severe needs, highlighting the use of rehabilitative services (USDOE, 1973). In addition, this legislation focused on the expansion of research and training opportunities related to individuals with disabilities (USDOE, 1973). Without this legislation, many individuals with disabilities could not access the support and opportunities needed to acquire skills to be independent (USDOE, 1973). The Education for all Handicapped Children Act of 1975 quickly followed the Rehabilitation Act, protecting children who were once denied or had unequal access to education (US Department of Special Education, 2010), and ensuring that free and appropriate education was provided to all students, regardless of their disabilities (US Department of Special Education, 2010).

In response to the increased school enrollment from these acts, federal officials developed a new school role to aid teachers and ensure the educational needs of students with disabilities were met (Watkins, 2015; Giangreco et al., 2001). This role was the paraprofessional. Because paraprofessionals did not need a professional certification or a college degree to perform their role, school districts could pay less for their services (Giangreco et al., 2001) and use them based on the needs of the school. Clerical tasks such as attendance, making class materials, bathroom breaks, and lunchroom duties became part of the paraprofessional responsibilities.

In January 2002, the No Child Left Behind Act (NCLB) was updated to increase accountability in schools relative to student academic outcomes. Additionally, this act stated that paraprofessionals who provide instructional support must be supervised by teachers. This act was the first to mention supervision of paraprofessionals. In 2004, NCLB was further updated with the Individuals with Disabilities Education Act (IDEA, 2004), in which paraprofessionals were federally defined as "assistants who are appropriately trained and supervised…to assist in the provision of special education" (IDEA Subchapter II, Section 1412 (a)(14)(B)). While NCLB acknowledged the need for paraprofessional development and supervision, clear guidelines were not developed at a federal or state level, leaving school districts on their own to determine how and when to provide paraprofessional supervision and professional development times.

At the same time, applied behavior analysis (ABA) was introduced in special education classrooms as a method of intervention for students diagnosed with autism. ABA is the scientific analysis of behavior and the application of core behavioral principles—reinforcement, punishment, extinction, and generalization—designed to develop meaningful and socially significant behaviors among students (Bear et al., 1967). In schools that use this approach, paraprofessionals use ABA techniques across school settings for academic instruction, social

interactions, and communication skills, as well as to increase meaningful behaviors and provide replacement behaviors to decrease challenging behaviors such as aggression to others or self.

Statement of the Problem

Despite the role of paraprofessionals holding immense value in special education, paraprofessional development remains limited (Tompkins et al., 2012), and district professional learning opportunities are often exclusive to teachers. As a result, teachers are responsible for delivering on-the-job training to paraprofessionals in their classrooms. School districts consider this on-the-job training an adequate model for paraprofessionals to learn the needed skills, those with the greatest level of student involvement remain to have the least amount of professional development (Maggin, Fallon, Sanetti, & Ruberto, 2012). In fact, many paraprofessionals do not have a background in special education or receive professional education opportunities after the initial start-of-school-year training (Tompkins et al., 2012; Giangreco et al., 2010).

Paraprofessionals are on the front lines of student support in special education (Maggin, Fallon, Sanetti, & Ruberto, 2012). They are considered a valued part of special education classrooms. However, it is unclear whether they receive the necessary professional development to fulfill their jobs. Paraprofessionals may struggle to effectively support students with special needs if they do not adhere to a stringent and ongoing training regimen (Causton-Theoris & Malmgren).

Organization of the Study

This thesis details the role of paraprofessionals in special-education classrooms implementing ABA. Supervision and professional learning opportunities are reviewed, followed by an examination of the skills that paraprofessionals need to work in such classrooms. Essential key terms are then defined. Subsequently, a review of the literature on paraprofessionals is

presented, focusing on their role in special education and the training available to them. Following this review, the research method is described, after which the results are presented. Finally, the limitations of the study are addressed, and recommendations for future research are provided.

Interest in the Study

Far too frequently, classrooms are challenged with the task how to address the social/emotional and academic needs of an increasingly diverse student body. It is imperative for educators to recognize the inherent connection between student learning and behavior, with behavior emerging as one of the primary challenges faced within schools. Various strategies, such as the use of ABA, do exist for educators whether specializing in special or general education.

Over the 2019-2020 academic year, the substantially separated classrooms focused on within this study experienced an increase of students enrolled from 8 to 11. To meet the needs of the students, additional paraprofessionals were hired. Alongside the increase in students and staff, there was a rise in student behavior concerns, the utilization of physical restraints, and staff injury, all despite teachers and paraprofessionals receiving 12 hours of behavior management training. Due to the increase in behaviors the specialized ABA-based program identified there was a need for change for paraprofessional training.

Following the COVID-19 pandemic and the return to in-person classroom learning, April 2021, sporadic professional development opportunities were provided to paraprofessionals employed within the district ABA-based elementry classrooms. Topics focus on understanding ABA, Autism, and behavior management. While this training approach was helpful, paraprofessionals continued to request additional training workshops to provide theory and

practice opportunities. Through a meeting between the special-education director, assistant special-education director, and behavior specialist the special-education department agreed to provide group ABA training workshops for paraprofessionals at the start of each school year.

Meanwhile at the national level, the Education Advisory Board (EAB) conducted a 2022 survey focused on current concerns within the classroom. Of the 1,109 respondents (teachers, therapists, district administrators) 84% agreed that students' behavioral skills lag behind those of the same age from two years ago. Additionally, 77% of respondents acknowledged that student behavior ranks among their primary concerns this year, representing an increase from 61% before the onset of the pandemic. The survey data further indicates a notable escalation in reported instances of bullying, violence, and opposition in students' relationships with both peers and adults since 2018.Correspondingly, 71% of teachers shared the same sentiment, estimating an average loss of 144 minutes of instructional time per week (equivalent to 14.5 school days per year) attributed to behavioral disruptions in the classroom.

Significance of the Study

Educating children with Autism Spectrum Disorder (ASD) and other disabilities is a responsibility of public schools. Effective 1975, as part of the Education of All Handicapped Children Act (now known as IDEA) public schools remain the primary setting for students with ASD to receive specialized interventions until adulthood (Murdick, Gartin, & Crabtree, 2002). To provide such interventions, public schools must adopt ABA-based programs for ASD students at a rate that matches that of children enrolling every year. Professional development is the key to ensuring that paraprofessionals have the required knowledge and skills to promote student success in the classroom. Paraprofessionals must be able to make informed decisions based on research to prompt the advancement of academic and social-emotional student skills.

The current benchmarks set by Every Student Succeeds Act of 2015 (ESSA) and federal mandates, such as IDEA, also create urgency for the adoption of ABA-based treatment interventions. Under the Least Restrictive Environment clause of IDEA, federal law requires that students with disabilities be educated with their nondisabled peers to the greatest appropriate extent. Students with ASD often display challenging behaviors that hamper the effective implementation of this clause; however ABA-based interventions are effective at reducing such behaviors to a level at which the students can be educated alongside their nondisabled peers, in either general classrooms or a combination of self-contained and general classrooms (Dawson, Jones, et al., 2012; Eapen, Rudi, & Walter, 2013; Grindel, Hastings, Saville et al., 2012; Sack-Min, 2008).

Furthermore, the financial toll on taxpayers when public schools fail to adopt ABA-based interventions for students with ASD cannot be ignored. Under IDEA, children with autism are guaranteed a free and appropriate public education that allows them to learn as much as possible. However, when public schools can no longer support students due to the severity of behaviors or lack of district resources, districts will seek alternative placement for the student. Additionally, when public schools do not use interventions with proven effectiveness, parents may seek legal advice resulting in a recommendation for costly private-school alternatives (Yell & Drasgow, 2000). The estimated cost of educating a student with autism in a private school can range from $22,500 to $75,000 per year, with an additional cost of transportation. This financial strain necessitates that public schools implement their own programs that are less expensive.

All these factors—the rising number of children with ASD enrolling in public schools, the high costs of educating such children in private schools and on taxpayers (Chasson, Harris, & Neely, 2007; Jacobson, Mulick, & Green, 1998), and the need for schools to adopt least-

restrictive interventions for students with disabilities (IDEA, 2004)—generate an urgency in professional development opportunities for paraprofessionals is imperative. IDEA (2004) and ESSA (2015) require all special-education professionals, including paraprofessionals, receive continued training that includes content on evidence-based practice (EBP). Based on the 2009–2015 May Institute EBP list, ABA is a vital method of interventions to support students with ASD (Cook & Odom, 2013). Douglas et al. (2012) asked paraprofessionals about district-provided training, and the paraprofessionals reported that the provided training was insufficient to implement EBP. Chopra et al., (2011) concluded that the most common concern for paraprofessionals was not only the lack of professional development provided by school districts but also that supervising teachers were either unwilling or unable to provide guidance and training. A central part of EBP is the creation of paraprofessional learning opportunities to ensure consistency and fidelity to ABA interventions.

Delimitations

As this research was conducted for a doctoral dissertation, this was a single year study. To address this limitation, historical data regarding paraprofessional development training opportunities for paraprofessionals employed in substantially separate ABA classrooms for the 2022–2023 academic year was selected to examine. This researcher only had access to the 2022-2023 academic year data at the time of the study.

Key Terms

Applied Behavior Analysis

Applied behavior analysis (ABA) is the scientific analysis of behavior and the application of the core behavioral principles designed to develop meaningful and socially significant behaviors—namely, reinforcement, punishment, and extinction (Bear et al., 1968).

Autism Spectrum Disorder

Under IDEA, autism spectrum disorder (ASD) is defined as "a developmental disability significantly affecting verbal and nonverbal communication and social interaction, usually evident before age three, that adversely affects a child's educational performance. Other characteristics often associated with ASD are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences" (section 300.8 (c)(1)). IDEA points out that, should a student's emotional disturbance negatively affect the student's educational performance, the term *autism* does not apply.

Behavior Intervention Plan

Using one of the dimensions of ABA, behavior intervention plans (BIPs) are guided by FBA outcomes. BIPs are step-by-step procedures for addressing behavior with a functionally selected intervention (Cooper et al., 2017). Interventions are specifically outlined on BIPs in a manner specific to the identified individual, which allows for consistently implementing the intervention. BIPs describe targeted behavior for change, antecedent strategies, response or consequence strategies, replacement behavior, reinforcement strategies, and systems for tracking behavior change (Glasberg, 2006).

Challenging Behavior

These behaviors were defined as socially unacceptable behaviors that had a high intensity topography, long duration, or high frequency and that harm students' safety and daily living, resulting in limited educational opportunities, vocational exposure, and community-based outings (Emerson, 1995; Matson et al., 2010).

Evidence-Based Practice

In 2009 and then updated in 2015, the National Autism Center, through the May Institute, conducted the National Standards Project (May Institute, 2015) to identify a comprehensive list of effective research-based interventions to target traits of ASD (May Institute, 2015). EBP within ABA is a decision-making process which combines empirical evidence, complex decision-making along with the repertoire of a trained behavior analyst, when selecting an intervention which is social valid and when applied will provide a meaningful change in behavior for the individual.

Functional Behavior Assessment

In accordance with Cooper, Heron, and Heward (2007), a functional behavioral assessment (FBA) is a systematic method of gathering information about a targeted behavior to identify the relationship of the targeted behavior to environmental and motivational factors, and the function or purpose of the behavior. The findings from FBAs steer the selection of functional interventions to decrease the targeted behavior while increasing a socially appropriate replacement behavior (Cooper et al., 2007).

Individualized Educational Plan

Individualized educational plans (IEPs) are legal documents reporting students' current academic, social, or behavioral performance based on assessment and observation by trained educators and therapists. These documents outline the delivery rate of special education, therapists, and services for those students who qualify for special education. IEPs contain students' educational placements, goals, necessary accommodations, modifications, and frequency of service to achieve the advancement of skills relative to a school-based setting (US Department of Education, 2010).

Summary

IDEA (2004) and ESSA (2015) require all special education professionals, including paraprofessionals, receive continued professional education related to the content and responsibilities they provide within the classroom. Based on the 2009, 2015, May Institute EBP list, ABA is a vital methodology of interventions to support students diagnosed with ASD (Cook & Odom, 2013). Douglas et al., (2012) asked paraprofessionals questions about district provided professional development, and paraprofessionals reported the provided training was not enough to implement EBP and, at times, not related to support they provide within the classroom. In support, Chopra et al., (2011) conclude that the most common concern for paraprofessionals was not only the lack of professional learning opportunities provided by school districts but also that supervising teachers were either unwilling or unable to provide guidance and trainings. A central part of providing EBP within the classroom is providing professional development times for those implementing EBP to ensure consistency and fidelity to ABA interventions, which can only occur with training and supervision by a trained teacher or applied behavior analysist.

Chapter two will provide a review of literature on paraprofessional role, within special education classrooms implementing ABA. Supervision and professional development opportunities will be reviewed followed by an examination of skills paraprofessionals need to possess to work within a special education classroom utilizing ABA. Essential key terms are defined in the definition section allowing the reader a better understanding of how the terms is interpreted for the purpose of the study. Subsequently, a review of current literature related to paraprofessionals will be conducted, focusing on their roles in special education and available professional development training opportunities.

Following the literature review, chapter three the methodology of the research

emphasizes its quantitative nature. Group knowledge of ABA will be examined using a pre-test –

post-test approach . The study will review data collection and analysis, revealing new

information from the study. In conclusion, the study will address its limitations and offer

recommendations for future research. After the review of literature, the quantitative nature of the

methodology of the research will be explored. The reader will then explore the method of data

collection and analysis and what added information has been learned from the data analysis.

Finally, limitations and recommendations for future research and teaching sessions will be

examined and discussed.

Chapter 2

Review of Literature

Today, paraprofessionals are providing a tremendous amount of support by directly teaching academics, social skills, and behavior strategies to students with ASD. This literature review provides an overview of how paraprofessionals support special education classrooms by examining their roles, the needs of students with ASD, challenging behaviors related to ASD, the use of ABA, and the use of EBP by professionals to directly support the needs of students with ASD.

Professional development is the key to ensuring that paraprofessionals have the required knowledge and skills to promote student success in the classroom. This study aims to understand the effectiveness of providing group training programs designed to teach paraprofessionals the competencies of ABA to support the behavior and skill acquisition of students in substantially separate classrooms. Professional development referred to as training is an essential tool for paraprofessionals, providing them with research-based best practices to engage students in learning (Gamrat et al., 2014). By providing paraprofessionals with the background and knowledge of ABA, they will be able to apply their knowledge of researched-based interventions within ABA-based classrooms to increase student skills while decreasing challenging behaviors.

Appropriate literature titles for this study were accessed using the Slippery Rock digital library, EBSCO Mega FILE, ERIC, and Education Journal, for articles published between 1950 and 2023. Chosen articles were either empirical studies, peer-reviewed publications, or journals focused on special-education laws, special-education paraprofessionals, paraprofessional professional development needs, autism, and ABA.

Roles and Responsibilities of Paraprofessionals

Paraprofessionals have become especially important in special-education programs. The development and use of paraprofessionals in the classroom is a strategy most frequently used to support students with ASD (Etscheidt, 2005: Koegel et al., 2009: Petterson, 2006). However, there is an "overall lack of understanding or consensus concerning the nature of the paraprofessional's role" (Forster and Holbrook, 2005, p. 156), which causes confusion regarding paraprofessional duties (Washburn-Moses et al., 2013).

Historically, along with clerical tasks, paraprofessionals primarily focused on providing support for students with disabilities on life-skills tasks, such as toileting, dressing, and eating (Pickett & Gerlach, 2003). In addition, paraprofessionals were tasked with making classroom materials, photocopying, completing attendance, and supervising the students during unstructured times, such as lunch and recess (Doyle, 2002). Today, the paraprofessional role has expanded to focus more on academic and behavior interventions in addition to "caretaker" responsibilities (French, 2001; Giangreco & Broer 2005; Webster & Blatchford, 2015; Werts et al., 2001, French & Pickett, 1997; Hughes & Valle-Riestra, 2008; Quilty, 2007: Shyman, 2010). These expanded responsibilities include reinforcing concepts taught by teachers, offering one-on-one support, performing small-group instruction, facilitating social communication groups with technology, carrying out functional assessment tasks, adapting instructional materials, job coaching, collecting data, facilitating social activities between peers, executing behavior plans, teaching personal care skills and daily life skills, overseeing vocational training, and providing community-based instruction (Fisher & Pleasants, 2012; Giangreco & Broer, 2005; Giles, 2010; Hall et al., 2010; Kraemer et al., 2008; Likins, 2003; Rogan & Held, 1999; Stahl & Lorenz, 1995; Suter & Giangreco, 2009). Increasingly, paraprofessionals are also tasked with providing

crisis management interventions when students display dangerous behaviors (Preston, 2015). Carlson et al. (2008) point out that paraprofessionals supply a vast amount of instruction for students with ASD, and for this reason, they should be provided with applicable training to fulfill their responsibilities.

Due to the lack of initial training, paraprofessionals often use a combination of learning approaches—such as trial and error, knowledge from their past experiences, and observing other paraprofessionals—to learn their job responsibilities and develop strategies (Causton-Theoharris & Malmegren, 2005; Downing et al., 2000; Rodriquez, 2010). Paraprofessionals who participated in a study by Jones et al. (2012) commented that they often looked to teachers for training, which was especially challenging when the teachers also lacked ABA understanding and training. A study by Patterson (2006) revealed that 90% of paraprofessionals regard managing student behavior as crucial for academic success. However, to manage behavior, paraprofessional training must incorporate knowledge on addressing behavior effectively and using behavior-management strategies (Patterson, 2006).

Studies have demonstrated that by providing professional development, paraprofessionals improve their knowledge and skills (Friend & Cook, 2010; Giangreco & Broer, 2007), especially for paraprofessionals who support students with ASD (Scheuermann et al., 2013). However, Brock and Carter (2013) reiterated that many school districts fail to provide paraprofessionals with overall training, which includes topics related to their job and role in classrooms (Causton-Theoharris & Malmegren, 2005; Downing et al., 2000; Passaro et al., 1994; Friend & Cook, 2010; Katsiyannie et al., 2000; Scheuermann et al., 2013).

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is a developmental disability with various causes, including genetic factors. It affects how individuals behave, communicate, interact, and learn. ASD manifests early in life and can persist throughout one's lifespan, though symptoms may improve over time (Hyman et al., 2020). People with ASD may face challenges in developing and maintaining friendships, communicating, and understanding expected behaviors in various settings, especially as they transition into adolescence and young adulthood. Individuals with ASD commonly experience difficulties in social communication and interaction, as well as exhibit restricted or repetitive behaviors and interests. Additionally, they may demonstrate unique learning styles, movements, or attention patterns. These characteristics contribute to the challenges individuals with ASD may face in various aspects of life (National Research Council, 2001).

Challenging Behaviors Associated with ASD

A wide range of characteristics can be displayed by students with ASD (Bingham et al., 2007; Buschbacher & Fox, 2003; Fox & Smith, 2007; Horner et al., 2002; Kraemer et al., 2008; Summers et al., 2004), especially when challenging behaviors are frequent (Kahal, 2008; Koegel & Covert, 1972). Matson et al. (2010), reported challenging behaviors were documented among 94% of students with ASD. Further, Chebli et al. (2016) reported that in addition to challenging behaviors stereotypical behaviors such as hand flapping, spinning, and repeated behaviors occurred in 88% of children with ASD. Challenging behaviors in children with ASD can serve different purposes referred to as function, such as access/obtaining or escape/avoid. The challenging behaviors is a method of communication to express needs, express discomfort, or cope with sensory issues Since 2009, the majority of behavior interventions utilized within

public schools are primarily function-based interventions (National Center for Autism, 2009;

Walker & Snell, 2017).

When providing behavioral support based on the challenging behavior's purpose,

interventions are designed to address and modify behaviors by targeting the underlying purposes

the behavior provided to the student. It is important to understand why the student is displaying

challenging behavior, rather than simply trying to eliminate the behavior. Function-based

interventions focus is on teaching or reinforcing alternative behaviors that serve the same

function in a more acceptable way. Examples of function-based interventions can be seen in

Table 1. These examples represent only a few interventions. Specific interventions will be

developed after the completion of a functional behavior analysis (FBA) which is later described

in a below section.

Table 1

Function-Based Interventions

Why or Purpose of the Behavior	Function-Based Intervention Examples
The student may engage in challenging behavior to gain attention of a peer or an adult.	• Have an adult frequently do check-ins with the student. • Have an adult directly assist the student with schoolwork. • Provide praise to all desired school behaviors (raising hand, completing tasks, showing a calm body). • Teach a communication skill to ask for help.
The student may engage in challenging behavior to gain access to preferred items, locations, activities,	• Schedule a moderately preferred activity between highly preferred and highly non-preferred activities. • Locate highly preferred items within the student's reach. • Make preferred activities more frequently accessible. • Teach the student communication skills to make requests.

The student may engage in challenging behavior to escape or avoid the task or environment.	- Modify the task to the student's cognitive ability. - Provide choices. - Increase the ability to gain access to preferred items/activities. - Teach the student a communication skill of self-advocating or how to terminate a task.

While most classrooms have conventional behavior management systems to address unwanted behaviors, these systems often do not result in sustainable and meaningful behavior improvements, because they do not provide individual strategies to meet the needs of each student (Bambara & Kern, 2005; Maag, 2004; Sugai & Horner, 2006; Walker & Snell, 2017). Sugai and Horner (2006) showed that 15% of all students need a moderate level of behavioral interventions, while 5% require a higher level or functional behavioral approach, such as a personalized behavior intervention plan (BIP).

In a 2007 study of children with ASD by Dominick et al., 32.7% of the participants displayed aggressive behaviors (kicking, hitting, biting, and pinching), and 33% displayed self-injurious behaviors (head banging, biting, or hitting themselves). In addition, 70.9% of the participants had severe temper tantrums. Further research supports the idea that there is a link between students exhibiting elevated levels of challenging behaviors (e.g., aggression towards others or property, avoidance, self-injurious actions, repetitive behaviors, and externalizing behaviors), and students diagnosed with Autism Spectrum Disorder (ASD). (Farmer & Aman, 2011, Matson et al., 2009; Minshawi et al., 2014: Tureck et al., 2014).

Evidence-Based Practices for Supporting Students with a Diagnosis of ASD

Evidence-Based Practice is a model used for decision-making for applied behavior analysis incorporating student values and context in combination with selecting interventions which are socially valid as well as being meaningful to the student (Slocum et. al, 2014). To

develop these guidelines for determining the effectiveness of interventions for ASD, the National

Autism Center conducted a study in 2005, releasing the first phase of EBP in 2009 (National

Center for Autism, 2009). The National Standards Project, in connection with The May Institute,

identified 27 evidence-based supports and interventions (Table 2) to help schools, families,

practitioners, and private organizations obtain the necessary tools and resources when selecting a

functional and effective intervention to support individuals with ASD.

     EBP articles were first reviewed and then quantified based on the level of support

provided through interventions to address the characteristics of ASD among children and adults.

A total of 775 studies were identified, showing the effectiveness of interventions for children

with ASD. Trained reviewers read and coded the identified articles, resulting in all articles being

supplied with a scientific merit rating scale score that reflected the confidence the experts could

place on the specific article findings. The score was a conceptual model for evaluating articles

and was created by a team of experts in a study panel (National Autism Center, 2009). The

project findings produced a four-tier classification method that named autism treatment

interventions as *set up*, *emerging*, *unestablished*, or *ineffective or harmful* (National Autism

Center, 2009).

     To date, this research project is the most comprehensive guide to interventions for ASD.

The project was last updated in 2015 (National Autism Center, 2015). Most established

interventions are based on analytic behavior principles (Autism Society of America, 2009, 2015;

CDC, 2007). Treatments are considered established when there is sufficient evidence to suggest

that the treatments produce favorable outcomes for individuals on the autism spectrum (Cook &

Cook, 2011). However, although emerging treatments produce favorable outcomes in some

cases, a thorough conclusion has not been reached; indeed, few treatments for individuals with ASD are considered established.

Based on the clinical findings of this research project, ABA-based interventions are a focal point in theory and interventions to address maladaptive behavior and skill acquisition for children with ASD. ABA-based interventions use behavior-based techniques, reinforcement, individualized goals, and the development of specific learning strategies while instituting a rewarding environment (CDC, 2007; Conroy et al., 2015: Cooper et al., 2007; National Alliance for Autism Research, 2005; National Autism Center, 2009). Additionally, educational programming can diminish the challenges associated with ASD, such as problem behaviors, weakness in social interactions, and reduced communication skills (CDC, 2007; National Autism Center, 2009; National Research Council, 2001).

Table 2

Evidence Based Practices

Antecedent-Based Interventions (ABI)	ABI is the arrangement of events that come before an interfering behavior, created to reduce the occurrence of that behavior.
Cognitive Behavioral Intervention (CBI)	CBI creates instruction on the management of cognitive processes that trigger changes in outward behavior.
Differential Reinforcement of Alternative, Incompatible, or Other Behavior (DRA/I/O)	DRA is providing positive consequences for behaviors or the absence of negative behaviors, ultimately reducing the happenings of undesirable behaviors, when the individual behaves in a desired alternative to an undesired behavior (DRA); when they're doing something that they couldn't physically do if exhibiting in undesired behavior (DRI); or when they're not engaging in the undesired behavior (DRO).
Discrete Trial Training (DTT)	This typically involves one-on-one time between a service provider and a student. Each trial starts with the provider's instruction, the student's response, and a consequence. There is a pause before the provider shares the next instruction.
Exercise (ECE)	Physical activity is increased to improve desirable behaviors or reduce undesirable ones. This can be accomplished through a wide range of exercises.

Extinction (EXT)	Extinction is an intervention whereby you remove reinforcers of undesirable behavior with the intention of reducing the frequency of that behavior.
Functional Behavior Assessment (FBA)	You identify events that come before or after an undesirable behavior in order to identify actions that support that behavior.
Functional Communication Training (FCT)	FCT involves replacing undesirable behavior that has a communication function with a different kind of communication that still accomplishes that function.
Modeling (MD)	The provider demonstrates a desired behavior or skill that the student imitates and eventually acquires themselves.
Naturalistic Intervention (NI)	This type of intervention strategy happens in the learner's natural setting. The teacher arranges for a learning event in that setting, supports the student to participate in the desired behavior, reinforces it when it occurs, and offers consequences.
Parent-Implemented Instruction & Intervention (PII)	Parents work one-on-one with their children to provide intervention to improve desirable behaviors or decrease interfering ones.
Peer-Mediated Instruction and Intervention (PMII)	PMII is similar to PPI, except it is their peers (as opposed to parents) who help those with ASD to learn new behaviors, communication skills, and social skills. Service providers work with peers to teach them appropriate strategies.
Picture Exchange Communication System (PECS)	With PECS, the student is taught to show a picture of a desired item to a partner in exchange for getting that item. It includes six stages: how to communicate, distance and persistence, picture discrimination, sentence structure, responsive requesting, and commenting.
Pivotal Response Training (PRT)	In PRT, intervention practices are guided by pivotal learning variables (like motivation) used in settings that build on the student's interests.
Prompting (PP)	A peer gives verbal or physical assistance to a learner to help them acquire a new behavior or engage in a new skill.
Reinforcement (R+)	Reinforcement is an event or activity that occurs after a student exhibits a desired behavior, which helps to increase the occurrence of that behavior.
Response Interruption/Redirection (RIR)	The teacher uses some kind of distracter to interfere with an undesirable behavior and divert the student's attention away.
Scripting (SC)	Scripting can be a verbal or written (or both) description that explains a skill or situation. It is a model for the learner, and it is practiced many times over before that skill is applied in real life.
Self-Management (SM)	Self-management helps the learner to differentiate between desirable and undesirable behaviors, monitor their own actions, record their behaviors, and reward themselves when appropriate.

Social Narratives (SN)	Narratives are used to explain social situations to learners. They emphasize important cues and teach students how to respond appropriately. Narratives should be created to suit individual needs.
Social Skills Training (SST)	SST teaches people with ASD how to appropriately interact with others. It often includes activities like role-playing, communication practice, and receiving feedback.
Structured Play Groups (SPG)	Structured play groups occur in defined areas with specific activities and individuals fulfilling specific roles.
Task Analysis (TA)	An activity is split up into smaller steps so that the provider can assess and teach it.
Technology-Aided Instruction and Intervention (TAII)	Technology is used to help maintain or improve the learner's skills and behaviors. This might include tablets, computers, and computer programs.
Time Delay (TD)	Time delay is used to give the learner a chance to use a skill without being prompted to do so. A delay happens between the chance to use the skill and the learner receiving any prompting. This helps to gradually eliminate the need for prompting over time.
Video Modeling (VM)	Demonstrations of desired behaviors or skills are shown through a video recording to aid in learning that behavior or skill.
Visual Supports (VS)	Visual supports aid the learner in acquiring a new behavior or skill without the assistance of prompts. Types of support include pictures, words, objects, maps, and labels.

To support the Centers for Disease Control and Prevention recommendations, the National Research Council (NRC, 2001) identified eight skill areas for students diagnosed with ASD to access general-education classrooms: social pragmatic skills; expressive, receptive, and nonverbal communication; functional symbolic or picture communication; fine and gross motor skills; cognitive skills; the ability to follow acceptable classroom expectations using a class-wide reinforcement plan; and the use of replacement behaviors in the absence of challenging behaviors (NRC, 2001). Such programs, whether in public schools or private schools, should also have a specialized curriculum focus and a function-based approach to addressing problematic behaviors (CDC, 2007; Iovannone et al., 2003).

Iovannone et al. (2003) named eight empirically sound features for schools to incorporate, including a well-developed, evidence-based educational placement for students with

ASD. These features included ongoing family collaboration across the student's placement and goal-area development; EBP curriculum and interventions to address the acquisition of academic, social, communication, and behavioral skills; the use of positive and environmental antecedent-based interventions; a schedule for consistency; the use of visual supports; therapeutic services, all documented on an individualized education plan to outline the level of needs of the student (Hagiwara, 2002); and a systematic approach to intervention and instruction (Johnson et al., 2004; Collins, et al., 2007; Flores & Ganz, 2007)

Applied Behavior Analysis

Applied behavior analysis (ABA) is a scientific set of principles and dimensions aimed at understanding and improving human behavior (Bailey & Burch, 2005; Cooper et al., 2007; Maurice et al., 2001). The primary intention of ABA is to implement interventions based on the principles of learning theory, which, when applied to real-world situations, meaningfully improve behavior (Alberto & Troutman, 2008; Bailey & Burch, 2005; Bear et al., 1968, 1987; Buchanan & Weiss, 2006; Celiberti et al., 2008; Greer & Ross, 2008). Over the past 60 years, ABA has evolved into various treatment models and intervention practices addressing deficits in cognition, language, social skills, problem behavior, and daily living skills for individuals with ASD (Dryer, 2013). The antecedents, behavior, and consequences model (ABC) is a foundational approach, manipulating these elements to modify behavior effectively. This model analyses what occurred in the environment or to the student prior (antecedent) to the behavior of interest, as well as what occurred following the behavior of interest (Lovaas, 1987).

A study by Bethune and Kiser (2017) supported ABA as an empirically sound practice for teaching students with ASD and increasing academic, social, behavioral, and vocational skills (Bethune & Kiser, 2017; Bear et al., 1968; Roth et al., 2014). Increases in skill acquisition,

communication, relationship-building, social functioning, independent play, and adaptive living, as well as the reduction of challenging behaviors, are all linked to ABA-based interventions (Kim et al., 2016; Fenske et al., 1985; Smith et al., 1997; Eikeseth et al., 2007).

Functional Behavior Assessments

The 1997 amendments to the Individuals with Disabilities Education Act (IDEA) mandated the use of functional behavior assessments (FBA) to guide the development of Behavior Intervention Plans (BIPs). The 2004 reauthorization specified that if a student's conduct is a manifestation of their disability, the school must conduct a FBA and implement a BIP. Empirical evidence supports the use of FBAs in improving outcomes for children and youth with disabilities.

Within schools, the FBA process is grounded in the science of ABA. It involves gathering pertinent data and information on the behavior of concern to understand the function of the behavior. The primary goal is to design a function-based intervention that optimizes the effectiveness and efficiency of behavior support. FBA serves as the initial step in the behavior intervention process, enabling those conducting the assessment to identify and create a BIP. The BIP is designed to decrease challenging behaviors and promote the increase of appropriate behaviors. Within the school setting, once the applied behavior analysist has trained the teacher and paraprofessionals, it is vital the plan is implemented with fidelity to reduce challenging behavior.

Paraprofessional Training

When surveyed in a study by Carter et al. (2009), paraprofessionals indicated that students with ASD were the largest student population receiving their support. Of these paraprofessionals, 97% provide one-on-one academic support, and 79.4% provided behavior-

management support (Carter et al., 2009). When further questioned about the ability to support students in these areas, paraprofessionals noted an overall lack of confidence in their ability to implement behavioral interventions due to the lack of job professional development opportunities and supervision (Causton-Theoharis et al., 2007; Giangreco et al., 2011).

Given the circumstances, EBPs outlined within BIPs are crucial strategies used daily in classrooms. This reality of the lack of training and supervision is concerning for families with students diagnosed with ASD (Brock & Carter, 2013). Austin (2013) found that paraprofessionals are better equipped through training opportunities, which enables them to meet the needs of students with ASD.

The professional development needs for paraprofessionals were further noted in research by Riggs (2001), who found that the highest perceived need for training for paraprofessionals related to types of diagnoses, behavior management strategies, communication strategies, types of learning styles, and how to support inclusion times (Riggs, 2001). Other areas that require staff development included assistive technology, providing small-group instruction, social opportunities for students with disabilities, and special-education laws and procedures (Riggs, 2001). Sturmey (2015) assessed educators and service providers in six areas of ABA to investigate training needs and found they needed development in preference assessments, prompting strategies, differential reinforcement, and crisis-management interventions (Sturmey, 2015). Pindiprolu et al., (2007) asked paraprofessionals what areas they were most in need of training, and the highest responses were in how to address challenging behavior and FBAs (Pindiprolu et al., 2007). A study by Brenton (2010) surveyed 750 paraprofessionals about their professional development opportunities and implementing strategies, of which 46% indicated that their training was either "very poor" or "fair" (Brenton, 2010). In addition, regarding the

quality of their daily job supervision to support their roles and responsibilities, 29% reported that they were either uncertain of the quality or found it poor (Brenton, 2010). Furthermore, Brenton (2010) questioned the participants about their ability to support behavioral difficulties and the need for training, and 63.5% noted training as a high priority.

Searching for a different way to complete professional development, Serna et al., (2015) turned to developing an online training with first-person interactive practice. The focus was on paraprofessionals directly collaborating with Board Certified Behavior Analysts (BCBAs). More precisely, the online training, named *LearningABA*, was crafted to equip inexperienced paraprofessionals with essential knowledge and proficiency in implementing Behavioral Intervention methods. The study addresses the high demand for well-trained paraprofessionals in behavioral intervention, especially for individuals with autism spectrum disorder and developmental disabilities. To meet this demand, the researchers developed an online training program called *LearningABA*. This program focuses on enhancing traditional online pedagogy by incorporating first-person interactive practice, resembling live mentor/mentee training.

The preliminary evaluation data indicates the effectiveness of *LearningABA*. A one-way ANOVA revealed significant group differences in pre-test to post-test change scores, favoring the experimental group. The experimental group showed a substantial mean improvement in correct responses (32.98%), compared to the control group's modest improvement (7.74%). An ANCOVA was conducted to account for time differences between test administrations, and it confirmed a significant main effect of group, supporting the earlier findings.

Additionally, a comparison of the time between tests for both groups showed a negligible difference, suggesting that the observed group differences were not influenced by the time elapsed between pre-test and post-test administrations. Overall, the study demonstrates the

potential of online training programs like *LearningABA* in efficiently preparing paraprofessionals for face-to-face training and supervision in behavioral intervention methods.

More recently, Mason et al. (2021) conducted a study on paraprofessional perceptions from the frontline across twelve school districts. The authors sought to understand the responsibilities, professional development needs, and related issues of paraprofessionals, as well as the professional development needs and related issues of teachers as supervisors of paraprofessionals. The authors categorized the responses into two themes: first, common training needs and challenges such as the need for clarification of the role, responsibilities, and team building to avoid conflict; and second, criticism of training programs pertained to the need for better behavior-management professional development, curriculum instruction, technology, and requests for increased observation and feedback (Mason et al., 2021).

Wiggs et al. (2021) conducted a comparable study involving a randomized group of 215 paraprofessionals from sixty-two elementary schools spanning kindergarten to fifth grade. The researchers administered a survey, encompassing eight items related to their current roles, six items regarding professional learning they had undergone, and one item addressing their professional learning needs. The reported hours of training received varied from zero to more than fifteen over a 12-month period, with 43.7% indicating zero hours and only nineteen paraprofessionals reporting over 15 hours. Respondents also conveyed their anticipated needs for future professional learning. The predominant areas identified included behavior-based training, managing student behaviors, and classroom-wide behavior management. Other reported training needs encompassed social-emotional learning, instruction, educational technology, district and state policies, evaluation systems, and communication with parents . The researchers concluded that tailoring professional development for paraprofessionals based on their specific learning

needs holds the potential to enhance outcomes for students, teachers, paraprofessionals, and other stakeholders.

In 2022 research conducted by Walker et al., a survey involving 768 paraprofessionals was undertaken to assess their training requirements, classroom demands, and skills needs in relation to Evidence-Based Practices for individuals with Autism. The study revealed that 46.1% of the participants worked in inclusive classrooms, 45.9% in self-contained classrooms, and the remaining 8% in other or mixed classrooms. Additionally, 9.1% of paraprofessionals did not work with students with Autism, while 81.7% worked with both students with Autism and other disabilities. The research methodology involved survey revision and a thorough examination of data through various approaches. The survey comprised twenty-four items categorized into paraprofessional characteristics, perceived skills, training needs, and classroom needs aligned with Evidence-Based Practices, as well as training and skill characteristics. The study's findings indicated that the majority of students served by the participants had low-moderate or high needs. Paraprofessionals expressed higher training needs in self-management practices, communication practices, and technology-aided practices. Conversely, the lowest training needs were reported in visual support and peer-mediated interventions.

Barriers to Paraprofessional Training

To address the lack of training among paraprofessionals and minimize the effects of improperly implemented EBPs, IDEA (2004) requires schools to provide all staff who offer special-education services to have professional development opportunities appropriate to the job and ongoing supervision (IDEA 20 USC. 1412(a; 14). Despite IDEA updating the paraprofessional requirements for professional development and supervision, the legislation lacks specific guidance on how the training and supervision should be provided (Picket, 1999).

As such, classroom teachers and principals are tasked with the additional job of training and supervising the paraprofessionals with no specific guidelines (Drecktrah, 2000; French, 2001; French & Pickett, 1997; Pickett et al., 1993; Wallace et al., 2001). Over the years, the task of training and supervising paraprofessionals has become increasingly challenging for teachers, particularly when teachers have not received professional development opportunities on EBPs specific to students with ASD or supervising paraprofessionals in classrooms (French & Pickett, 1997; Wallace et al., 2001).

Scheuremann et al. (2013) identified two barriers connected with certification pathways in higher education. First, there is great variation across states in the requirements for licensing special educators, with some states requiring certification in specific disabilities and other states not specifying. Mainzer & Horvath (2001) found that more teachers complete a noncategorical or multi-categorical educational licensure, which raises concerns pertaining to whether the licensure program sufficiently trains teachers across the various disabilities. Before training paraprofessionals, teachers themselves need specialized instruction on low-incidence disabilities like blindness, deafness, and ASD (Scheurmann et al., 2013).

However, it remains unclear whether these programs sufficiently train teachers to understand students with ASD, let alone supervise paraprofessionals (Scheuremann et al., 2013). Scheurmann et al. (2013) identified the following skills needed among teachers and paraprofessionals: developing interventions for students diagnosed with communication impairments (nonverbal or echolalic) and advancing knowledge for behavior-management strategies. Barnhill et al. (2011) investigated autism-specific coursework across eighty-seven teacher-preparation programs in thirty-four states and found that only about half the programs offered a course about autism, and, of the programs that did, 35% supplied training on only

discrete trial procedures (Barnhill et al., 2011). In addition, when programs on ABA were offered, the courses seldom supplied suggestions or resources for training paraprofessionals on behavioral principles (Reid, 2017). Thus, practitioners are on their own when coaching paraprofessionals, with on-the-job training being the primary method.

The shortage of special-education teachers is an additional barrier that influences professional development opportunities (Barnhill et al., 2011). To address this shortage, school districts can offer certification programs and expedite certification (US Department of Education, 2017). However, while this expedited route increases the number of teachers, those who were once paraprofessionals but lack professional development now go through certification programs that also lack the additional professional development (Darling-Hammond, 2002), particularly related to educating students with ASD and providing on-site supervision to paraprofessionals (Scheurmann et al., 2013). Teachers are not trained to effectively use or supervise paraprofessionals (French, 2001; Giangreco et al., 2001; Maggin et al., 2012; Moshoyannis et al., 1999; Pickett, 1999; Wallace et al., 2001); indeed, Capizzi and DaFonte (2012) noted that "teachers who supervise paraprofessionals are often unprepared or untrained to provide paraprofessionals with needed training" (p. 2). When teachers do not receive further development opportunities on methods and teaching paraprofessionals, they may struggle with paraprofessionals to provide cohesive support to students.

One barrier in special education pertains to the use of EBP, especially when implementing ABA-based interventions (Stahmer et al., 2015). Because ABA principles and interventions vary based on the function of the intervention, professional development on ABA requires providing sufficient time to practice and achieve mastery (Stahman et al., 2015). Specifically, Discrete Trial Training (DTT) requires multiple sessions with the guidance of a

trained teacher or behavior analyst. To effectively teach others, teachers also must be educated in providing feedback, analyzing data, and making recommendations from the data gathered (Wallace et al., 2001; French, 2001). Fundamentally, many teachers are inadequately and inconsistently trained in ABA interventions and supervising paraprofessionals, leading to the suboptimal implementation of ABA principles by paraprofessionals in classrooms.

Need for the Training

While there are federal guidelines regulating the qualifications of paraprofessionals, ongoing development for paraprofessionals and supervision of paraprofessionals are the responsibilities of individual school districts. Currently, there are no federal guidelines or regulations in the state of Massachusetts outlining the ongoing professional development for paraprofessionals. As paraprofessionals continue to be a critical part of the education of students with special needs, the importance of paraprofessional cannot be overstated; without ongoing training, paraprofessionals may be unable to adequately support students with special needs or perform the tasks associated with their position (Causton-Theoharis & Malmgren, 2005).

Paraprofessionals continue to receive a vast portion of their job training from either their supervising teachers—referred to as on-the-job training (French, 2001; Moody, 1967)—or one-day staff development at the start of school years (Carter et al., 2009; Rispoli et al., 2011). Despite previous literature reviews (Azad, et al., 2015; Locke et al., 2016), the roles and responsibilities of paraprofessionals that include the principles of ABA development are sparse. Paraprofessionals who assist students with ASD must have training in ABA and knowledge of teaching approaches to implement structured and unstructured learning, utilizing assistive technology, implementing specialized curriculum such as modified tasks or discrete trial training as well as folding in social and communication skills practice opportunities for generalization of

previously learned skills (Carter et al., 200). In addition, paraprofessionals should receive specific professional education and supervision, and legislative acts should mandate as much (Forster & Holbrook, 2005; Giangreco & Broer, 2005; Giangreco et al., 2002; Giangreco et al., 2005; Minondo et al., 2001).

Daily, paraprofessionals are entrusted with implementing EBP strategies to improve student skills, address challenging behaviors, and increase pro-social behaviors in social interactions and communication (Brock et al., 2015). Riggs and Mueller (2001) report that paraprofessionals often make instructional decisions and deliver instruction for students. Knowing that paraprofessionals lack formal professional development and considering the impact they have on student learning, IDEA directs schools to provide applicable staff development and ongoing supervision to paraprofessionals (IDEA, 2004).

Knowledge Assessments

Knowledge assessments are tools used to gather information about a learning experience. One common challenge many teachers have is understanding a student's prior knowledge of subject matter. Hailikari et al. (2008) defined prior knowledge as a "multidimensional and hierarchical entity that is dynamic in nature and consists of different types of knowledge and skills" (p.1).

A pre-test, prior to content review, is a way to acquire a baseline of learner knowledge. Conducting a pre-test and post-test evaluation is essential to determining the effectiveness of a training program. A pretest–posttest design has several advantages, such as measuring the change in the outcome variable that is attributable to the intervention, detecting the differential effects of the intervention on different subgroups of participants, and increasing the internal validity of a study (Guskey et al., 2016).

Professional learning is defined as on-going engagement through a comprehensive, sustained, and intensive approach to improve participants' effectiveness by advancing their skills or expertise (Darling-Hammond et al., 2017). Adult learners can master new knowledge and skills and then transfer this knowledge to classrooms through a combination of effective practices (Joyce & Showers, 2002). Thus, this study incorporated a framework that rested on research on principles of adult learning, effective practices, and structural elements (Graner et al, 2018).

Learning can be inferred from the difference in performance between two points in time, and the degree to which learning can be measured depends upon the amount of time and quality of instruction between the two points in time. As such, when using a pre-test–post-test model, if teaching has resulted in the expected learning, the post-test score will be higher than the pre-test score.

Research Question

Paraprofessionals are often the primary support source for special-education students (Fisher & Pleasants, 2012) and are part of the core special-education instructional team (Giangreco, Suter, & Doyle, 2010). Both the National Resources Center for Professionals and the Council for Exceptional Children (Hyman et al, 2020) agree that paraprofessionals must have prerequisite knowledge for supporting students with disabilities as well an understanding of and the ability to implement EBP. However, school districts continue to provide minimal or no ongoing paraprofessional learning times. As such, the current study's purpose is to gain an understanding of pre-existing paraprofessional knowledge, provide specific ABA training, and then test participant knowledge with a post-test. Understanding whole-group training knowledge

will aid in the development of paraprofessional learning opportunities. Therefore, this study seeks to clarify:

1. In a group training of evidence-based practice, to what extent, if any, do paraprofessionals advance their knowledge of applied behavior analysis?

Summary

This literature review highlights how paraprofessionals are in high demand to support students with ASD. Based on the literature, not only do paraprofessionals need training in characteristics of autism, but they also require distinct learning opportunities related to ABA principles, behavior management, social skills, and communication. Hence, for paraprofessionals to positively support students with ASD, schools must not only define the roles and responsibilities of paraprofessionals but also provide meaningful staff development. Training opportunities for paraprofessionals should entail the principals of adult learning: motivation to learn new interventions, reinforcement of staff when implementing strategies, retention of skills through ongoing practice, and transference of skills from learning to application within the classroom (Bear, 2012). Meanwhile, through ongoing supervision by teachers and applied behavior analysts, paraprofessional skills should be assessed, allowing for dialogue between paraprofessionals and their supervisors. Research informs us that when paraprofessionals are thoroughly trained, they can perform educational tasks with a high degree of fidelity (Brock & Carter, 2016).

Chapter three will take a closer look at how this study was conducted. Overall district information as well as the participating specialized program paraprofessionals' information is provided to allow for study replication. The study aims to answer the question of to what extent, if any, will participating paraprofessionals advance their knowledge of ABA within a group

training. By using pretest and posttest data results for individual participants and group

comparison data will provide an insight of areas of paraprofessional growth and the need to

further provide professional development times.

Chapter 3

Methodology

Due to the evolving and multifaceted role of the paraprofessional in special education, particularly in supporting students with a diagnosis of ASD, paraprofessionals need specialized learning opportunities. However, there is a concern that many school districts fail to provide comprehensive professional development, covering essential content areas related to the paraprofessionals' roles within an ABA-based classroom. With the lack of initial education, paraprofessionals often rely on trial and error, past experiences, and observation to identify their job responsibilities and develop strategies. The purpose of the current study is to determine whether group training on the use of evidence-based practices advances paraprofessional knowledge in ABA. The study will analyze the existing level of paraprofessional knowledge of ABA, and also determine whether the knowledge levels have increased after a group learning session focused on EBP within ABA.

Research Design

For this study, thirty-five full-time paraprofessionals were participants in a pretest/posttest quasi-experimental design approach. Quasi-experimental research designs tend to have real-world applications, which increases their external validity (Creswell and Creswell, 2018). The participants were a nonequivalent group of first-year paraprofessionals to the school districts in substantially separate specialized classrooms using ABA-based principles.

Prior to the start of the school year for the students, the participants participated in a three part series of workshop sessions on introduction to ABA. Each session was 2-3 hours based on the content and responses from the participants. These sessions were embedded into the start of the school year paraprofessional training for those paraprofessionals employed within the ABA-

based classrooms. Learning sessions consisted of participants completing pretraining assessments, training, and post-training assessments for each session. Learning sessions consisted of a series of slide-show presentations including ABA theory and practice.

This study utilized the historical data which was previously collected during paraprofessional training sessions. Historical data allows flexibility in the type of data subject matter for analysis, which has information about events of great practical importance, such as paraprofessional knowledge of ABA. As such, the selected data had tremendous pragmatic value for this study.

Site Permission

Site permission of research was granted by the district superintendent following a written proposal to examine data from the 2022–2023 school year learning modules conducted at the start of the academic year. The superintendent supplied written approval (Appendix A), allowing for the analysis of the paraprofessional group training. The findings of this study will be provided to the school district to enhance the paraprofessional learning modules for the substantially separated classrooms implementing ABA-based supports and interventions.

Community Information

The city in which this study took place was founded in 1850 and is currently one of the largest cities along the Atlantic coastline within New England. The city is 13.5 square miles with a population of 100,891 with a median age of 36.3. Of this, 49.83% are males and 50.17% are females. US-born citizens make up 61.42% of the residents, while non-US-born citizens account for 20.5%. Additionally, 18.08% of the population is represented by non-citizens. The largest identified race is white, 67.89%, followed by Hispanic or Latino, 18.4%. White-collar workers make up 75.33% of the working population, while blue-collar employees account for 24.67%.

The average annual household income is $80,063, while the median household income sits at $63,922 per year. Approximately 41.35% of the population in the city holds a high school degree (that is 31,526 documented residents), while 18.38% have attained a college certificate. Table 3 displays a breakdown of the community demographics of which this study took place.

Table 3

Community Demographics with a Reported Population of 100,891

Median Age	Gender	Citizenship Status	Race	Employment	Household Income	Education Level
36.3	49.83% Male	61.42% US-Born Citizens	67.89% White	75.33% White - Collar	Average $80,063	~41.35%
	50.17% Female	20.5% Non-US-Born Citizens	18.4%. Hispanic or Latino	24.67% Blue - Collar	Median $63,922 per year	~18.38%
		18.08% Non-Citizenship				

District Information

The participating school district has a student population of 17,069 enrolled students. Minority enrollment is 84% of the student body. The largest student race and ethnicity population is Hispanic, 72.5% followed by white, 10.6%. English language learners consist of 43.4%. First language learners, not English, make up 70.2% of the student population. Students identified as having high needs make up 86.2% of the student population. There are 985 teachers within the district and 151 special education staff including the special education administration. A breakdown of the district details is displayed in Table 4, while Table 5 provides a breakdown of the special education department by related therapists. Special education programs consist of early childhood center, therapeutic social-emotional classrooms across all grades, ABA based

classrooms across all ages, multi-handicapped classrooms, life skill classes of all ages, as well as substantially separated classrooms with primary diagnosis of developmental delay, intellectual impairment, or specific learning disability.

Table 4

School District Details

Break Down	Students	Students with IEP	Teachers	Teacher-to-Student Ratio
2 High Schools (9–12) 1 Vocational School (9–12) 1 alternative junior/senior high school 3 Middle Schools (6–8) 20 Elementary Schools (Pre-K–5)	17,069	~3000	985	14:1

Table 5

Special Education Related Therapist Breakdown for the District

Behavior	Speech	Occupational Therapy	Physical Therapy	Vision	Hearing	School Phycologist
13 Behavior Specialist	28 Speech Pathologists	5 Certified	3 Certified	2 Certified	4 Certified	12 Total
6 Registered Behavior Technicians	4 Speech Assistants	10 Assistants	2 Assistants			6 Bilingual

Specific Program Information

The substantially separated ABA program within the district ranges from pre-kindergarten classrooms starting at 3-years-old, through high school up to 22-years-old.

Classrooms are located across five schools: two elementry schools, one middle school, one high school, and one vocational school. Student diagnoses include ASD level 2 or 3, communication impairment, a health impairment (attention deficit disorder or attention deficit hyperactivity disorder), specific learning disorders, or a combination of these diagnoses. Student IEPs consist of a combination of the following goal areas: math, English language arts, pre-readiness skills, communication, and social/behavior. Related services such as occupational therapy, physical therapy, speech and language, and behavior specialist were included with the IEPs based on student needs.

Student demographics, found in Table 6, of the classrooms consists of 67% Hispanic, 9% Caucasian, 18% Black, and 6% Asian. Regarding gender, 75% were male and 25% were female. Student communication skills consisted of 62% nonverbal students of which 17% of the nonverbal students have less than four picture exchange icons (food related), and 38% were categorized as Gestalt verbal learners (i.e., learn chunk phrases or parts of the whole to communicate). The use of alterative augmentative communication devices was modeled to students on iPads or picture exchange. Toileting needs consisted of 48% fully potty trained, 20% required dressing aid, while 32% required full diapering and dressing support. Transportation was offered for all students; 92% used transportation, while 8% of families supplied transportation. School breakfast and lunch were supplied for all students.

Table 6

Student within the Substantially Separated ABA-Based Classroom Demographics

Race	Gender	Communication Level	Toileting Level	Transportation
67% Hispanic	75% Male	62% Non-Verbal (17% less than 4 picture exchange)	48% Fully Toileted Trained	92% Bus

9% Caucasian	25% Female	38% Verbal	20% Dressing Assisted	8% Family
18% Black			32% Full Support Required	
6% Asian				

Classrooms consist of eleven students, one special education teacher, and up to four paraprofessionals. Classrooms with four paraprofessionals require a higher level of behavioral interventions for student safety. Classroom methodology and delivery of instruction follow the principles of ABA including explicit, systematic, sequential, and cumulative instruction based on mastery. Explicit teaching means that what you are teaching is clearly explained and defined. Expectations are clear and presented at the current level of student ability and broken into manageable chunks. Lessons are written out procedures the student and teacher can easily follow. Within the lesson directions, instructions are provided on how to present the information, how to provide support within the lesson, and how to provide corrective feedback when needed. Lessons are taught in a sequential order that will help your students achieve mastery of the core concepts which are aimed at increasing student independence. Support for task completion is provided in a one student to one adult or two students to one adult ratio. Visual cues are paired with verbally presented information across all settings. To support the retention of skills and knowledge, reinforcement and practice times are implemented daily. Discrete trial training and natural environment training are embedded throughout the school day targeting student specific skills to acquire or decrease. When the specific skill is learned, data is collected to ensure the student has mastered the skill across time and the skill has been generalize (Lovaas et al., 1073) across locations, materials, and people. Specific student behavior management strategies are assessed using a functional behavior assessment followed by the

development of a behavior intervention plan. Formalized computer based data collection is used to monitor student progress toward independence of skill acquisition and the reduction of challenging behaviors.

Participant and Setting

The focus classrooms for paraprofessionals participating in this study include only substantially separated ABA-based elementry classrooms, grades pre-kindergarten to fifth grade. The fourteen classrooms span across two elementry schools as shown in Table 7. The home-base school has supported the substantially separate ABA-based classrooms for 23 years. Classroom sizes previously ranged from six students to eight students. However, across the last seven years starting in 2016, students identified as needing ABA-based classroom support grew increasing classroom sizes to ten students within a classroom. More recently, 2019, the increase of students required the district to expand the elementry ABA-based classrooms across a second school. The second school is referred to as the sister program. Within the sister program four additional ABA-classrooms were opened.

Table 7

Participating Classroom Breakdown

Classroom Grades	Home Base School	Sister School	Number of Classrooms
Pre-Kindergarten to Kindergarten	2	3	5
First and Second Grade	3	1	4
Second through Fourth Grade	3	0	3
Third through Fifth Grade	2	0	2

Thirty-five full-time paraprofessionals across the fourteen classrooms participated in the study. The criteria to determine participant eligibility are: 1.) participants were employed to work within the elementry substantially separated ABA-based classrooms, 2.) participants were employed for less than 6 months within this district, or 3.) participants had not received ABA professional development from the district in the past. All participants were fluent in English and had a high school degree. Two had trade school experience, six had an associate degree, and eleven had a bachelor's degree. The mean age was 32 years old, ranging from 18 to 56 years. Fifteen participants reported having prior ABA experience, with an average of nine years of experience. The previous type and quality of staff development indicated by the participants was not collected. This was the first ABA staff development within the participating district the paraprofessionals received. A breakdown of participant demographics is reflected in Table 8.

Table 8

Participant Demographics

Gender		Race		Highest Degree		Prior ABA Experience	
Females	29	Muslim	1%	High School	16	Yes	15
Male	6	Black	4%	Trade School	2	No	16
		Hispanic	46%	Associate	6		
		White	49%	Bachelor's	11		

Training Curriculum and Materials

Teaching critical knowledge competencies is often an initial objective of training to aid paraprofessionals to understand concepts and methods which will advance the overall use of ABA strategies effectively (Reid et al., 2003: Ricciardi, 2005). The three training modules outlined in Table 9 in this study were pulled from a variety of studies pertaining to an adult day-

care healthcare setting and paraprofessional development using ABA-based interventions, focusing on the overarching principles consistent with the instructional needs of an education setting. In addition, the learning modules reflect the research-based competencies of the behavior technicians task list seen in Table 10, developed by the Behavior Analysis Certification Board (BACB, 2018). These competencies include primary tasks which are likely to be performed by paraprofessionals in a substantially separated ABA-based classroom. The training sessions were across three consecutive days, where one learning session with one module was presented each day. Training sessions were presented at the start of the day lasting between two to three hours per day. Pretests and posttests were each 30 minutes while the module content lasted between two to three hours.

The three learning modules addressed ABA theory and its implementation. The first module included defining behavior, positive and negative reinforcement, antecedent-behavior-consequence contingency, observation, measurement, data collection, functional analysis, interpreting data, consequence interventions, and antecedent interventions. The second module included discrete trial training, incidental teaching, and task analysis. Lastly, the third module consisted of prompt hierarchy for verbal and physical responses and fading prompt strategies.

Table 9

Learning Modules

Module	Content Area
Module One 3 Hours	• Define Behavior • Reinforcement – What is it? • Antecedent-Behavior-Consequence Contingent • Measurement – Why and when it is needed. • Data Collection and Interpreting the Data • What is a Function Behavior Analysis • Interventions – Antecedent – Consequence

Module Two 3 Hours	• Discrete Trial Training Procedure • Incidental Teaching or Natural Teaching • Task Analysis Procedure
Module Three 2 Hours	• Prompt Hierarchy - Verbal and Physical Responses • Fading Prompt Strategies – Visuals, positioning

Table 10

Learning Competencies
Italicized** topics were not part of the learning modules based on time restraints

Content Area	Skill
Measurement	• Prepare for data collection. • Implement continuous measurement procedures (e.g., frequency, duration). • Implement discontinuous measurement procedures (e.g., partial & whole interval, momentary time sampling).** • Implement permanent-product recording procedures. • Enter data and update graphs. • Describe behavior and environment in observable and measurable terms.
Assessment	• *Conduct preference assessments. *** • Assist with individualized assessment procedures (e.g., curriculum-based, developmental, social skills). • Assist with functional assessment procedures.
Skill Acquisition	• Identify the essential components of a written skill acquisition plan. • Prepare for the session as required by the skill acquisition plan. • Use contingencies of reinforcement (e.g., conditioned/unconditioned reinforcement, continuous/intermittent schedules). • Implement discrete-trial teaching procedures. • Implement naturalistic teaching procedures (e.g., incidental teaching). • Implement task analyzed chaining procedures. • *Implement discrimination training. *** • *Implement stimulus control transfer procedures. *** • Implement prompt and prompt fading procedures. • Implement generalization and maintenance procedures. • *Implement shaping procedures. *** • Implement token economy procedures.

Behavior Reduction	- Identify essential components of a written behavior reduction plan. - Describe common functions of behavior. *Implement interventions based on modification of antecedents such as motivating operations and discriminative stimuli.* ** *Implement differential reinforcement procedures (e.g., DRA, DRO).* ** - Implement extinction procedures. - Implement crisis/emergency procedures according to protocol.
Documentation and Reporting	- Effectively communicate with a supervisor in an ongoing manner. - Actively seek clinical direction from supervisor in a timely manner. - Report other variables that might affect the client in a timely manner. *Generate objective session notes for service verification by describing what occurred during the sessions, in accordance with applicable legal, regulatory, and workplace requirements.* ** - Comply with applicable legal, regulatory, and workplace data collection, storage, transportation, and documentation requirements.
Professional Conduct and Scope of Practice	*Describe the BACB's RBT supervision requirements and the role of RBTs in the service-delivery system.* ** - Respond appropriately to feedback and maintain or improve performance accordingly. - Communicate with stakeholders (e.g., family, caregivers, other professionals) as authorized. - Maintain professional boundaries (e.g., avoid dual relationships, conflicts of interest, social media contacts). - Maintain client dignity.

RBT task list (2nd edition)

Data Collection Procedure

Two assessment-of-knowledge, randomized test questionnaires were developed for each module as a "paper and pencil" test (Appendices B-G). Each test consisted of ten multiple-choice questions. One test was given before each module as a pretest to gather the learner's knowledge of the content area within the module. The second test was provided as a posttest directly following the learning session. The posttest measures learned knowledge of the presented

module. The pretests and posttests were analyzed to decide the extent of knowledge gained upon completing the group training session. None of the tests required participant names. At the top of all tests, a set of questions were asked to identify corresponding tests without identifying the participants. Questions asked about the participant's first car, first pet's name, number of cousins, and the participant's favorite number. Participating paraprofessionals were encouraged to complete as many questions as possible and repeat their responses for each test.

Training Procedure

Pretraining assessments, learning session, and post-training assessments were conducted within one to five days prior to the start of the academic year. Prior to this study, the participating paraprofessionals received a behavior-management course in which safety procedures using de-escalation and physical management for student behaviors were taught. The course was created by an independent Board Certified Behavior Analysist agency. The behavior-management course was provided 10-20 days prior to the participation within this study. Therefore, participating paraprofessionals were provided with similar ABA-based information which should be considered as supplement training. The behavior-management course was provided as a district train the trainer format, while this study was conducted by a Board Certified behavior Analyst employed by the participating school district.

For this study, participating paraprofessionals were provided with the pretest (Appendix B, D, F) before the training session. No specific module information was reviewed before the pretest. Participants responded to ten four-item multiple-choice questions. To secure participant identity and ensure a blind review, the participants placed their responses in a manila envelope. Participants had 30 minutes to respond to the pretest questions. Upon gathering the pretest, participants participated in a two to three hour learning session. The sessions were presented to

all participating paraprofessionals as a whole group format within an elementry café. Information was presented as a slideshow. Content videos and modeling of the skills were incorporated into the training session. Participant questions were based on the topic being reviewed. Directly following the learning session, a posttest was provided. Questions from the pretest were randomly configured onto the posttest (Appendix C, E, G). To ensure autonomy participants followed the same format of placing their completed posttest into a manila envelope. In total there were three sessions, each lasting between three to four hours.

Pre-Training Sessions

All participants attended the same training sessions. Each training session began with a pretest (Appendix B, D, F) of the module content information. A selected senior paraprofessional, one who previously received ABA-based education and is currently employed within the home based elementary ABA-based classroom, provided the test to each of the participating paraprofessionals. Participating paraprofessionals were provide 30 minutes to complete the 10-multiple choice questions. Upon completion of the pretest, the participant placed the test in a manila envelope. The senior paraprofessional ensured all test codes were completed prior to having the participants place the test in the manila envelope. During the 30 minutes for the pretest, the presenter remained in front of the participants so as to not observe any participant test responses. Participants were then provided with a ten minute break prior to the start of the training session. The pretest time was separate from the training session time.

Training Sessions

The duration of each learning session lasted for between two to three hours with a five-to-ten-minute break every 40 minutes. The sessions were conducted in the cafeteria of the home base elementary school. The training modules were a series of slideshow presentations.

Paraprofessionals were provided with a handout of all the slides. Slides consisted of a concept, definition, explanation, or an example of each topic area in the module. Fill-in-the-blank questions were incorporated in the slides, allowing for discussion. A trainer training module was developed consisting of added examples and responses for the fill-ins. The participants were encouraged to ask questions, supply examples per topic, and participate in group discussions. Content videos and modeling of procedures were conducted by the trainer. All sessions were completed by a Board Certified Behavior Analyst employed by the participating school district.

Post-Training Session

Directly following the training session, the participants completed a posttest (Appendix C, E, G). The posttest consisted of the same set of pretest questions, albeit in randomized order. Post-training sessions followed the pretest procedure. The selected senior paraprofessional provided the posttest to each of the participating paraprofessionals. Participating paraprofessionals were provide 30 minutes to complete the 10-multiple choice questions. Upon completion of the posttest, the participant placed the test in a manila envelope. The senior paraprofessional ensured all test codes were completed prior to having the participants place the test in the manila envelope. During the 30 minutes for the posttest, the presenter remained in front of the participants so as to not observe any participant test responses.

Data Analysis

Gathering pretest data from participating paraprofessionals allowed for matched-pairs analyses of pretest and posttest data, in which each participating paraprofessional's posttest could be compared with their pretest. To allow for the assessments to be anonymous, a code was created at the top of each assessment, where paraprofessionals responded to questions. Due to the paraprofessional union contract, individual participant feedback was not an option. Therefore,

this study evaluated the effects of the group learning sessions. The use of a code allowed for anonymously pairing assessments without the knowledge of who completed them.

Data from the pre-test and post-test was analyzed using a comparison analysis of variance (ANOVA). An ANOVA is an analysis tool used in statistics that splits an observed aggregate variability found inside a data set into two parts: systematic factors and random factors (Rutherford, 2013; Shieh, 2020). The systematic factors have a statistical influence on the given data set. Analysts use the ANOVA test to determine the influence of training on performance.

Limitations

This study was conducted in one urban, northeastern public school district across two elementary schools, using a total of fourteen classrooms. The study only focused on special-education paraprofessionals assigned to the school district's substantially separate ABA-based program. Hence, the training findings that were found from this study specifically involve elementary-employed special-education paraprofessionals in this school district's ASD setting only. Despite the use of carefully planned research procedures, findings from this study may not be generalized due to the setting, sample size, or population. Second, the scope of paraprofessionals was restricted to those newly hired for the upcoming school year. This specific criterion is used to select participants, limiting the sampling size. While participants were new to the school district, thirteen out of thirty-five participants indicated that they had prior education and implementation of ABA procedures and interventions of varying years of experience. Specifics of past training from previous employments were not collected.

Another limitation was the use of historical data. Campbell and Stanley's (1966) study on quasi-experimental design showed that the use of historical data may be considered based on its internal validity due to the inability to schedule when and with whom to conduct the experiment.

However, historical data does allow the researcher to analyze it, which may lead to an improved experiment.

The purpose of this research was to understand newly hired paraprofessional knowledge of applied behavior analysis practice in substantially separated ABA-based classroom. The effects of knowledge gained were determined by analyzing the results of the pretest and posttest. This analysis provided insight into future paraprofessional training, to focus on vital components of ABA principles and interventions to support the needs of students with ASD in substantially separated classrooms.

Summary

The study utilized a pretest/posttest quasi-experimental design to evaluate the effectiveness of Applied Behavior Analysis (ABA)-based content for thirty-five first-year paraprofessionals working in specialized classrooms with students in pre-kindergarten to fifth grade across two elementary schools. The research involved historical data to assess the current training's efficacy and included pretraining and post-training assessments conducted just before the academic year. The focus was on professional development for special-education paraprofessionals in an urban, northeastern public school district within substantially separate ABA-based programs for students with ASD diagnosis. The findings are context-specific and may not be generalized due to factors like the setting, sample size, and population. Although participants were newly hired for the upcoming school year, some had prior ABA education from previous employment, with specific details about this training not collected. Caution is advised in applying the study's insights to other settings or populations.

In the upcoming chapter, the study will delve into an analysis of participants' responses from both the pretest and posttest. The examination will focus on content areas to discern

instances where participants exhibited an increase in knowledge relative to their pretest performance. Specific content areas will be scrutinized to identify and measure improvements in participants' knowledge levels following the learning sessions. This method enables researchers to pinpoint the effectiveness of the training by gauging enhancements in targeted knowledge domains.

Chapter 4

Results

The focal aim of this study was to examine the intricacies of group training dynamics and the assimilation of newly recruited paraprofessionals regarding ABA practices within substantially separated ABA-based classrooms. This chapter commences with a concise recapitulation of the research inquiries, seamlessly transitioning into the description of the methodological framework employed for data collection and subsequent analysis. The overarching goal of this chapter is to meticulously unveil and critically analyze the findings extracted from the comprehensive process of data analysis.

Restatement of Research Purpose

Presently, there are no established federal guidelines or regulations specifying subject matter or times pertaining to paraprofessionals receiving continuous professional development. School districts must acknowledge the vital contribution that paraprofessionals make to the education of students with special needs. Paraprofessionals must have meaningful professional development opportunities. Without ongoing training, paraprofessionals may face challenging situations where they are ill-equipped to adequately support students with special needs or fulfill the responsibilities associated with their role.

This study focused on previously collected data from a past professional development training for paraprofessionals supporting students in a significantly separated ABA-based elementary classrooms, grades Pre-K–5.

Thirty-five full-time paraprofessionals across fourteen classrooms participated in past professional development. The paraprofessionals were either recently recruited for the ABA-based program or had been working in the ABA-based program for less than six months. All

participants were proficient in English and had a high school diploma, with two having trade-school experience, six with an associate degree, and eleven with a bachelor's degree. The average age of the participants was 32 years, ranging from 18 to 56 years. Fifteen participants had previous ABA experience, but data pertaining to such experience was not collected. Table 11 outlines details on participating paraprofessionals.

Table 11

Participant Details

Number of Participants	Number of Classroom the Participants Represent	Criteria for Participant Participation	Participant Highest Degree	Participant Age Range	Number of Participants with Prior Experience
35	14	1.) participants were employed to work within the elementry substantially separated ABA-based classrooms, 2.) participants were employed for less than 6 months within this district, 3.) participants had not received ABA professional development from the district in the past	High School - 16 Trade School – 2 Associate - 6 Bachelor - 11	18-56 Average - 32	15

The past professional development was completed across three sessions, each session lasted two to three hours, which started with a pretest moving into the power point training and ending with a posttest. The two assessment-of-knowledge questionnaires for each of the three training module, consisting of 10 multiple-choice questions. The assessment off knowledge

questionnaires were administered as "paper and pencil" assessments, with one given as a pretest before the training session and the other as a posttest immediately afterward. Participants were instructed to respond independently from each other.

During the pre-training sessions, participants took the pretest without prior review of the module content. They had 30 minutes to complete the ten multiple-choice questions. When tests were completed, the tests were placed in manila envelopes to ensure anonymity and a blind review process. A senior paraprofessional, who ensured all test codes were completed, administered the pretest. After the pretest, participants were given a 10-minute break before the training session began.

The training sessions lasted between two to three hours, with short breaks every 40 minutes. Conducted in the elementry school cafeteria, the sessions included slideshow presentations with handouts, content videos, and skills modeling. Slides featured fill-in-the-blank questions to encourage discussion, and participants were prompted to ask questions and engage in discussions. The training was led by an employee of the school district who holds a Board Certified Behavior Analyst certification and twenty-five experience years within ABA. The trainer has worked within the district for ten years supporting the ABA classrooms and has experience in providing district one hour, one topic training, such as function of behavior, use of visuals, to past paraprofessionals, teachers, parents, and administrators.

Immediately following the training, participants completed the posttest, which consisted of the same questions as the pretest but randomized. They had 30 minutes to complete the test, which was again placed in manila envelopes for anonymity. The senior paraprofessional ensured all test codes were completed before collecting the tests. After the posttest, participants returned to their classrooms to prepare for the first day of school. This process aimed to measure the

knowledge gained by paraprofessionals through the training sessions while ensuring anonymity and reducing potential biases in test administration and evaluation.

The following research question guided this quantitative study: *In a group training of evidence-based practice, to what extent, if any, do paraprofessionals advance their knowledge of applied behavior analysis?*

Results

Pretest and posttest for each of the three modules were matched using the corresponding code placed at the top of each test. Subsequently, packet numbers from 1 to 35 were assigned once the matching was completed. Table 12 illustrates the number of correct responses on both the pretest and posttest for every packet. The scores on this table range from 0, indicating no correct responses, to 10, representing the highest number of correct responses.

Table 12

Packet Number Scores

Packet Number	Module One		Module Two		Module Three	
	Pretest Correct Responses	Posttest Correct Responses	Pretest Correct Responses	Posttest Correct Responses	Pretest Correct Responses	Posttest Correct Responses
1	7	10	4	7	8	9
2	2	3	6	8	8	8
3	6	7	4	5	7	9
4	7	8	4	8	9	8
5	2	7	6	9	8	9
6	4	4	5	5	9	8
7	3	4	6	5	7	9
8	8	9	8	9	8	9
9	2	3	5	8	5	8
10	4	6	8	5	6	6
11	5	6	6	9	7	9
12	9	9	7	9	6	9
13	6	9	8	10	9	8
14	5	10	10	7	7	10
15	4	7	6	6	9	9

16	6	10	6	5	7	10
17	3	4	7	8	8	9
18	2	5	6	8	9	9
19	5	5	4	6	8	8
20	5	7	8	6	10	8
21	4	5	5	8	9	6
22	9	10	6	8	8	8
23	8	9	10	8	7	8
24	5	7	9	9	10	9
25	7	6	9	9	8	8
26	6	5	8	10	8	9
27	8	9	8	6	7	9
28	8	10	9	9	6	7
29	6	6	4	6	9	10
30	8	8	7	7	9	10
31	9	8	6	7	8	10
32	8	9	5	6	8	10
33	3	5	3	7	7	10
34	4	6	4	9	8	8
35	6	8	3	8	8	9

Statistical Method

Pretest-posttest designs are commonly employed in educational research for comparing one or more groups as well as measuring changes resulting from experimental treatments (Kim & Wilson, 2010). Pretesting serves multiple purposes: it establishes a baseline before an intervention, enables stratification of subjects based on pretest scores (known as blocking), provides a covariate in quasi-experimental designs, and helps tailor instructional materials to students' current levels by identifying their existing knowledge or deficiencies. Some researchers argue that pretests function as motivational tools or direct teaching aids (Gunasekera, 1997). Generally, pretests can increase arousal or attention towards upcoming events such as treatments and posttests (Sime & Boyce, 1969). By alerting subjects to relevant topics, pretests selectively direct attention towards the areas of interest for the researchers. This heightened focus on the intervention or posttest, whether general or specific. Pretesting is a starting point; essentially,

pretesting is recommended in education to understand what participants already know or where they may need improvement. Then, posttests gauge alterations in dependent variables, offering valuable insights into the development of knowledge following the intervention.

Figure 1

Growth Gain Design Flow
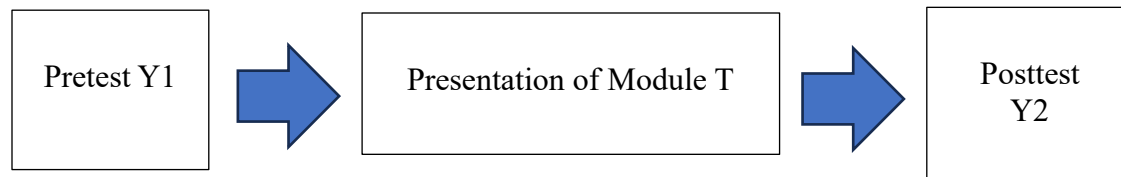
Y1 = pretest scores, T = experimental treatment, Y2 = posttest scores, and D = the difference between pretest-posttest scores (calculated as Y2 − Y1 = D).

Module Analysis

In the context of educational and social science research, the reliability and validity of gain scores are critical for accurately measuring changes in learning (Zimmerman & Williams, 1982). This method's focus is very often on the description of systematic patterns within change, such as the increase of knowledge after intervention. The analysis began by determining the total number of accurate responses for both the pretest and posttest phases. This foundational step of pairing and then identifying the difference between the tests served as a crucial starting point for assessing the impact of the intervention across the different modules (Kelly & Monczunski, 2007). Using growth gain analysis provides estimates of the magnitude of the treatment effects, rather than merely indicating their presence. This approach also directly facilitates many of the pairwise comparisons, offering a more comprehensive analysis of the data (Glantz, et. al, 2016).

To measure changes in learning, one fundamental approach is to calculate the raw score referred to as growth gain, defined as the absolute difference between post-test and pre-test

scores. This measure provides a straightforward metric for assessing learning outcomes. Additionally, similar principles apply to the validity of gain scores (Zimmer & Williams, 1998). When the conditions favor higher variance and reliability in post-test scores, the validity of gain scores is likely enhanced. A comprehensive understanding of performance across the three modules was calculated. The process involved calculating cumulative correct responses, which entailed summing the total correct responses from both pretests and posttests within each module. The subsequent step centered on calculating the variance by subtracting the correct pretest responses from their respective correct posttest responses. This method was systematically applied to each module, in succession.

The next step involved completing a variance analysis to identify any differences or changes in the measured outcomes (Gravetter & Wallnau, 2017). Variance is a measurement of the spread between numbers in a data set; in particular, it measures the degree of dispersion of data around the sample's mean. (Graziano & Raulin, 2013) The variances obtained were instrumental in gauging the effectiveness of the intervention in each module (Table 13). Further, the average of correct responses and the corresponding variance for each module were calculated, facilitating a module-wise understanding of the impact, and allowing for a comparative assessment across different stages of the study.

Table 13

Summary of Data

Module One	Total Points Correct out of 350 Responses	Average Correct Responses	Variance	Total Percentage of Correct Responses
Pretest	194	5.543	4.785	55%
Posttest	244	6.971	4.617	70%

Difference	50 points gained			14% increase
Module Two	Total Points Correct Responses	Average Correct Responses	Variance	Total Percentage of Correct Responses
Pretest	221	6.286	3.798	63%
Posttest	276	7.886	2.311	79%
Difference	56 points gained			16% increase
Module Three	Total Points Correct out of 350 Responses	Average Correct Responses	Variance	Total Percentage of Correct Responses
Pretest	275	7.857	1.303	79%
Posttest	303	8.657	1.055	87%
Difference	28 points gained			8% increase

Among the three modules, Module One exhibited the lowest pretest score, indicating a lower baseline of understanding or performance level. In contrast, Module Two highlighted a middle-range pretest score, suggesting a moderate starting point for participants in this module. Finally, Module Three boasted the highest pretest score among the three, indicating a comparatively stronger initial grasp or competence in the subject matter. These variations in pretest scores across modules lay the foundation for further analysis and exploration of how each module's instructional strategies contributed to the observed differences in participant performance.

All the modules increased their scores from pretest to posttest, implying a consistent and overall advancement in performance or comprehension within each respective area of study. The increased posttest scores demonstrate the positive impact of the interventions applied in the modules, underscoring notable progress and success in the learning process.

To determine the means and standard deviations for each module, an analysis of variance (ANOVA) was conducted. The mean served as a measure of central tendency for each area under examination, and the standard deviations provided a definition to elucidate potential variations within each distribution. An ANOVA is a statistical method for gauging the impact of an independent variable (in this case, paraprofessional group ABA training) on dependent variables (pretest-posttest). The determination of statistically significant relationships relied on an alpha level of 0.05 or lower. Adherence to ANOVA assumptions was imperative, encompassing independence, normal distribution, and homogeneity of variance. The independence assumption was contingent on data collection methods, the normality assumption addressed the sampling distribution of means, and the equal variance assumption pertained to variances within populations (Gravetter & Wallnau, 2017).

This study's data exemplifies statistical significance; as the p-value was below the significance level of .05, the null hypothesis was rejected in the one-way ANOVA, indicating ample evidence that the group means were not all equal. In other words, the three learning modules did not result in identical average exam scores. ANOVA calculations can be seen in table 14.

Table 14

ANOVA Calculations

Module One	SS	df	MS	F	P-value	F crit
Between the Participants	35.714	1	35.714	7.597	0.008	3.982
Within the Participants	319.657	68	4.701			
Module Two	SS	df	MS	F	P-value	F crit

	SS	df	MS	F	P-value	F crit
Between the Participants	22.857	1	22.857	7.483	0.008	3.982
Within the Participants	207.714	68	3.055			
Module Three	**SS**	**df**	**MS**	**F**	**P-value**	**F crit**
Between the Participants	11.200	1	11.200	9.500	0.003	3.982
Within the Participants	80.171	68	1.179			

Note: SS = sum of squares (a critical measurement of the variability of a data set; the variance of a set of scores and the square root of the variance is its standard deviation); *df* = degrees of freedom (the number of independent pieces of information used to calculate in statistics, calculated as the sample size minus the number of restrictions); MS = mean square (calculated as *SS* / *df*); *F* = *F*-value (the overall value, calculated as $MS_{Between}$ / MS_{Within}); *p* = the *p*-value corresponding to the overall *F*-value; and *F* crit = the *F* critical value that corresponds to α = .05

Question Analysis

An analysis of the module questions spanning over the three modules was conducted to discern the specific areas where the participants consistently provided correct responses. This examination identified patterns of proficiency and pinpointed the topics or aspects within each module that resonated effectively with the participants (Table 15). Scrutinizing the correct responses enables gaining valuable insights into the strengths and weaknesses of the modules, facilitating targeted improvements and refinements. Such scrutinizing is essential for honing the effectiveness of training materials and ensuring that paraprofessionals acquire a comprehensive understanding of the key concepts embedded within the modules.

Table 15

Module Question Correct Responses

	Module One		Module Two		Module Three	
	Pretest Correct Responses	Posttest Correct Responses	Pretest Correct Responses	Posttest Correct Responses	Pretest Correct Responses	Posttest Correct Responses
Question 1	16	27	16	27	35	35
Question 2	25	28	25	28	33	34
Question 3	17	23	17	23	33	28
Question 4	17	25	17	25	34	34
Question 5	28	31	28	31	13	33
Question 6	20	21	20	21	18	31
Question 7	33	28	33	28	25	26
Question 8	13	29	13	29	27	27
Question 9	12	20	12	20	32	35
Question 10	13	12	13	12	23	19

Module One

In Module One, the pretest scores ranged from 12 to 33. Question 7 (behavior) had the highest correct responses, and Question 9 (function) had the least. The subsequent posttest scores ranged from 12 to 31. The cumulative correct responses demonstrate an increase of fifty points, highlighting an improvement particularly notable in Question 8 (function). This overall observation across questions denoted 14% knowledge growth. However, the discernible decrease

in correct responses for Questions 7 and 10 prompted a nuanced inquiry, signaling potential challenges with or misunderstandings of the questions.

Module Two

In Module Two, the pretest scores ranged from 12 to 33. The participants displayed prowess in Question 7 (data collection) but struggled with Question 9 (graphing), which had the fewest correct responses. The posttest ranged from 12 to 31. The collective correct responses from the posttest demonstrate an increase of fifty-six points, emphasizing a notable improvement and substantial 16% transformation. However, a reduction in correct responses for Question 7 (data collection) and 10 (baseline) hints at potential content perplexities, emphasizing the imperative for targeted instructional adjustments.

Module Three

In Module Three, the pretest scores ranged from 13 to 35. This module exhibited the highest number of correct responses on the pretest, with Question 1 seeing a perfect score. The posttest ranged from 19 to 35. The combined posttest responses showed an increase of twenty-eight points, underscoring a positive advancement, showing an 8% augmentation in knowledge retention. Questions 1 and 9 on the posttest achieved perfect scores. Hence, questions 3 and 10 saw a decrease in correct responses.

The subtleties across the pretests and posttests encourage an investigation into factors influencing participant comprehension and delineating areas for instructional enhancement. This scrutiny serves as an invaluable compass for honing instructional strategies and effectively addressing the multifaceted learning needs of participants in this scholarly pursuit.

The focal aim of this study was to examine the intricacies of group training dynamics and the assimilation of newly recruited paraprofessionals regarding Applied Behavior Analysis

(ABA) practices within substantially separated ABA-based classrooms. Thirty-five full-time paraprofessionals participated in the professional development training, which included pretests, PowerPoint training sessions, and posttests to measure knowledge gained. The training, conducted by an experienced Board Certified Behavior Analyst, included engaging discussions, content videos, and skills modeling. The study's primary research question was to determine the extent to which paraprofessionals advanced their knowledge of ABA through group training. Pretest and posttest scores for each of the three modules were matched and analyzed, showing a consistent increase in knowledge across all modules.

The analysis revealed significant improvements in knowledge, with each module exhibiting notable growth. Module One showed a 14% increase in knowledge, Module Two showed a 16% increase, and Module Three showed an 8% increase. An analysis of variance (ANOVA) confirmed statistically significant differences in group means, suggesting the effectiveness of the training. The findings demonstrated the positive impact of the training on paraprofessionals' understanding of ABA practices, highlighting areas of strength and pinpointing aspects needing further instructional improvement. This comprehensive analysis underscores the importance of ongoing professional development for paraprofessionals to support students with special needs effectively.

The next chapter will begin with a detailed discussion of the results, providing an overview of each module and the specific questions that were part of the training assessment. This discussion will not only summarize the findings but also interpret the implications of these results in the context of paraprofessional training for ABA practices. By examining the performance on each question and module, we will identify areas where participants showed

significant improvement as well as topics that may require additional focus in future training sessions.

Furthermore, the chapter will explore the broader implications of the study, particularly how the findings can enhance current training programs for paraprofessionals. By pinpointing areas of strength and identifying gaps in knowledge, the study offers valuable insights that can be used to refine and target professional development initiatives more effectively. The chapter will conclude with recommendations based on the study's outcomes, providing actionable suggestions for enhancing the training and support of paraprofessionals in ABA-based classrooms, thereby ensuring they are well-equipped to meet the needs of students with special needs.

Chapter 5

Discussion

The current study evaluated the effectiveness of a group-training format with paraprofessionals who support students in ABA-based, substantially separated classrooms. The training curriculum focused on ABA knowledge competencies, ensuring a foundational understanding of essential learning concepts and their applications in behavior-analytic settings. In essence, the study measured participants' knowledge regarding basic learning principles of behavior, instructional strategies, and prompt/prompt-fading methods through pre- and post-training tests.

The study's reliability was a primary concern. Recognizing the potential impact of participant history on the subject matter, measures were taken to control and account for external events that could influence measurements. These measures involved establishing participant criteria and having the participants independently complete both the pretest and posttest. The risk of participant dropout was addressed through a detailed focus on time constraints, implementing strategies to minimize dropout rates by including the training on scheduled district training days, and ensuring a comprehensive dataset. Mindful participant selection was another crucial aspect, aimed at mitigating selection bias by carefully choosing individuals for the training.

In adapting the training model to district constraints for accommodating district professional development days, several aspects were tailored, such as the time of the day and duration of each learning session. District orientations on mandatory 51A training and confidentiality training were integrated into the afternoon portion following a morning ABA training. Acknowledging the need for efficient and group-focused training, knowledge competency sessions were spread over three mornings sessions where each session lasted

between two to three hours. Each session featured content modules for topic-specific training sessions. To optimize the training's effectiveness a, a single trainer employed within the district provided the training sessions for professional development. The trainer was a certified behavior analyst with over 25 years of experience in the field and has routinely conducted ABA training across the district to paraprofessionals, teachers, district administration, and parents. The trainer employed visually appealing Power Point slides, case illustrations, and interactive discussions within a standardized presentation format. While the paraprofessionals' perceptions of the training were not objectively measured, anecdotal evidence suggested a positive reception, aligning subjectively with their entry-level skills.

There was a positive trend in participant performance, revealing a noteworthy increase in correct responses from the pretest to the posttest across the three modules. Module One demonstrated a 14% increase in knowledge, Module Two showed a 16% increase, and Module Three exhibited an 8% increase. This observation implies a substantial enhancement in the participants' comprehension and proficiency across the diverse areas covered within the modules. Module One encompassed defining and providing examples of behavior, reinforcement, antecedent-behavior-consequence contingency, measurement, data collection, and the fundamental principles of functional behavior assessment. Module Two delved into discrete trial training, incidental teaching, and task analysis, while Module Three inspected prompt hierarchy and fading prompt strategies.

Module One demonstrated an increase in knowledge in eight out of ten questions, indicating a successful learning outcome for the majority of the content covered. The clarity and relevance of content was clearly presented and highly relevant to the participants' roles and responsibilities. When participants perceive the material as directly applicable to their work, they

are more motivated to learn and remember it. The module topics were on fundamental concepts and straightforward information rather than complex, nuanced topics. This focus makes it easier for participants to learn and retain the material. Additionally, due to Module One being presented on the first of three days, participants typically approach the material with a heightened level of interest and enthusiasm. Participants are free from fatigue or distraction that may accumulate over subsequent days of training. This can enhance their ability to memorize and respond to straightforward content.

Module Two, which showed the highest increase at 16%, may have had a greater potential for growth due to reasons such as covered content that was less familiar to participants initially, providing more room for learning and improvement referred to as content complexity. The higher increase suggests that participants had more to gain in terms of new knowledge or skills. Content complexity pertains to the cognitive demands implied by the language used in a content standard which involves considerations such as the required prior knowledge, the processing of concepts and skills, the sophistication, the number of components, and the application of the content structure necessary to meet an expectation or achieve an outcome (Kurdi, 2019).

In comparison, Module Three showed a smaller increase of 8%, which was lower compared to the other modules. This modest growth can be primarily attributed to the high number of correct responses observed in the pretest. When participants already possess a substantial understanding of the material before the intervention, there is naturally less room for improvement. Factors such as pre-existing knowledge or the ceiling effect could explain this phenomenon. In summary, the high number of correct pretest responses for Module Three indicates that participants were already knowledgeable about the material, limiting the scope for

noticeable improvement (Uttl, 2005). This underscores the importance of considering initial

knowledge levels when designing educational interventions and assessments to ensure that they

can effectively measure growth across different starting points (Uttl, 2005).

Table 16 below provides a visual representation of the correct responses per question for

both the pretest and posttest across the three modules. Of the ten questions in Module One, eight

demonstrated an increase of at least one additional correct response when comparing posttest

responses to pretest responses. However, questions seven and ten exhibited a decrease in the

number of correct responses in the posttest.

Analyzing Module One question seven pertained to identifying when a paraprofessional

should refer to a behavior intervention plan. Question ten addressed which behaviors could be

classified in specific categories such as action, medical, or communication. Despite these topics

being covered during the presentation, the decline in correct responses may be attributed to the

paraprofessionals' application of these questions to practical scenarios, which might have

introduced complexity (McEwan & McEwan, 2003). In contrast, other questions were more

straightforward, focusing on definitions. This disparity suggests that while theoretical knowledge

might have been effectively conveyed, the practical application of this knowledge posed a

greater challenge for the paraprofessionals.

Table 16

Total Correct Responses per Question

Within Module Two, eight of the ten questions show an increase in correct responses on the posttest when compared to the pretest. The decrease in correct responses for question seven can be attributed to the requirement for participants to apply task analysis techniques to their existing knowledge in order to make a comparison. Task analysis involves breaking down complex behaviors or tasks into smaller, manageable steps to understand how they are performed. This application may have posed challenges, as it required participants to match theoretical knowledge with real-world situations, potentially leading to inconsistencies in their responses. Similarly, question ten experienced a decrease in correct responses because it demanded participants to not only know how to identify specific behaviors but also to understand how to effectively present and teach these skills. This dual requirement of knowledge application (identification and instructional competence) could have contributed to the decline in correct responses. Participants may have struggled to integrate both aspects seamlessly, especially because the training emphasized theoretical understanding over practical application or if the question's complexity exceeded their initial preparation.

Similarly to Module One and Two, Module Three also has a decrease of correct responses in two question. Question three refers to classrooms having a schedule of the day posted within the classroom. Perhaps the training about the use of visuals was not adequately covered in the training module, or the choices for question three may have been ambiguous or closely related, making it challenging for participants to select the correct response. Ambiguous options can lead to confusion and incorrect answers even among participants who grasp the underlying concepts (McEwan & McEwan, 2003). Last, question ten in Module Three also saw a decrease in correct responses on the pretest. A few factors may have contributed to this decline in correct responses. Participants may not have been able to understand the reasons and timing for prompting which involves nuanced knowledge of behavioral principles and intervention strategies. Due to being the third day of training, the presenter rushed the presentation of the context. Additionally, participants may experience mental fatigue or a decline in attention, leading to mistakes or less careful reading and answering of the question. When this occurs, Participants might rush through the last question if they are running out of time or eager to finish the quiz. This haste can lead to misunderstandings or less thoughtful responses.

Table 17

Content Questions with a Decrease in Correct Responses

Module	Content Area	Content Questions with a Decrease of Correct Responses
Module One	• Define Behavior • Reinforcement – What is it? • Antecedent-Behavior-Consequence Contingent • Measurement – Why and when it is needed. • Data Collection and Interpreting the Data • What is a Function Behavior Analysis • Interventions – Antecedent - Consequence	• When to refer to a Behavior Intervention Plan. • Behavior can serve as communication.

Module Two	• Discrete Trial Training Procedure • Incidental Teaching or Natural Teaching • Task Analysis Procedure	• When not to use a task analysis. • When not to provide reinforcement during DTT.
Module Three	• Prompt Hierarchy - Verbal and Physical Responses • Fading Prompt Strategies (Visuals, positioning)	• When to use visuals. • Why we prompt student.

Despite the overall growth observed in participant responses table 17 depicts where participants showed a decrease of correct responses on the posttest when compared to the pretest. The differences that have surfaced, especially in questions related to behaviors, task analysis, and the timing for appropriate prompting. These variations highlight areas where participants may benefit from additional focus, examples, and longer time for questions during the treatment phase of future training endeavors. This analysis demonstrates the participants' evolving proficiency and guides recommendations for refining and tailoring future training programs to optimize learning outcomes.

This study aligns with the findings of Brock and Carter (2013), indicating a consistent pattern in the effectiveness of adequately trained paraprofessionals, particularly in their ability to implement beneficial educational practices for students with ASD. Additionally, scholars (Douglas et al., 2012, Fisher and Pleasants, 2012, Kim et al., 2016) emphasize the importance of having evidence-based approaches to objectively assess paraprofessional skills and provide targeted feedback for improvement. Without sufficient professional development resources, including valid assessments and data-driven feedback, paraprofessionals may not develop the necessary skills to effectively support teachers and cater to the needs of students with disabilities.

Implications

Studying paraprofessional training within an ABA-based classroom can have several benefits and insights for the school district as well as for research in the field of ABA. In educational settings, the effectiveness of paraprofessionals is crucial to ensuring the success of students with diverse learning needs, particularly those receiving interventions grounded in ABA. Understanding the impact of paraprofessional training goes beyond immediate classroom outcomes; it extends to broader implications within the educational landscape and research community. By delving into the training protocols, methods, and outcomes associated with paraprofessionals in ABA-based classrooms, researchers can discover insights that inform not only practice but also contribute to the ongoing evolution of evidence-based interventions and educational policies. Thus, the study of paraprofessional training serves as a pivotal point where practical implications intersect with the advancement of knowledge in the field of ABA.

ABA-based approaches are highly structured and individualized for each student (Cooper, et al, 2017). Well-trained paraprofessionals can better implement EBP to increase student academic and functional skills. Trained paraprofessionals are also able to identify challenging behaviors, implement developed behavior interventions, and provide reinforcement to increase prosocial behaviors.

Investing in comprehensive training for paraprofessionals may initially require resources, but it can lead to long-term cost savings for school districts. Trained paraprofessionals are likely to be more effective in their roles, reducing the need for additional interventions or specialized services. Paraprofessionals who receive thorough training are more likely to feel confident and competent in their roles, which can lead to higher job satisfaction and reduced turnover rates. This stability can benefit the school district by fostering continuity in support for students and

reducing the need for frequent recruitment and training of inexperienced staff. Further, providing adequate training for paraprofessionals ensures that school districts follow legal requirements, such as those outlined in the Individuals with Disabilities Education Act, and failure to provide appropriate training may result in legal challenges or complaints from parents or advocacy groups.

ABA-based classrooms often require collaboration among various stakeholders, including teachers, therapists, administrators, and families. Training paraprofessionals effectively can facilitate smoother collaboration and communication within school districts, leading to more coordinated support for students. ABA approaches rely heavily on data collection and analysis to inform instructional decisions and behavior-management strategies. Well-trained paraprofessionals can contribute to this process by accurately collecting and documenting relevant data, which can ultimately improve the effectiveness of interventions and support services.

Demonstrating a commitment to providing high-quality training for paraprofessionals reflects positively on school districts and can enhance their reputation within their community. This reflection and enhancement can be particularly important for attracting and retaining families with students with special needs. By prioritizing high-quality training for paraprofessionals in schools is paramount. These dedicated professionals are pivotal in supporting both teachers and students, thus enhancing the overall educational experience. Equipping them with effective training ensures they have the necessary skills to assist students with diverse needs, fostering inclusive learning environments. Moreover, investing in quality training facilitates their professional development, boosting job satisfaction and retention rates.

Ultimately, such investment leads to improved student outcomes and cultivates a more supportive educational ecosystem.

In tandem with this commitment to training, effective organizations embrace best practices to cultivate top talent. To retain sought-after employees, these organizations prioritize positive workplace cultures, competitive compensation, and opportunities for professional growth and longevity of the paraprofessional's employment to the district.

The results of this study contribute to the development of best practices for training paraprofessionals who work with students with diverse learning needs, particularly those receiving ABA-based interventions. By providing empirical evidence of the effectiveness of specific training interventions or strategies, research in this area can promote the adoption of evidence-based practices within educational settings, which can lead to improvements in the quality of support provided to students with ASD and other learning needs, enhancing their educational outcomes.

Studies in this area can help fill gaps in the existing literature regarding the role of paraprofessionals in implementing ABA interventions and supporting students with ASD or other developmental disabilities. By addressing these gaps, researchers can contribute to a more comprehensive understanding of effective instructional practices and support systems. Such research may inform policy decisions related to the training and deployment of paraprofessionals in educational settings. Further, policymakers can use evidence from studies in this area to develop guidelines, standards, and regulations that promote high-quality training and support for paraprofessionals working with students with diverse needs.

Ultimately, both researching paraprofessional training within ABA-based classrooms and acquiring foundational knowledge before working with students with ASD in substantially

separated classrooms present multifaceted benefits. These benefits include informing best practices, identifying effective strategies, filling knowledge gaps, enhancing professional development, supporting evidence-based practice, informing policy and practice, promoting collaboration, and fostering interdisciplinary research in education and applied behavior analysis. Prioritizing such endeavors not only deepens understanding of individual needs and improves classroom management but also cultivates cultural sensitivity and creates opportunities for professional growth. In the end, these efforts contribute to a more inclusive and supportive learning environment, ensuring that all students receive the support they need to thrive academically and socially.

Conclusion

Currently, schools heavily rely on paraprofessionals to support students at risk or with disabilities, yet research and practices regarding the professional development training of these individuals lag behind. This dissertation delves into the imperative requirement for bolstered training and support systems tailored for paraprofessionals engaged in special education services within Massachusetts, particularly in light of the escalating populace of students with disabilities. Despite their pivotal contributions, paraprofessionals often encounter gaps in their preparation concerning evidence-based instructional methodologies, potentially impeding their efficacy in aiding students with significant needs.

The study undertook an assessment of the efficacy of group training for newly recruited paraprofessionals in substantially separated ABA-based classrooms, with a focus on elementary classrooms spanning from pre-kindergarten to fifth grade, across two schools. Thirty-five full-time paraprofessionals, encompassing both fresh recruits and those with less than six months of experience in the ABA-based program, participated in the research endeavor. Analysis of the

data underscored a substantial enhancement in posttest scores across all modules, indicative of a consistent progress in both performance and comprehension among the participants.

A meticulous scrutiny of specific module questions revealed areas of proficiency and highlighted topics that resonated effectively with the paraprofessionals. Noteworthy was the 14% knowledge growth in Module One, a 16% transformation in Module Two, and an 8% increase in knowledge retention in Module Three. Particularly remarkable were the perfect accuracy rates achieved in Question ten of Module Three on both pretest and posttest. However, challenges encountered with data-related questions alluded to potential content complexities necessitating instructional refinements.

Given the escalating prevalence of ASD, this research underscores the urgency of equipping educational personnel, including paraprofessionals, with a heightened understanding of ABA principles and evidence-based practices. Crucially, the study accentuates the pressing necessity for comprehensive training of paraprofessionals to ensure their proficiency in supporting students with ASD in substantially separated ABA-based classrooms. The integration of specialized, evidence-based interventions emerges as imperative to address the distinctive needs of these students, thereby fostering their academic and developmental achievements. By prioritizing ongoing professional development and targeted support mechanisms, educational institutions can bolster the capacity of paraprofessionals to facilitate meaningful progress and inclusive educational experiences for students with ASD.

Implications for Future Research

The results of this study provide valuable insight into the possibilities of future professional development. For example, schools should prioritize including paraprofessionals in as many school paraprofessional development as possible because their involvement enhances

overall educational effectiveness, fosters a cohesive team dynamic, and ensures alignment with the school's educational objectives. This approach additionally offers a cost-effective means of incrementally building the skills of paraprofessionals while tailoring their training to address specific school-based needs. Doing so not only acknowledges the crucial role played by paraprofessionals in the school but also demonstrates respect for their contributions, likely resulting in increased effectiveness and motivation among these valuable staff members.

Next, to foster effective collaboration and information exchange between teachers and paraprofessionals, school schedules must be structured to accommodate regular meetings. These meetings serve as crucial platforms for discussing student performance, sharing insights, providing ongoing professional development, and coordinating efforts to provide optimal support.

Additionally, school districts must create a well-defined job description to serve as a roadmap for paraprofessionals, outlining the specific tasks and responsibilities expected of them. Such a roadmap not only helps in avoiding misunderstandings but also provides a foundation for assessing performance and identifying areas for improvement.

Finally, future research endeavors should explore critical areas of training requirements and evaluate the effectiveness of existing training structures or programs tailored for paraprofessionals. School districts should contemplate employing specialized special-education trainers, particularly those well-versed in ABA and autism. By incorporating a dedicated trainer with expertise in ABA and autism, investigating the specialized district format and delivery mechanisms, overcoming barriers to training provision, and assessing the impact on the proficiency of paraprofessionals can be undertaken. This comprehensive exploration serves as

the foundation for tailoring a model of training that can be adapted for broader application across educational settings.

Furthermore, the focused research should be directed toward specific skills identified as high-priority training needs. These skills may include positive behavior support interventions, natural environment teaching, and prompting techniques. The prioritization of research in these domains may inform interventions that enhance the educational experiences of students with ASD, empowering educators to adeptly address behavioral, academic, and communication needs in the children they serve.

When individuals feel respected and appreciated, they are more likely to perform at their best. Therefore, promoting the effectiveness of paraprofessionals in schools aligns with the collective interests of the entire school community. By investing in their professional development, schools can enhance the skills and capabilities of paraprofessionals, ultimately contributing to a more supportive and successful learning environment for all students.

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Appendix A: Research Permission Form

SCHOOL PERMISSION TO CONDUCT RESEARCH

June 22, 2022

Dear Instructional Review Board:

The purpose of this letter is to inform you that I gave Dr. Katie Leckenby and Nicole Grube-Benson permission to conduct the dissertation research titled Group Training of Applied behavior Analysis (ABA) Knowledge Competencies to School-Based Paraprofessionals for Students in Substantially Separated Classrooms. I understand this form is needed for the IRB process at Slippery Rock University and will serve as assurance that the school complies with requirements of the Family Educational Rights and Privacy Act (FERPA) and will ensure that these requirements are followed in the conduct of research.

Sincerely,

Dr. Patrick Tutwiler

Superintendent, Lynn Public School District

Project Title:

Principal Investigator:

Appendix B:

Behavior, Reinforcement, Antecedent-Behavior-Consequence, Measurement, Data

Collection, and Functional Behavior Analysis

Quiz 1 Pretest

Date: _____
CODE:
Your first car make/model. _____
Your first pet name. _____
Number of cousins you have _____ or your favorite number. _____
        **Do not write your name on the quiz.

        **When you are finished, please place it in the manila envelope.

1. Which group only has behaviors?
    a. Kick, Smell, Walk
    b. Angry, Pinch, Happy
    c. Mad, Listen, Think
    d. Walk, Stomp, Mad

2. Reinforcement occurs _____ the behavior.
    a. Sometimes
    b. After
    c. During
    d. Never

3. The goal of positive or negative reinforcement should be to _____ desired behavior.
    a. Stop
    b. Increase
    c. Decrease
    d. Prolonged

4. Reinforcement can be _____, _____, or _____.
    a. Comments, Smiles, Nothing
    b. Food, Verbal, Comments
    c. Nothing, Toys, or both
    d. Verbal, Tangible, Both

5. What type of data collection counts each occurrence of a displayed behavior?
    a. Latency
    b. Interval
    c. Frequency
    d. Duration

6. Antecedent strategies occur before an undesired behavior. Which is not an antecedent strategy?
    a. Using a visual schedule
    b. Using behavior momentum
    c. Withholding attention
    d. Completing a preference assessment

7. Whenever you are questioning how to respond, always follow the _____.
    a. Withholding Attention
    b. Provide Reinforcement
    c. Behavior Support Plan
    d. Task Analysis

8. When concluding why a student displays behaviors, you first need to rule out _____.
    a. Attention Concerns
    b. Boredom Concerns
    c. Cognitive Level
    d. Medical Concerns

9. There are four _____ to why a person engages in a behavior.
    a. Functions
    b. Games
    c. Control
    d. Ideas

10. Behavior is a form of _____.
    a. Action
    b. Communication
    c. Medical
    d. None of the above

Appendix C:

Behavior, Reinforcement, Antecedent-Behavior-Consequence, Measurement, Data

Collection, and Functional Behavior Analysis

Quiz 1: Posttest

Date: _____

CODE:
Your first car make/model. _____
Your first pet name. _____
Number of cousins you have _____ or your favorite number. _____
    **Do not write your name on the quiz.

    **When you are finished, please place it in the manila envelope.

11. Reinforcement occurs _____ the behavior.
    a. Sometimes
    b. After
    c. During
    d. Never

12. Whenever you are questioning how to respond, always follow the _____.
    a. Withholding Attention
    b. Provide Reinforcement
    c. Behavior Support Plan

13. Task Analysis Reinforcement can be _____, _____, or _____.
    a. Comments, Smiles, Nothing
    b. Food, Verbal, Comments
    c. Nothing, Toys, or both
    d. Verbal, Tangible, Both

14. There are four _____ to why a person engages in a behavior.
    a. Functions
    b. Games
    c. Control
    d. Ideas

15. The goal of positive or negative reinforcement should be to _____ desired behavior.
    a. Stop
    b. Increase
    c. Decrease
    d. Watch

16. Which group only has behaviors?
    a. Kick, Smell, Walk
    b. Angry, Pinch, Happy
    c. Mad, Listen, Think
    d. Walk, Stomp, Mad

17. Behavior is a form of _____.
    a. Action
    b. Communication
    c. Medical
    d. None of the above

18. Antecedent strategies occur before an undesired behavior. Which is not an antecedent strategy?
    a. Using a visual schedule
    b. Using behavior momentum
    c. Withholding attention
    d. Completing a preference assessment

19. Prolonged: What type of data collection counts each occurrence of a displayed behavior?
    a. Latency
    b. Interval
    c. Frequency
    d. Duration

20. When concluding why a student displays behaviors, you first need to rule out _____.
    a. Attention Concerns
    b. Boredom Concerns
    c. Cognitive Level
    d. Medical Concerns

Appendix D:

Discrete Trial Training, Incidental Teaching, and Task Analysis

Quiz 2: Pretest

Date: _____
CODE:
Your first car make/model. _____
Your first pet name. _____
Number of cousins you have _____ or your favorite number. _____
      **Do not write your name on the quiz.

      ** When you are finished, please place it in the manila envelope

1. Discrete trial training provides direct _____.
   a. Love
   b. Responses
   c. Instruction
   d. Behaviors

2. Prior to starting DTT, first you must _____.
   a. Talk with the teacher about any hunger concerns
   b. Talk to the student to the bathroom
   c. Gather and prepare materials
   d. Have the student sit for three minutes

3. During DTT, when you provide the directive (SD) to the student, you need to ensure _____.
   a. The room is quiet by removing all the other students
   b. The student is quiet and watches others play games
   c. You gave the student multiple reminders to sit
   d. The student is attending to you

4. During DTT, when you provide the directive (SD) to the student, you _____.
   a. Should talk loudly and ask a question?
   b. Should use clear and concise statements
   c. Should use lengthy and detailed statements
   d. You should provide multiple examples of why the student should look at you

5. During baseline we do not provide _____, but during teaching sessions we must provide _____.
    a. Attention, reinforcement
    b. Reinforcement, attention
    c. Attention, attention
    d. Reinforcement, reinforcement

6. Naturalistic teaching is another term for _____ teaching.
    a. Discrete Trial Training
    b. Applied Behavior Analysis
    c. Incidental Teaching
    d. Trained Learning

7. Both DTT and incidental teaching are _____ and we collect _____.
    a. Whimsical, observation
    b. Only with large groups, data
    c. Planned, data
    d. More than 10 students, observation

8. A task analysis can be referred to as a _____ because all parts of the task are broken down.
    a. Bill
    b. Recipe
    c. Novel
    d. Comic Strip

9. We at COACh graph the student's _____ on a task analysis.
    a. Incorrect
    b. Challenges
    c. Number of needed prompts
    d. Independence

10. What skill would **not** be taught using task analysis?
    a. Going to the bathroom
    b. Brushing teeth
    c. Getting dressed
    d. Naming flashcards

Appendix E:

Discrete Trial Training, Incidental Teaching, and Task Analysis

Quiz 2: Posttest

Date: _____
CODE:
Your first car make/model. _____
Your first pet name. _____
Number of cousins you have _____ or your favorite number. _____
    **Do not write your name on the quiz.

    **When you are finished, please place it in the manila envelope.

11. We at COACh graph the student's _____ on a task analysis.
    a. Incorrect
    b. Challenges
    c. Number of needed prompts
    d. Independence

12. A task analysis can be referred to as a _____ because all parts of the task are broken down.
    a. Bill
    b. Recipe
    c. Novel
    d. Comic Strip

13. During DTT, when you provide the directive (SD) to the student, you need to ensure _____.
    a. The room is quiet by removing all the other students
    b. The student is quiet and watches others play games
    c. You gave the student multiple reminders to sit
    d. The student is attending to you

14. During DTT, when you provide the directive (SD) to the student, you _____.
    a. Should talk loudly and ask a question?
    b. Should use clear and concise statements
    c. Should use lengthy and detailed statements
    d. You should provide multiple examples of why the student should look at you

15. Discrete trial training provides direct _____.
    a. Love
    b. Responses
    c. Instruction
    d. Behaviors

16. Prior to starting DTT, first you must _____.
    a. Talk with the teacher about any hunger concerns
    b. Talk to the student to the bathroom
    c. Gather and prepare materials
    d. Have the student sit for three minutes

17. Naturalistic teaching is another term for _____ teaching.
    a. Discrete Trial Training
    b. Applied Behavior Analysis
    c. Incidental Teaching
    d. Trained Learning

18. Both DTT and incidental teaching are _____ and we collect
    _____.
    a. Whimsical, observation
    b. Only with large groups, data
    c. Planned, data
    d. More than 10 students, observation

19. What skill would **not** be taught using task analysis?
    a. Going to the bathroom
    b. Brushing teeth
    c. Getting dressed
    d. Naming flashcards

20. During baseline we do not provide _____, but during teaching sessions we
    must provide _____.
    a. Attention, reinforcement
    b. Reinforcement, attention
    c. Attention, attention
    d. Reinforcement, reinforcement

Appendix F:

Prompt Hierarchy and Fading Prompt Strategies

Quiz 3: Pretest

Date: _____
CODE:
Your first car make/model. _____
Your first pet name. _____
Number of cousins you have _____ or your favorite number. _____

       **Do not write your name on the quiz.

       **When you are finished, please place it in the manila envelope.

1. What students might have prompts provided to them?
   a. No one needs extra support
   b. All- at some point everyone needs some support
   c. Only students with education plans
   d. Only students grade pre-K to fifth grade

2. Prompts are to help the student gain _____ and have _____ responses.
   a. Information, silent
   b. Items, correct
   c. Attention, incorrect
   d. Information, correct

3. Prompts can be _____, _____, and _____.
   a. Verbal, loud, clear
   b. Physical, verbal, repeated
   c. Repeated, clear, loud
   d. Verbal, physical, spatial

4. As the student gains correct responses, prompts should _____.
   a. Fade
   b. Remain
   c. Immediately stopped
   d. Increased

5. Visual supports are a way of making auditory information _____.
   a. Have meaning
   b. Understand
   c. Informed
   d. All of the above

6. What is **not** considered a visual support is a physical prompt.
   a. Arrangement of the environment with written and pictures on the items (clock/desk/table)
   b. Gestures – pointing
   c. Classroom schedules
   d. Making a sign for the class with expected school behaviors

7. All classrooms should have _____ displayed in the room.
   a. Classroom schedule
   b. Only written classroom rules
   c. Student artwork
   d. Teacher schedule

8. When we use visual supports, we should _____.
   a. Never talk
   b. Make the student tell us what the visual means
   c. Pair our language with the visual
   d. Never use visuals

9. The simplest schedule visual to use is a _____ - _____ board.
   a. Never, Later
   b. First, Then
   c. Then, Yesterday
   d. Now, First

10. When should visuals be use.
    a. Bathroom only
    b. Half
    c. Only for DTT
    d. All day

Appendix G:

Prompt Hierarchy and Fading Prompt Strategies

Quiz 3: Posttest

Date: _____
CODE:
Your first car make/model. _____
Your first pet name. _____
Number of cousins you have _____ or your favorite number. _____

    **Do not write your name on the quiz.

    **When you are finished, please place it in the manila envelope.

11. When should visuals be use.
    a. Bathroom only
    b. Half
    c. Only for DTT
    d. All day

12. What students might have prompts provided to them?
    a. No one needs extra support
    b. All- at some point everyone needs some support
    c. Only students with education plans
    d. Only students grade pre-K to fifth grade

13. All classrooms should have _____ displayed in the room.
    a. Classroom schedule
    b. Only written classroom rules
    c. Student artwork
    d. Teacher schedule

14. When we use visual supports, we should _____.
    a. Never talk
    b. Make the student tell us what the visual means
    c. Pair our language with the visual
    d. Never use visuals

15. Prompts can be _____, _____, and _____.
     a. Verbal, loud, clear
     b. Physical, verbal, repeated
     c. Repeated, clear, loud
     d. Verbal, physical, spatial

16. Never use visuals. As the student gains correct responses, prompts should

    _____.
     a. Fade
     b. Remain
     c. Immediately stopped
     d. Increased

17. The simplest schedule visual to use is a _____ - _____ board.
     a. Never, Later
     b. First, Then
     c. Then, Yesterday
     d. Now, First

18. Visual supports are a way of making auditory information _____.
     a. Have meaning
     b. Understand
     c. Informed
     d. All of the above

19. What is **not** considered a visual support is a physical prompt.
     a. Arrangement of the environment with written and pictures on the items (clock/desk/table)
     b. Gestures – pointing
     c. Classroom schedules
     d. Making a sign for the class with expected school behaviors

20. Prompts are to help the student gain _____ and have _____ responses.
     a. Information, silent
     b. Items, correct
     c. Attention, incorrect
     d. Information, correct
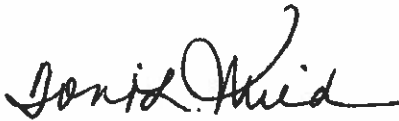
Slippery Rock University

Department of Special Education

Group Training of Applied Behavior Analysis Knowledge Competencies to School-Based
Paraprofessionals for Students in Substantially Separated Classrooms

A Dissertation written by
Nicole Grube-Benson

Bachelor of Science in Child Life, Edgewood College of Wisconsin, 2000
Master of Education in Special Education, East Stroudsburg University of Pennsylvania, 2005
Doctorate of Education, Slippery Rock University of Pennsylvania, 2024
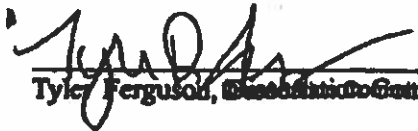
Approved by

Title: Assistant Professor

Toni L. Mild, Dissertation Chair

Title: Associate Professor

Ashlea Rineer-Hershey, Dissertation Committee Member

Title: Lead School Psychologist, Lynn Public Schools

Tyler Ferguson, Dissertation Committee Member

Accepted by

Dean, College of Education, Slippery Rock A. Keith
University of Pennsylvania

Dils, Ed.D.