Supporting Educators of Students with Significant Disabilities: Promoting Generalization and Examining Feasibility

Dissertation

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Kara Nicole Shawbitz, MS

Graduate Program in Educational Studies

The Ohio State University

2023

Dissertation Committee

Dr. Matthew E. Brock, Advisor

Dr. Carly B. Gilson

Dr. Yvonne Goddard

Dr. Moira Konrad

Dr. Sheila Alber Morgan

This research was partly funded by a grant from the Wing Institute at Morningside Academy.

Abstract

This dissertation explores teacher and paraeducator training with a specific focus on generalization of training outcomes and social validity. Chapter 1 presents brief background information to introduce the research questions posed in Chapters 2, 3, and 4. Chapter 2 presents a systematic literature review of educator training studies that measured generalization of educator training outcomes. Chapter 3 presents a multiple method research study that evaluated the effect of a paraeducator training package that consisted of initial training and teacher-delivered coaching with performance feedback on paraeducator generalization. Chapter 4 presents the results of a secondary data analysis of the National Teacher and Principal Survey (NTPS) that focused on professional development opportunities available for teachers in the United States. Finally, Chapter 5 provides a research statement that discusses the place of this dissertation in my work and future directions for my research.

Dedication

This dissertation is dedicated to my family, both those who were there from day one and those I found along the way.

Acknowledgements

I would like to thank everyone who made this dissertation possible. I would first like to thank the teachers, staff, and students at the school where I conducted this study. Thank you for allowing me to be a part of your classroom every day. I cannot thank you enough for your enthusiasm for training and your flexibility at every stage.

I would also like to thank all the individuals at Ohio State who helped me along the way. To my advisor, Dr. Matthew Brock, for all his support and opportunities throughout my academic career. Thank you to my committee members Drs. Gilson, Goddard, Konrad, and Morgan for your thoughtful feedback and input at each stage. Thank you to the Wing Institute at Morningside Academy for their generous support and investment in my research. I would also like to thank Dr. Susie Mauck and all the consultants at the Quantitative Methodology Center for their invaluable support and help in my quantitative journey over the years. Thank you to Angie Harris for your support with data collection and countless hours spent working together. Thank you to Kate Anderson, Jenna Hurlburt, and Kaitlyn Viera for your assistance with data collection. Lastly, thank you to all of the others who supported me along the way as classmates, supervisors, and colleagues. I appreciate all your support and encouragement.

Vita

2012.....Assumption High School

2016..... Michigan Technological University

2019.....Northern Michigan University

2019 to present…….....Graduate Trainee,

Department of Educational Studies, The Ohio State University

Publications

Shawbitz, K.N., & Brock, M.E. (2022). A systematic review of training educators to implement response prompting. *Teacher Education and Special Education.* 1-19. https://doi.org/10.1177/08884064221114130

Anderson, E.J., Brock, M.E., & Shawbitz, K.N. (2022). Philosophical perspectives and practical considerations for inclusion of students with developmental disabilities. *Education Sciences, 12*(7), 478. https://doi.org/10.3390/educsci12070478

Brock, M.E., Shawbitz, K.N., Anderson, E.J., Criss, C.J., Sun, X., & Alasmari, A. (2021). Recess should include everyone: A scoping review of interventions designed to improve social and play outcomes for elementary students with developmental disabilities at recess. *Review Journal of Autism and Developmental Disorders.* https://doi.org/10.1007/s40489-020-00233-8

Fields of Study

Major Field: Educational Studies

Areas of Emphasis: Special Education

Table of Contents

List of Tables

List of Figures

Chapter 1. Introduction

This dissertation is written as three stand-alone manuscripts supported by an introduction and conclusion. The central theme of this dissertation is training educators to implement evidence-based practices with students with intellectual and developmental disabilities. Specifically, I will (a) review and synthesize the existing literature on promoting generalization of educator implementation of evidence-based practices across students, settings, and situations; (b) describe a multiple method study examining the effects of a multiple exemplar training and teacher-delivered performance feedback on paraeducator implementation of time delay; and (c) describe secondary data analysis of professional development opportunities that are typically available for educators across in the United States, including an examination of differences in opportunities for general and special educators.

Rationale

Researchers, educators, administrators, and advocates agree that the best way to improve outcomes for students with intellectual and developmental disabilities (IDD) is to use practices that are supported by rigorous scientific evidence. Federal laws, including both the Every Student Succeeds Act of 2015 (ESSA) and the Individuals with Disabilities Education Improvement Act of 2004 (IDEIA), mandate that students with IDD must be taught using evidence-based practices. An evidence-based practice is one that has been shown by high-quality research to reliably improve student outcomes (Cook & Odom, 2013).

For a practice to be considered evidence-based, it must undergo rigorous experimental evaluation. Educational organizations, such as the Council for Exceptional Children (CEC), have provided guidelines for experimental rigor. The CEC requires that to be classified as evidence-

based, a practice must be supported by five methodologically sound single-case studies with positive effects, two methodologically sound group comparison studies that used random assignment, or a combination of these (Cook et al., 2015). Additionally, each of these studies must meet quality indicators to be classified as methodologically sound. A single-case design study must meet 22 quality indicators and a group design study must meet 24. Some examples of quality indicators include thorough descriptions of study elements such as participants, context and setting, and the intervention; measuring implementation fidelity; and accounting for threats to internal validity (Cook et al., 2015).

Researchers have conducted extensive experimental evaluation to identify multiple evidence-based practices for students with IDD. For example, Hume et al. (2021) identified 28 evidence-based practices for students on the autism spectrum. A total of 972 studies supported these practices. Similarly, Spooner et al. (2011) reviewed 17 studies and found support for practices such as time delay and task analysis for teaching students with severe developmental disabilities. In another review, Spooner et al. (2012) examined interventions for teaching students with severe developmental disabilities academic skills. They found 18 studies that supported systematic instruction (e.g., time delay, system of least prompts) as an evidence-based practice. Several of these practices (e.g., time delay, task analysis) overlapped across reviews.

However, identifying evidence-based practices has little impact on student outcomes if the gap between the results of empirical studies—research—and what is implemented in schools—practice—is not closed. Scholars have been describing the research-to-practice gap for nearly 40 years (Grima-Farrel, 2018), yet despite efforts to increase the use of evidence-based practices in schools, it remains a persistent problem in special education. Although efforts have been made to provide more training to teachers in evidence-based practices, these efforts have

not resulted in increased knowledge or use of evidence-based practices. Brock et al. (2020) surveyed 99 teachers in Ohio regarding their instructional approaches for students on the autism spectrum. They found that only half of the teachers reported using approaches that included evidence-based practices. Similarly, Knight et al. (2019) found that over half of educators reported ineffective or harmful practices such as rapid prompting method. There is still a wide disparity between the research that shows that these practices are effective and what educators use in practice.

Experimentally validating and identifying evidence-based practices is only the first step toward closing the research-to-practice gap and improving student outcomes (Hume et al., 2021). The second step is ensuring that practices are adopted and used effectively by educators. This problem is best addressed through implementation science. Implementation science is a collection of practices that are used to promote the systematic adoption of research findings and evidence-based practices into routine practice (Eccles & Mittman, 2006; Odom et al., 2014). Implementation science uses an ecological systems perspective in which implementation on the individual classroom level is viewed as embedded within the larger school organization (Odom et al., 2014). Improving implementation of evidence-based practices, therefore, involves intervening on both the individual teacher and classroom level as well as at the administrative and organizational level. For example, efforts to improve implementation at the teacher-level might involve providing one-on-one training and coaching to support teachers to use a new practice in the classroom. To accomplish this, however, change is also required on the administrative and organizational level through district-wide policy change. For example, districts may allocate more time and resources to teacher training or provide teachers with incentives to participate in a teacher coaching program.

Implementation science involves three processes: (a) identifying practices, (b) translating evidence into practice, and (c) supporting implementation through professional development (Odom, 2009). Identifying practices involves the processes described above: conducting rigorous experimental evaluation using methodology that meets quality indicators. Translating evidence into practice is accomplished by disseminating research results in pre-service teacher education programs, professional development conferences, and academic and practitioner journals. Lastly, implementation of evidence-based practices must be supported in schools through professional development for in-service teachers, supervision and mentorship of pre-service teachers, and on-going supervision and support for paraeducators Each process is essential: if one is missing, then a practice may not be adopted.

The focus of this dissertation is on the third process of implementation science: supporting implementation through professional development. Professional development is "facilitated teaching and learning experiences that are transactional and designed to support the acquisition of professional knowledge, skills, and dispositions as well as the application of this knowledge and practice" (National Professional Development Center on Inclusion, 2008, p. 3). Professional development is an important part of bridging the research-to-practice gap as it provides educators with the knowledge and training to implement evidence-based practices. Professional development encompasses several different approaches including in-service training days, professional conferences, scholarly articles, and university courses.

Although professional development can take many forms, the most common way professional development is provided to educators is through single-day events, which are often called "one-shot" workshops. Often, these workshops rely on a "sit and get" method in which an expert disseminates information while educators passively sit and listen (Matherson & Windle,

2017). The “sit and get” method is common in educator professional development, with 90% of educators reporting that they participated in this type of training (Darling-Hammond et al., 2009).

The “one-shot sit and get” method poses several challenges for translating research into practice. Educators are often given a description of the practice, rather than the opportunity to view a model, practice the skill, and receive feedback on their implementation (Freeman et al., 2017). Additionally, the process is often passive and does not require engagement from educators. Without an opportunity to practice the implementation steps when initially learning a skill, educators may make mistakes, and without feedback, they may continue to make mistakes. As a result, educators may not be able to implement a practice with high adherence to its intended implementation steps (i.e., implementation fidelity). Even if educators can accurately implement a practice without having practiced it prior, the sit and get method still neglects to provide educators with the crucial on-going support that is needed to continue to implement a practice with high fidelity and adapt that practice to other students or situations (i.e., generalization). As a result, “sit and get” professional development rarely translates into an increase in the use of evidence-based practices in the classroom (Darling-Hammond et al., 2009).

Fortunately, researchers have identified several effective training strategies: instruction, modeling, roleplay, and feedback. These strategies can be used together or as a subset, such as instruction and feedback. Instruction provides educators with a description of the skill and its implementation steps. Modeling involves a demonstration of the implementation steps and can be delivered in several ways, including live modeling and video modeling. Modeling allows for clear communication of the implementation steps prior to implementation with students and may help reduce further need for training (Brock & Anderson, 2021). Roleplay, involves practicing

the implementation steps with a partner who acts as the student. Roleplay may help to build educator confidence and may help to reduce the need for additional training or performance feedback in the intervention setting. Feedback is the delivery of information that enables an educator to improve their future performance. Performance feedback helps to close the gap between training and implementation in the classroom by identifying errors, providing an opportunity to ask questions, and receive additional modeling of the implementation steps (Aljadeff-Abergel et al., 2017). Lastly, in order for training to be effective, sustained efforts to provide training must be made over time. Rather than provide training through single-event workshops, follow-up training should be provided to support on-going implementation fidelity (Darling-Hammond et al., 2009).

Although researchers have identified effective professional development strategies, there are still several limitations to consider. First, most of the evidence focuses on measuring an educator's ability to implement an evidence-based practice with fidelity with a single student to address a single goal. There is limited information on how to train educators to generalize. Second, the evidence is heavily focused on researcher-delivered coaching. A one-to-one coaching model from an external expert is unlikely to be feasible and replicable on a large scale.

Generalization is the use of practices in novel settings, situations, and with novel students without additional training (Stokes & Baer, 1977) and is a critical piece of any staff training program (Reinke et al., 2012). Often, educators are tasked with working with students with various educational diagnoses and needs across a variety of intervention settings, such as in the regular education classroom, self-contained special education classroom, or in social settings such as the playground. Many evidence-based practices have been shown to be effective to address a variety of student goals. For example, systematic prompting is a versatile procedure

that has been used across students with disabilities such as autism spectrum disorder or intellectual disability to teach community, self-care, and vocational skills (Shepley et al., 2019; Walker, 2008). Additionally, some evidence-based practices, like systematic prompting and reinforcement, are components of other evidence-based practices. For example, systematic prompting is also a component of procedures such as Picture Exchange Communication System (PECS), pivotal response training, and discrete trial training. Therefore, training educators to generalize their implementation of a practice would conserve valuable school resources and prevent the need to provide additional training.

However, despite the high demand for generalization, it is often overlooked in experimental studies. In one comprehensive review of educator training studies, Brock et al. (2017) found that 25% (n = 29) of the 118 single-case studies reviewed included a measure of generalization. To date, there is no review of educator training studies that examines the specific strategies that researchers used to support educators to generalize their implementation to novel students, settings, or situations. Further examination of the strategies that enable generalization is necessary in order to provide educators with professional development that maximizes benefits to students.

A second concern in the educator professional development literature relates to feasibility. One issue that contributes to the research-to-practice gap in education is that the practices identified by research to be effective may not always be feasible to implement in practice. For example, while effective professional development strategies have been identified, much of professional development still relies on the "sit and get" method (Freeman et al., 2017). This may be due to an issue of feasibility. School districts rely on the "sit and get" method because it is seemingly one of the easiest, most cost-effective ways to train a large group of

educators. However, since this method does not result in long-term change in teacher practice (Darling-Hammond et al., 2009), it may not be a good investment for school districts.

This dissertation was designed to address the issues of generalization and feasibility. Previous studies have examined generalization of educator training outcomes to new settings, students, and situations. However, there is a lack of consensus on specific strategies that are effective at promoting generalization. Therefore, I designed a training that uses instruction, modeling, roleplay, feedback, and multiple exemplar training to promote paraeducator implementation fidelity of constant time delay to new instructional goals. I also examined feasibility by training special education teachers to provide coaching with performance feedback to paraeducators. Additionally, I incorporated qualitative methods to assess the feasibility of the training.

Therefore, the purpose of this dissertation is threefold. First, in Chapter 2, I provide a systematic review of the educator training literature to identify effective training practices. Second, in Chapter 3, I present the results of a multiple method training study that designed and tested a training approach for enabling paraeducators to implement time delay with students with IDD. Specifically, I test a training that incorporates multiple exemplars to promote generalization and uses teacher-delivered performance feedback to support on-going implementation fidelity. Third, Chapter 4 presents a secondary data analysis using data from the National Teacher and Principal Survey (NTPS) to identify current professional development practices using a national sample of general and special education teachers. Finally, Chapter 5 presents a comprehensive discussion of how each of these chapters fit into the existing literature on educator training and how my future research will continue to explore the larger question of how to conduct training

that promotes generalization and ensures that evidence-based training practices continue to be used in schools.

Chapter 2. Literature Review

In this chapter, I provide a systematic review of the educator training literature that measured generalization. This paper includes an introduction, a detailed description of the methods, a description of the results, and a discussion of findings.

Abstract

Closing the research-to-practice gap in special education requires high-quality training that enables educators to generalize evidence-based practices across students, settings, and situations. In this systematic review, I identified 52 studies published in 50 articles that measured generalization of teacher, pre-service teacher, or paraeducator fidelity of practices for students with disabilities. Most studies used a combination of didactic instruction, roleplay, modeling, and performance feedback to train practitioners to implement educational practices. Consistent with previous reviews, most studies (77%) did not report using any specific approach to promote generalization of practitioner implementation. Results showed that although this approach did sometimes lead to generalization, results were mixed. In other studies, researchers programmed for generalization using strategies such as mediating generalization, training educators to generalize, or sequential modification through performance feedback. I offer suggestions for how researchers can design studies to measure generalized effects, and how educators can leverage strategies for generalization.

Preparing Special Educators to Generalize Evidence-Based Practices across Students and Situations: A Systematic Review

Federal law mandates that educators use evidence-based practices to teach students with disabilities (IDEIA, 2004). An evidence-based practice is one that has been shown by scientific research to reliably improve student outcomes (Cook et al., 2020). However, despite federal mandates and the benefits of using evidence-based practices with students, there is a disparity in what practices have been shown to be effective and what educators do in practice. This disparity is known as the research-to-practice gap, and it remains a critical challenge in special education (Cook et al., 2020).

Providing high-quality training to educators is one critical step in closing the research-to-practice gap (Odom, 2009). Fortunately, researchers have identified several effective training strategies. Training that uses a combination or a subset of didactic instruction, modeling, roleplay, and performance feedback results in improved educator implementation fidelity (Brock & Carter, 2017; Brock et al., 2017). Instruction provides educators with an explanation of the implementation steps. Modeling involves a demonstration of the implementation steps and may help to reduce initial errors (Brock & Carter, 2017). Roleplaying gives educators an opportunity to apply what they learned from instruction and modeling. Performance feedback provides educators with information about their performance that enables them to identify and correct errors in their next performance (Aljadeff-Abergel et al., 2017).

There is an abundance of research on effective training for educators, but limited research on how to promote generalization. Generalization refers to the use of skills in new settings, contexts, and situations without prior training (Stokes & Baer, 1977). Although the field of special education typically thinks about generalization in terms of student learning, this is a

ubiquitous concept that applies to all learning, including educators learning to implement evidence-based practices. Researchers have highlighted the importance of generalization, pointing to it as the truest measure of educators' learning (Reinke et al., 2012; Seward, 2008). For educators to maximally impact student outcomes, their use of educational practices must generalize to novel students, settings, and situations. If an educator cannot implement a skill with students or in situations other than those trained in the study, then that skill cannot become a part of their daily teaching practice (Seward, 2008).

The demand for generalization is high in special education. Many educational practices can be implemented across content areas, with a wide range of students with diverse needs and abilities, and across multiple settings. For example, systematic prompting is a versatile procedure that can be used across a range of academic and daily living skills (Brock et al., 2021; Hume et al., 2021; Seward, 2008). Naturalistic interventions are effective across all age groups to target social, play, and challenging behaviors. Antecedent-based interventions can be used across all ages to target communication, adaptive and self-help skills, and challenging behavior (Hume et al., 2021). Given the versatility of these and many other evidence-based practices, their ability to improve student outcomes is only fully realized when educators are able to generalize them across students, skills, and situations.

Training educators to generalize requires support and planning. However, traditional educator training methods use a "train and hope" approach for generalization. Stokes and Baer (1997) first described the "train and hope" approach in their seminal review on generalization of student outcomes. They found that most researchers did not use specific strategies to program for generalization, but instead "hoped" that generalization would occur. Similarly, many educators receive training also often uses a "train and hope" approach. Specifically, the most common form

of educator training is a single-event workshop that rarely impacts teacher practice (Brock & Carter, 2015). Furthermore, educators are rarely given the opportunity to practice the skill or learn how to use that practice outside of the specific confines in which it was taught (Garwood & Harris, 2020). For example, an educator may learn how to implement time delay to teach math facts but may not understand how time delay can be applied across content areas, such as for teaching reading or vocational skills. Further, the educator may not understand how time delay can be used with other students in the classroom.

There is no consensus on what specific approaches are effective for promoting generalization. In their seminal paper, Stokes and Baer (1977) identified nine specific strategies: train and hope, sequential modification, introduce to natural maintaining contingencies, train sufficient exemplars, train loosely, use indiscriminable contingencies, program common stimuli, mediate generalization, and train "to generalize." See Table 1 for a description of each strategy. Although Stokes and Baer (1977) described these strategies as mechanisms to promote student generalization, these strategies also apply to staff training (Brock & Carter, 2015). Many studies have measured practitioner generalization of staff training to new students, settings, or situations, but no prior reviews have focused specifically on generalization or provided a summary of effective methods for targeting generalization. Without this summary, researchers and educators lack guidance on research-based approaches for promoting generalization. Given that the impact of evidence-based practices is limited by degree to which educators can apply them in everyday practice, a review of the existing evidence on educators' generalization is sorely needed. Therefore, the purpose of this review is to summarize what interventions have been used to promote generalization of educators' use of educational practices. This systematic review of the literature addresses the following research questions:

1. What types of generalization have been targeted and for what educational practices?
2. What types of educators were trained, what students received the educational practice, and what goals were targeted?
3. What approaches have been used to promote generalization and how successful have these approaches been?

Method

I conducted a systematic review of the literature using the following criteria and procedures to identify and code studies. For a flow diagram of search procedures, see Figure 1.

Inclusion Criteria

I included studies that met five criteria. The first four inclusion criteria are the same as those used by Brock et al. (2017), Brock and Carter (2017), and Shawbitz and Brock (2022) in their previous meta-analyses and review. First, participants must have been educators (e.g., teachers, pre-service teachers, paraeducators) who worked with students with disabilities in school settings in the United States. Second, the independent variable must have involved training provided to educators designed to change or improve implementation of an educational practice. Educational practices included both focused interventions and comprehensive treatment models (Hume et al., 2021). Third, the dependent variable must have been educator implementation fidelity measured through observation in the context of teaching or providing support to students with disabilities. Implementation fidelity was defined as the degree to which the practice was implemented as designed (O'Donnell, 2008). Fourth, the study must have used experimental methods with adequate internal validity to draw causal inference. Specifically, the study must have used a single-case design with three opportunities to demonstrate and replicate an experimental effect, a randomized-controlled trial with random assignment to treatment and

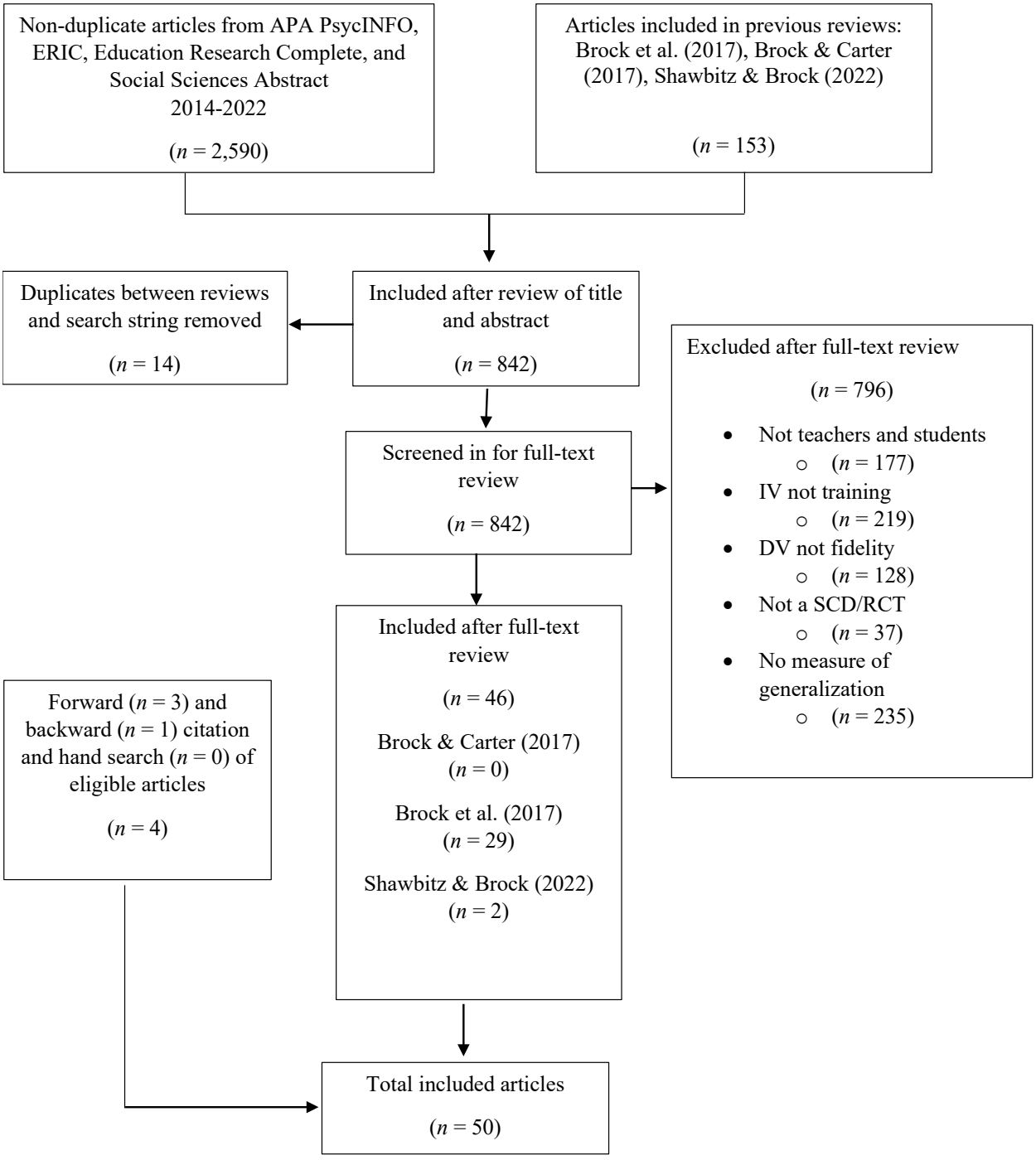


Figure 1. Flow Diagram of Search Procedures

control groups, or a quasi-experimental design with nonrandom assignment and matching participants on key variables (Cook et al., 2020). Lastly, generalization of practitioner outcomes must have been measured and reported. Generalization was defined as the measurement of the same variable in a stimulus condition or setting that varied from the original training condition (Stokes & Baer, 1977). For single case designs, generalization must have been reported in the context of the single-case design (i.e., generalization data must have been presented on a single-case graph). For randomized-controlled trials or quasi-experimental designs, generalization data must have been reported using standardized mean effect sizes (i.e., Cohen's *d*; Borenstein et al., 2011), or sufficient data must have been reported so that the reader could compute an effect size themselves. If studies reported generalization outside of the context of an experimental design, they were excluded.

Search Strategies

I used multiple search strategies. First, using the inclusion criteria above, I screened the 153 studies included in two previous meta-analyses (i.e., Brock & Carter, 2017; Brock et al., 2017) and one systematic literature review (Shawbitz & Brock, 2022). Thirty-one studies from these reviews met inclusion criteria. Second, since the previous reviews included articles published up to 2016, I conducted an electronic search of databases beginning in 2014 to ensure that I did not miss studies in overlapping years. In November 2021, I conducted a concurrent search of four databases restricting publications from 2014 to present. I searched APA PsycINFO, ERIC, Education Research Complete, and Social Sciences Abstract. This electronic search yielded 2,590 non-duplicate hits.

I used the same screening process described in the above meta-analyses and review. First, we screened titles and abstracts, excluding articles that clearly (a) did not include human

participants, (b) were not conducted in a school with students in preschool to twelfth grade, (c) did not include original data (e.g., conceptual paper or literature review), and (d) did not involve an intervention. Second, I conducted a full-text review of the remaining 689 articles and applied the above inclusion criteria. Fifteen articles met inclusion criteria from the search string, resulting in 46 articles from previous studies and the search string.

For each of these 46 articles, I conducted a backward search (i.e., reviewing reference list) and a forward search (i.e., screening all peer-reviewed studies that cited an article using Google Scholar). For articles identified from the previous meta-analyses and review, I conducted a forward search of citations beginning in 2014. I identified one additional article through the backward search and three through the forward search. Finally, I conducted a hand search of *Teacher Education and Special Education* and the *Journal of Applied Behavior Analysis* to ensure that no articles were overlooked. I selected these journals to follow search procedures used in Brock & Carter (2017) and Brock et al. (2017). I searched all issues of both journals since their inception. I identified no additional articles through the hand search. In total, I identified 52 total studies published in 50 total articles.

Participants, Settings, and Intervention Strategies

I coded the educator's professional role (e.g., teacher, pre-service teacher, paraeducator), age, years of experience, and highest level of education. For students, I coded the grade level, educational diagnosis, and student outcome targeted by intervention. I coded the setting in which the intervention took place, the dependent variable that was measured, and the type of educational practice that educators were trained to implement. Educational practices were coded based on those defined by Hume and colleagues (2021) and included both focused interventions and comprehensive treatment models. I coded the duration of training that was provided to

educators, the role of the trainer (e.g., researcher, teacher), and the strategies used to provide training.

Experimental Design

I coded whether studies used a single-case design, randomized-controlled trial, or quasi-experimental design. For single-case designs, I coded the specific sub-design (e.g., multiple-baseline across participants, multiple baseline across behaviors, withdrawal).

Dependent Variable

I coded both the type of practitioner outcome (i.e., number of steps correct, frequency or rate of target behavior), the student outcome, and the effects of the intervention on each outcome. I coded whether a student outcome was academic (i.e., tasks aligned with the general education curriculum), school readiness skills (i.e., skills not directly related to academic content that are required for school success), communication (i.e., the ability to express wants, needs, ideas, feelings, etc.), social (i.e., skills required to relate with others), motor (i.e., movement or motion, including both fine and gross), challenging/interfering behaviors (i.e., behaviors to be decreased that interfere with the student's ability to learn), on-task behavior (i.e., behavior that matched the defined task), play (i.e., the use of toys or leisure materials), adaptive/self-help (i.e., skills related to independent living or personal care skills), and vocational (i.e., employment or employment preparation related to skills required for a specific job; Hume et al., 2021).

Study Effects

I summarized study effects using success estimates (Reichow & Volkmar, 2010). Success estimates are a ratio that summarizes visual analysis of the data in terms of the total number of experimental effects that are demonstrated (numerator) over the number of planned opportunities to demonstrate an effect (denominator). I conducted visual analysis based on inspection of

changes in trend, level, variability, and immediacy of effect within and across adjacent conditions (Ledford & Gast, 2014). If only a subset of participants in a study met inclusion criteria, I calculated success estimates only for participants who met criteria. For multiple baseline studies that introduced intervention to multiple participants at the same time, I used data from the first participant in the tier to make the success estimate.

Generalization

I coded the type of generalization that was measured in the study. I coded whether the practitioner outcome was measured (a) in a *setting* that differed from the original training or initial acquisition setting, (b) with a *student* that the practitioner did not implement the practice with during training or initial acquisition, (c) using *materials* that differed from training materials (e.g., novel book), (d) with an *instructional goal* or target that differed from the training target, (e) during an *activity* that differed from the activity during training or initial acquisition, or (f) a combination of these.

In single-case design studies, I coded whether authors measured generalization in the baseline condition. For the studies that measured generalization in baseline, I coded if the study met What Works Clearinghouse's criteria for single-case design (Kratochwill et al., 2010). To meet criteria, researchers must have (a) systematically manipulated the independent variable and determined how and when the independent variable conditions changed, (b) measured the dependent variable at least three times in each phase, (c) recorded interobserver agreement (IOA) for each dependent variable for no fewer than 20% of observations, (d) reported IOA to be greater than or equal to 80%, and (e) provided at least three opportunities to demonstrate an intervention effect.

If authors measured generalization experimentally by measuring generalization in baseline, then success estimates were made by comparing changes in trend, level, variability, and immediacy of effect between the generalization data in baseline and in the generalization phase. If generalization was not measured experimentally, then I calculated success estimates by comparing practitioner performance of the dependent variable in the training condition (i.e., the non-generalization condition) to performance in the generalization phase. I would have conducted a similar analysis of randomized-controlled trials or quasi-experimental design studies had any studies with these designs met inclusion criteria.

Strategies Used to Promote Generalization

I coded the strategies that researchers used to promote generalization in accordance with Stokes and Baer's (1977) nine strategies: sequential modification, introducing to natural maintaining contingencies, training sufficient exemplars, training loosely, using indiscriminable contingencies, programming common stimuli, mediating generalization, and training "to generalize." See Table 1 for definitions.

Coder Training and Reliability

Three coders were trained by (a) providing a detailed coding manual, (b) reviewing the coding manual through oral instruction, (c) assigning practice studies to code, and (d) providing detailed feedback on disagreements. We calculated point-by-point agreement at each phase of the study. First, we calculated agreement on initial title and abstract screening for 519 (20%) of the 2,590 initial hits that were not duplicates. Agreement was 92%. I resolved disagreements by having the two coders review the coding together and come to consensus.

Strategy name	Description
Train and hope	Researchers did not program or plan for generalization; no specific strategy was used
Sequential modification	Researchers conducted training, measured generalization, found it insufficient and introduced an additional intervention to support generalization (e.g., performance feedback)
Introduce to natural maintaining contingencies	Researchers created a natural reinforcement contingency in the generalization setting
Train sufficient exemplars	Researchers provided multiple examples of how to implement an educational practice during training (i.e., multiple exemplar training)
Train loosely	Researchers loosened experimental control over non-critical features of stimuli and responses in training
Use indiscriminable contingencies	Researchers programmed contingencies that made it difficult for trainees to discriminate when reinforcement would be delivered in generalization setting
Program common stimuli	Researchers used stimuli in training that were present in the generalization setting
Mediate generalization	Researchers contrived a mediating stimulus or taught trainees to mediate generalization through self-management (e.g., self-monitoring)
Train "to generalize"	Researchers reinforced response variability or instructed trainees to generalize

Table 1. Generalization Strategies Defined by Stokes and Baer (1977)

Results

I identified 52 studies published in 50 articles (i.e., two articles included two studies). All studies used a single-case design. Specific types of single-case designs were multiple baseline across participants (n = 24), multiple probe across participants (n = 21), multiple baseline across behaviors (n = 4), multiple baseline across settings (n = 1), multiple probe across behaviors (n = 1), and multiple probe across settings (n = 1).

Participants, Settings, and Educational Practices

Across the 52 studies, 205 educators were trained to implement educational practices with students with disabilities. Training was provided to in-service special education teachers (n

= 83; 40%), paraeducators (*n* = 63; 31%), pre-service teachers (*n* = 30; 15%), general education teachers (*n* = 18; 9%), undergraduate students enrolled in a university education course (*n* = 10; 5%), and a speech language pathologist (*n* = 1; 0.5%). Years of experience ranged from no experience to 29 years of experience. Researchers reported highest level of education in 38 studies. In these studies, educators had a high school diploma (*n* = 9; 7%), some college (*n* = 21; 16%), an associate degree (*n* = 10; 8%), a bachelor's degree (*n* = 69; 52%), or a master's degree (*n* = 25, 19%).

Student Characteristics

Forty-eight of the 52 studies reported the number of students who received intervention from educators. Across those studies, 399 students participated. Diagnoses were reported for 167 students across 45 studies. Students in these studies received special education services under labels of autism spectrum disorder (*n* = 85; 51%), developmental delay (*n* = 16; 10%), developmental disability (*n* = 15; 9%), intellectual disability (ID; *n* = 11; 7%), multiple disability (*n* = 11; 7%), speech-language impairment (*n* = 9; 4%), autism and ID (*n* = 6; 4%), other health impairments (*n* = 5; 3%), specific learning disabilities (*n* = 5; 3%), or orthopedic impairment (*n* = 3; 2%). In nine studies, authors reported that students had disabilities, but did not specify the type. In 13 studies, authors reported that students had disabilities but did not report the specific type of disability or the number of student participants. Student grade or age was reported in 42 studies. In these studies, students were in preschool (*n* = 208; 57%), elementary (*n* = 108; 30%), middle (*n* = 41; 11%), or high school (*n* = 8; 2%).

Settings

Educational practices were implemented in a variety of settings, including in general education classrooms (*n* = 22; 44%), self-contained special education classrooms (*n* = 19; 38%),

in both general and special education classrooms (n = 5; 10%), in separate schools (n = 3; 6%), and in non-classroom settings such as an office within a school (n = 1; 2%). Two studies did not report an intervention setting.

Educational Practices Targeted by Training

Educators were trained to implement naturalistic interventions (n = 15), reinforcement (n = 13), prompting (n = 12), antecedent-based interventions (n = 11), discrete trial training (n = 7), time delay (n = 7), functional communication training (n = 4), opportunities to respond and initiate (n = 4), pivotal response treatment (n = 3), stimulus preference assessments (n = 2), differential reinforcement (n = 2), modeling (n = 2), scripting (n = 2), behavior intervention plans (n = 1), a curricular focus on functional skills (n = 1), data collection (n = 1), functional behavior assessment (n = 1), peer-mediated intervention (n = 1), Picture Exchange Communication System (PECS; n = 1), procedures to support ambulation (n = 1), task analysis (n = 1), video modeling (n = 1), and visual supports (n = 1).

Interventions targeted a range of student outcomes, including communication (n = 24), academic (n = 11), modification of problem behavior (n = 7), social (n = 6), daily living skills (n = 5), on-task behavior (n = 4), school readiness skills (n =3), motor skills (n = 2), vocational skills (n = 2), and play (n = 1). Researchers targeted more than one student outcome in 13 studies, with one study targeting six student outcomes (e.g., Downs et al., 2008).

Training Strategies and Trainers

Researchers used a variety of training strategies. See Table 2 for a summary. The most common training strategies were performance feedback (n = 52; 100%), instruction (n = 45; 87%), modeling the implementation steps (n = 35; 67%), and roleplay or rehearsal of the implementation steps (n = 30; 58%). All studies used performance feedback, or information

about a performance that enabled educators to improve their implementation (Aljadeff-Abergel et al., 2017). In four studies, the sole intervention was performance feedback. In 16 studies, performance feedback was provided to educators during the initial training phase. In 25 studies, researchers provided feedback in the intervention setting following training. Researchers provided feedback in both the initial training and in the intervention setting in 10 studies. Specific types of feedback included verbal feedback (n = 29; 56%), written feedback (n = 1; 2%), both written and verbal feedback (n = 3; 6%), bug-in-ear feedback delivered over headphones or via a Bluetooth ® device (n = 6; 11%), written feedback that was delivered via email (n = 6; 11%), video-based feedback in which the practitioner watched recorded videos of past performance (n = 5; 10%), or both bug-in-ear feedback and emailed feedback (n = 1; 2%).

Instruction was provided in 45 studies (87%), with 42 studies using didactic instruction, 24 studies using written instruction, and 21 studies providing both. Didactic instruction involved the researcher using PowerPoint lectures, training manuals, or other materials to verbally describe the educational practice and its implementation steps. Modeling the implementation steps was used in 35 studies (67%). Modeling was either conducted live by the researcher (n = 22) or by providing a recorded video of the implementation steps (i.e., video modeling; n = 13).

Most studies used multiple training strategies. The average number of training strategies used in each study was 3.8 (SD = 1.4; range 1-6). The most common combinations of strategies were instruction, modeling, roleplay, and feedback (n = 25; 48%) and instruction, modeling, and performance feedback (n = 8; 15%). In four studies, authors used performance feedback as the only training strategy. In these studies, researchers did not provide an initial training to educators, but instead delivered performance feedback to educators as they implemented the practice in the intervention setting. Educators were provided with an opportunity to ask the

researchers questions and receive answers in 13 studies. In seven studies, during the training phase, educators completed planning sheets for how they would implement the educational practice. In six studies, educators used a self-monitoring checklist to evaluate their own performance.

In 49 of the 52 studies (94%), the trainer was the researcher. In three studies (6%), researchers trained teachers to train additional educators.

Training Length

Researchers reported the length of training provided to educators for initial skill acquisition in 29 of 52 studies. The length of training varied throughout each study, with one researcher conducting training for seven minutes (e.g., Catania et al., 2009) and another providing an 8-hour workshop (e.g., Downs et al., 2008). The average length of training was 106 minutes (*SD* = 108). In four studies, an initial acquisition training was not provided to educators.

Generalization

Researchers measured educators' ability to generalize to new settings (*n* = 22; 42%); new instructional targets, programs, or tasks (*n* = 14; 27%); new students (*n* = 10; 19%); materials, such as books that differed from those used in training (*n* = 3; 6%), and a combination of students and tasks (*n* = 3; 6%).

Strategies Used to Promote Generalization

In 40 studies (77%), authors did not report using a strategy to program or plan for generalization. Specific generalization strategies were used in 12 (23%) studies. Researchers mediated generalization in seven studies by providing educators with self-monitoring checklists in the generalization setting. In three of these seven studies, self-monitoring was used, but authors did not report if the self-monitoring checklists were made available to educators in the

generalization phase (i.e., D'Agostino et al., 2020; Hyer & Cooper-Duffy, 2019; Lylo & Lee, 2013). Train "to generalize" was used in four studies. In two of these studies (i.e., Bethune & Wood, 2013; McBride et al., 2003), researchers instructed educators to complete planning sheets prior to generalizing their use of the educational practices in new settings or with new students. In two studies (i.e., Halle et al., 1981; Schwartz et al., 1989), researchers and educators generated lists of opportunities to use time delay with new students or to new targets. Lastly, one study used sequential modification (i.e., Brock et al., 2021). In this study, researchers provided performance feedback to educators when they failed to demonstrate high levels of implementation fidelity (i.e., 85%) for the generalization target.

What Works Clearinghouse's Criteria for Generalization

Thirty-one (60%) of the 52 studies measured generalization in baseline. Of these studies, 12 met What Works Clearinghouse's (WWC) criteria for single-case design. Studies that did not meet WWC's criteria did not measure generalization at least three times in each phase or did not replicate effects across three participants. For example, Andzik and Malone (2019) measured implementation fidelity for 8 educators but collected generalization data for only two educators and thus did not meet the WWC criteria for replication of effects.

Experimental Effects

I calculated success estimates for each outcome. Success estimates are used to indicate how consistently effects were demonstrated across studies. Authors reported both educator and student outcomes in 30 studies. The remaining 22 studies reported educator outcomes only. For the effect of training on educator outcomes, across each study, there were 282 opportunities to demonstrate an experimental effect. Effects were demonstrated 261 times (93%). For students outcomes, across the 30 studies that reported student outcomes, there were 128 opportunities

		Training strategy							Success estimates		
Study	Practice Trained	Instruction	Modeling	Roleplay	Feedback	Planning	SM	Q&A	Main effect	Gen.	Student
Andzik & Malone (2019)	PP, OTI	✓	✓	✓	✓			✓	8/8	2/2	4/4
Andzik et al. (2021)	PP, OTI	✓	✓	✓	✓			✓	3/3	3/3	3/3
Barton et al. (2013) – Study 2	PP, R+, SCR	✓	✓	✓	✓				8/8	9/9	4/4
Barton et al. (2013) – Study 3	ABI, R+, NI				✓				9/9	4/4	-
Barton et al. (2016)	ABI, R+, NI				✓				9/9	6/8	-
Barton et al. (2018)	ABI, R+, NI				✓				9/9	9/9	-
Bethune & Wood (2013)	ABI, DR, FCT	✓	✓		✓	✓			3/3	3/3	4/4
Binger et al. (2010)	M, PP	✓	✓	✓	✓			✓	3/3	3/3	3/3
Brock et al. (2016)	PMI	✓	✓		✓	✓			4/4	0/3	4/4
Brock et al. (2021)	PP	✓	✓	✓	✓				10/10	10/10	4/5
Catania et al. (2009)	DTT	✓	✓		✓				3/3	3/3	-
Cheek et al. (2019)	OTR	✓			✓				3/3	2/2	3/3
Coogle et al. (2015)	ABI	✓			✓				3/3	3/3	-
Coogle et al. (2018)	NI	✓			✓				4/4	1/3	4/4
Coogle et al. (2020)	NI				✓				3/3	1/3	-
Coogle et al. (2021)	ABI, R+	✓			✓				8/9	2/3	11/18
D'Agostino et al. (2020)	NI, PRT	✓			✓		✓		6/6	6/6	6/6
Downs et al. (2008)	DTT	✓	✓	✓	✓				6/6	6/6	-
Fetherston et al. (2014)	DTT	✓	✓	✓	✓			✓	1/4	4/4	4/4
Study 2	VS	✓	✓	✓	✓			✓	4/4	4/4	4/4
Study 3	NI	✓	✓	✓	✓			✓	-	3/3	0/4

Continued

Table 2. Training Practices, Strategies, and Success Estimates

		Training strategy							Success estimates		
Study	Practice Trained	Instruction	Modeling	Roleplay	Feedback	Planning	SM	Q&A	Main effect	Gen.	Student
Feldman & Matos (2012)	PRT	✓			✓				3/3	3/3	3/3
Flynn & Lo (2016)	DR, FBA	✓	✓	✓	✓				6/6	6/6	-
Ganz et al. (2013)	PECS	✓	✓	✓	✓		✓	✓	3/3	0/3	3/3
Gerencser et al. (2018)	DTT	✓	✓		✓			✓	3/3	3/3	-
Gianoumis et al. (2012)	NI, SPA	✓	✓	✓	✓			✓	6/6	6/6	2/3
Halle et al. (1981)	NI, TD	✓	✓		✓				5/5	5/5	5/5
Hemmeter et al. (2015)	PP, R+	✓	✓		✓	✓		✓	9/9	8/9	-
Hyer & Cooper-Duffy (2019)	PP, TD, SCR	✓	✓	✓	✓		✓		3/3	3/3	6/6
Kretlow et al. (2012)	M	✓	✓	✓	✓			✓	3/3	3/3	-
Lerman et al. (2004)	NI, PP, R+	✓		✓	✓			✓	30/30	15/15	-
Lerman et al. (2008)	PP, SPA	✓	✓	✓	✓				2/9	8/9	-
Lylo & Lee (2013)	PP, R+	✓		✓			✓		3/3	2/3	-
McBride et al. (2003)	ABI	✓		✓	✓	✓			3/3	2/2	3/6
McLeod et al. (2019)	ABI, R+, NI	✓	✓	✓	✓	✓			6/6	6/6	-
McMillan & Renzaglia (2014)	FCT, TD		✓	✓	✓				5/9	3/3	-
Mouzakitis et al. (2015)	FCT, R+, BIP	✓	✓		✓		✓	✓	4/4	3/4	4/4
Nabeyama & Sturmey (2010)	Safety	✓	✓	✓	✓		✓	✓	3/3	3/3	3/3
Nigro-Bruzzi & Sturmey (2010)	NI	✓	✓	✓	✓			✓	3/3	3/3	5/5
Peck et al. (1989)	PP, R+				✓	✓			6/6	4/6	3/3
Phillips & Halle (2004)	NI, TD	✓	✓	✓	✓	✓			4/4	4/4	-
Pollard et al. (2014)	ABI, DTT, PP, R+	✓	✓	✓	✓				3/3	3/3	-

Continued

		Training strategy							Success estimates		
Study	Practice Trained	Instruction	Modeling	Roleplay	Feedback	Planning	SM	Q&A	Main effect	Gen.	Student
Reid et al. (1985)	Curricula	✓			✓			✓	3/3	2/2	-
Robinson (2011)	PRT		✓		✓			✓	4/4	4/4	4/4
Rosenberg et al. (2020)	NI	✓		✓	✓	✓			4/4	3/3	3/3
Sarokoff & Sturmey (2008)	DTT	✓	✓	✓	✓				3/3	3/3	3/3
Scheeler et al. (2010)	R+, OTR	✓			✓				3/3	3/3	-
Schwartz et al. (1989)	NI, TD	✓	✓	✓	✓				3/3	0/3	-
Seaman-Tullis et al. (2019)	TA, VM	✓	✓	✓	✓		✓	✓	3/3	3/3	1/1
Shepley et al. (2020)	Data collection	✓	✓		✓			✓	4/4	4/4	-
Tekin-Iftar et al. (2017)	PP	✓	✓	✓	✓				3/3	3/3	3/3
Walker et al. (2021)	FCT	✓	✓	✓	✓	✓			3/3	1/1	2/3

Note. ABI = antecedent-based intervention; DR = differential reinforcement; DTT = discrete trial training; FBA = functional behavior assessment; FCT = functional communication training; Gen. = generalization; M = modeling; NI = naturalistic intervention; OTR/OTI = opportunities to respond/initiate; PMI = peer-mediated intervention; PECS = picture exchange communication system; PRT = pivotal response treatment; PP = prompting; R+ = reinforcement; SCR = scripting; SM = self-monitoring; SPA = stimulus preference assessment; TA = task analysis; TD = time delay; VM = video modeling; VS = visual supports; Q&A = question-and-answer session.

Study	Practice trained	Gen. type	Gen. in baseline	Meets WWC criteria	Generalization strategy used	Gen. success estimate
Andzik & Malone (2019)	PP, OTI	Setting	✓		None reported	2/2
Andzik et al. (2021)	PP, OTI	Setting	✓	✓	None reported	3/3
Barton et al. (2013) – Study 2	PP, R+, SCR	Student			None reported	9/9
Barton et al. (2013) – Study 3	ABI, R+, NI	Setting, Student	✓		None reported	4/4
Barton et al. (2016)	ABI, R+, NI	Setting	✓		None reported	6/8
Barton et al. (2018)	ABI, R+, NI	Setting	✓		None reported	9/9
Bethune & Wood (2013)	ABI, DR, FCT	Setting			Train "to generalize"	3/3
Binger et al. (2010)	M, PP	Materials			None reported	3/3
Brock et al. (2016)	PMI	Setting			None reported	0/3
Brock et al. (2021)	PP	Target	✓	✓	Sequential modification	10/10
Catania et al. (2009)	DTT	Target			None reported	3/3
Cheek et al. (2019)	OTR	Materials			None reported	2/2
Coogle et al. (2015)	ABI	Setting			None reported	3/3
Coogle et al. (2018)	NI	Activity			None reported	1/3
Coogle et al. (2020)	NI	Setting			None reported	1/3
Coogle et al. (2021)	ABI, R+	Setting			None reported	2/3
D'Agostino et al. (2020)	NI, PRT	Setting	✓		Mediate generalization*	6/6
Downs et al. (2008)	DTT	Student			None reported	6/6
Fetherston et al. (2014)	DTT	Target			None reported	4/4
Study 2	VS	Target			None reported	4/4
Study 3	NI	Target			None reported	3/3
Feldman & Matos (2012)	PRT	Activity	✓		None reported	3/3
Flynn & Lo (2016)	DR, FBA	Student	✓		None reported	6/6
Ganz et al. (2013)	PECS	Setting	✓		Mediate generalization	0/3
Gerencser et al. (2018)	DTT	Target	✓		None reported	3/3
Gianoumis et al. (2012)	NI, SPA	Student	✓	✓	None reported	6/6

Table 3. Description of Generalization Types and Strategies Continued

Study	Practice trained	Gen. type	Gen. in baseline	Meets WWC criteria	Generalization strategy used	Gen. success estimate
Halle et al. (1981)	NI, TD	Target	✓	✓	Train "to generalize"	5/5
Hemmeter et al. (2015)	PP, R+	Activity	✓		None reported	8/9
Hyer & Cooper-Duffy (2019)	PP, TD, SCR	Materials	✓	✓	Mediate generalization*	3/3
Kretlow et al. (2012)	M	Target	✓	✓	None reported	3/3
Lerman et al. (2004)	NI, PP, R+	Student			None reported	15/15
Lerman et al. (2008)	PP, SPA	Target			None reported	8/9
Lylo & Lee (2013)	PP, R+	Target	✓		Mediate generalization*	2/3
McBride et al. (2003)	ABI	Student & Target			Train "to generalize"	2/2
McLeod et al. (2019)	ABI, R+, NI	Setting	✓		None reported	6/6
McMillan & Renzaglia (2014)	FCT, TD	Setting	✓		None reported	3/3
Mouzakitis et al. (2015)	FCT, R+, BIP	Student	✓	✓	Mediate generalization	3/4
Nabeyama & Sturmey (2010)	Safety	Student	✓	✓	Mediate generalization	3/3
Nigro-Bruzzi & Sturmey (2010)	NI	Setting	✓		None reported	5/5
Peck et al. (1989)	PP, R+	Activity	✓	✓	None reported	4/6
Phillips & Halle (2004)	NI, TD	Student	✓	✓	None reported	4/4
Pollard et al. (2014)	ABI, DTT, PP, R+	Target	✓		None reported	3/3
Reid et al. (1985)	Curricula	Setting	✓		None reported	2/2
Robinson (2011)	PRT	Student & Activity			None reported	4/4
Rosenberg et al. (2020)	NI	Setting & Activity	✓		None reported	3/3
Sarokoff & Sturmey (2008)	DTT	Target	✓	✓	None reported	3/3
Scheeler et al. (2010)	R+, OTR	Setting			None reported	3/3
Schwartz et al. (1989)	NI, TD	Student			Train "to generalize"	0/3
Seaman-Tullis et al. (2019)	TA, VM	Target			Mediate generalization	3/3
Shepley et al. (2020)	Data collection	Student	✓	✓	None reported	4/4
Tekin-Iftar et al. (2017)	PP	Target	✓		None reported	3/3
Walker et al. (2021)	FCT	Activity			None reported	1/1

Note. * = unclear if self-monitoring checklists available in generalization setting ABI = antecedent-based intervention; DR = differential reinforcement; DTT = discrete trial training; FBA = functional behavior assessment; FCT = functional communication training; Gen. = generalization; M = modeling; NI = naturalistic intervention; OTR/OTI = opportunities to respond/initiate; PMI = peer-mediated intervention; PECS = picture exchange communication system, PRT = pivotal response treatment, PP = prompting, R+ = reinforcement, SCR = scripting; SPA = stimulus preference assessment; TA = task analysis; TD = time delay; VM = video modeling; VS = visual supports.

Continued

to demonstrate an experimental effect. Effects were demonstrated 111 times (87%).

I calculated success estimates for the most common combination of training strategies. Instruction, modeling, roleplay, and feedback were used in 25 studies. There were 117 opportunities to demonstrate an experimental effect. Effects were demonstrated 107 times (91%). Eight studies used instruction, modeling, and feedback. Effects were demonstrated for 35 out of 35 opportunities (100%). Four studies used performance feedback only. Effects were demonstrated 30 out of 30 times (100%).

Generalization Experimental Effects

For educator outcomes for the generalization target, there were 230 opportunities to demonstrate an experimental effect. Effects were demonstrated 205 times (89%). Experimental effects were demonstrated in 54 of 65 (83%) opportunities for studies that measured generalization to new settings, 45 of 49 (92%) for generalization to new students, 57 of 59 (97%) for generalization to new targets, 8 of 8 (100%) for generalization to new materials, 17 of 22 (77%) for generalization to novel activities, and 18 of 18 (100%) for studies that measured generalization to a combination of these types. Authors did not report using a generalization strategy in 40 studies. Across these studies, there were 177 opportunities to demonstrate an effect. Effects were demonstrated 163 times (92%). Researchers mediated generalization in seven studies. Effects were demonstrated for 20 of 25 opportunities (80%). Researchers trained practitioners to generalize in four studies. Effects were demonstrated for 10 of 13 opportunities (77%). Sequential modification was used in one study. Effects were demonstrated for 10 out of 10 opportunities (100%).

Discussion

Evidence-based practices can only have an optimal impact on student outcomes when educators are able to generalize them across students, settings, and situations. In this systematic review, I synthesized findings across training studies that measured generalization of educator implementation fidelity. I identified 52 studies. Consistent with previous reviews on targeting generalization for student outcomes, most of the studies in this review did not describe an explicit strategy for generalization. These findings extend the literature regarding targeting generalization in educator training in several ways. First, researchers measured generalization to a variety of new contexts and for a variety of educational practices. Most studies (42%) measured generalization to settings that varied from the original intervention setting. For example, educators were trained to implement naturalistic interventions in the classroom and generalize to the playground. The most common practices educators were trained to implement were naturalistic interventions, reinforcement, and antecedent-based interventions. These practices represent several basic practices that are good contextual fits for a wide variety of students and settings, and thus have a high demand for generalization. For example, Rosenberg and colleagues (2020) trained paraeducators to implement naturalistic interventions to increase student communication and self-advocacy skills. Generalization was measured during different activities and times. Because there are endless opportunities for students to communicate throughout the day, restricting the use of an intervention to one context may not provide students with opportunities to use the skill throughout the day and thus does not maximally impact student outcomes.

Second, researchers used a combination of instruction, modeling, roleplay, and performance feedback to train initial skill acquisition. This is consistent with previous reviews on staff training (Brock & Carter, 2017; Brock et al., 2017). Additionally, all studies used

performance feedback. Performance feedback has been shown to support on-going implementation fidelity after initial skill acquisition (Brock et al., 2017). Performance feedback may also help educators generalize. One study (i.e., Brock et al., 2021) demonstrated this by using sequential modification, in which initial acquisition was achieved, generalization was measured, found to be insufficient, and then feedback was provided to support generalization. When feedback was provided in the generalization setting, all participants reached high levels of fidelity for the generalization target.

Although Stokes and Baer (1977) described sequential modification as a non-strategy for promoting generalization, it may be a good contextual fit for supporting generalization in schools for several reasons. First, performance feedback is an evidence-based practice that is a critical component of quality staff training (Brock et al., 2017). Second, performance feedback can be easily implemented with little cost (Sleiman et al., 2020). Lastly, for some educators, there are already opportunities for performance feedback. For example, paraeducators receive supervision from special education teachers. Special education teachers can provide feedback to paraeducators to support generalization to new students, settings, and situations (Irvin et al., 2018). For educators such as general and special education teachers, peer feedback could be used to support generalization.

Third, this review provides some initial recommendations for how to promote generalization in educator training. In this review, 12 studies used at least one of the following generalization strategies: mediating generalization, training "to generalize," and sequential modification. Educators were trained to use self-monitoring checklists to mediate generalization by monitoring their own implementation fidelity. Researchers trained educators "to generalize" by having educators plan how to use the educational practice in the generalization setting.

Sequential modification involved providing performance feedback to educators who did not demonstrate generalization. Results from this review indicate that these strategies were successful in supporting educators' generalization.

However, the studies that did not use specific strategies to promote generalization (n = 40; 77%) demonstrated better experimental effects than those that did. Experimental effects were observed in 10 of 12 studies (83%) that used specific strategies and effects were observed for 37 of the 40 studies (93%) that did not use generalization strategies. This may have occurred for two reasons. First, it is possible that researchers in studies that used strategies might have anticipated that generalizing in those situations may have been more challenging and thus they provided additional support for generalization. Second, it is likely that researchers may not have provided an exhaustive list of all of the strategies that they used as part of staff training or may have not have explicitly stated if and when strategies were used for generalization. Therefore, it is possible that in some cases researchers may have used strategies for generalization without describing those strategies in the manuscript.

More research with more complete descriptions of training is needed to fully understand the relationship between strategies that promote generalization and educators' ability to generalize. Further, the absence of approaches for generalization leads to inconsistent effects. It is possible that providing a high-quality initial training may be sufficient to support educators' generalization. However, Stokes and Baer (1977) emphasized that generalization may not always be guaranteed, and due to the high demand for generalization in special education, researchers should be cautious about adopting a "train and hope" approach. Therefore, more research is needed in this area to determine best practice to meet the demand for generalization.

Implications for Practice

Findings from this review have implications for practice. First, administrators, teacher educators, and researchers should conduct a high-quality initial training that uses a combination of didactic instruction, roleplay, modeling, and performance feedback. This review showed that a combination of these strategies was effective for initial skill acquisition. Second, educators should plan training that targets educator generalization in order to optimize educators' use of educational practices. While educators in many of the studies that did not program for generalization demonstrated generalization, Stokes and Baer (1977) emphasized that it is not guaranteed. Results of this review indicate that mediating generalization with self-monitoring, using sequential modification using performance feedback, and training educators to generalize through planning can promote generalization. At a minimum, during the training phase trainers can describe how a practice can be applied in additional settings and situations. Lastly, when time and resources are limited, educators should use performance feedback to support implementation fidelity in the generalization setting (i.e., sequential modification).

Limitations and Future Directions

Limitations of this review suggest directions for future research. First, visual analysis was used to make success estimates for experimental effects. It is possible that other researchers may make different judgements when conducting visual analysis or may choose to use a different metric to summarize effects. Second, it is possible that authors used strategies to promote generalization that were either not reported or were unclear. When strategies were unclear, it was coded as "none reported." In future studies, researchers should clearly describe their methods to allow for replication. Third, the majority of studies trained educators to implement naturalistic interventions, reinforcement, and antecedent-based interventions, which are practices that may lend to generalization more naturally than others with more comprehensive implementation steps

(e.g., Picture Exchange Communication System). Future studies should examine how to promote generalization of more complex educational practices. Lastly, many studies included in this review did not measure generalization experimentally. Only 12 studies (23%) met What Works Clearinghouse's criteria for single-case designs for generalization data. Because of this, only descriptive information can be provided about which strategies support generalization. In future studies, researchers should measure generalization experimentally.

Conclusion

Closing the research-to-practice gap requires providing high quality training that enables educators to generalize to new students, settings, and situations. Results from this review show that generalization occurs when high-quality initial training and targeted strategies for generalization are provided to educators. Mediating generalization with self-monitoring checklists, providing performance feedback for the generalization target, and describing opportunities to generalize can help support generalization. However, more research is needed to determine which specific strategies promote generalization for complex evidence-based educational practices.

Chapter 3. Multiple Method Study

In this chapter, I describe the results of a multiple method paraeducator training study. This chapter includes an introduction, a detailed description of the methods, a description of the quantitative and qualitative results, a discussion of findings, and an overall discussion.

Abstract

Teaching students with significant disabilities requires a specialized skillset to address their complex needs. Paraeducators who are tasked with providing instruction to these students rarely are given adequate training to do so effectively. The purposes of this multiple method study were to (a) using a single-case design, evaluate the effects of a paraeducator training with teacher-delivered coaching and (b) through qualitative analysis of semi-structured interviews, explore educators' perceptions about the feasibility of this model. In the single-case design study, training featuring research-based strategies was delivered to three paraeducators who worked with K-5 students with intellectual and developmental disabilities and their supervising teachers delivered follow-up coaching. Training and coaching enabled all three paraeducators to implement constant time delay with high implementation fidelity and to generalize fidelity to new untrained teaching targets. Key themes from the interviews included interest in pursuing additional training opportunities in several areas and high feasibility and acceptance of the training interventions used in the study.

Efficacy of Teachers Coaching Paraeducators to Implement and Generalize Time Delay

Teaching students with significant disabilities requires a specialized skillset to address their complex needs. Students with significant disabilities are students who are eligible for alternative assessment and often need intensive modifications, adaptions, and supports to access the grade-level curriculum. In the absence of effective intervention, students with significant disabilities are at risk for poor long-term academic and post-secondary outcomes (Wagner et al., 2006).

Despite the clear need to deliver highly specialized instruction to students with severe disabilities, these students often receive instruction from school staff with the *least* amount of training and guidance (Lekwa & Reddy, 2021). Paraeducators are part-time or full-time school personnel who provide classroom and instructional support to students with and without disabilities under the supervision of a licensed teacher (U.S. Department of Education, 2018). In most states, paraeducators are not required to hold a degree higher than a high school diploma or complete any formal coursework in special education (Fisher & Pleasants, 2012). Therefore, paraeducators often begin their positions with no background knowledge about children with disabilities or special education, and no skill in evidence-based practices that improve outcomes for students with disabilities.

Once paraeducators are hired, they are given strikingly limited training. In a survey of paraeducators, Wiggs et al. (2021) found that 44% reported that they had received zero hours of training in the past year. Paraeducators who had received training in the past year reported that the most common training topic was behavior (n = 73; 32.6%), followed by classroom behavior management (n = 38; 17%), and managing individual behaviors (n = 35; 15.6%). Academic instruction-based training was one of the least common training topics, with 12% of

paraeducators surveyed reporting having participated. The results of this study highlight that paraeducators are rarely provided training, and when they are, it is most commonly designed to address student behavior, rather than instructional strategies.

Even the limited training that paraeducators do receive may not be effective. When formal training is provided to paraeducators, it is commonly delivered via single-event professional development workshops (Wiggs et al., 2021), which is not aligned with best practice (Brock & Anderson, 2021). These workshops typically involve a trainer delivering information as paraeducators sit and listen. There are no opportunities for active participation or to practice the new strategy (Freeman et al., 2017). Additionally, after the workshop, there is no additional follow-up support provided to paraeducators as they implement the new practice with students. As a result, these workshops do not enable paraeducators to implement new strategies with students. Even when these workshops use high-quality training techniques, such as opportunities to practice and receive feedback, they do not result in maintained use of strategies (Brock & Carter, 2015; Hall et al., 2010).

In contrast, effective paraeducator training uses modeling, coaching with performance feedback , and follow-up training and support (Brock & Anderson, 2021; Douglas et al., 2019). Modeling the implementation steps during training may help to reduce initial errors and clarify correct implementation (Brock & Carter, 2017). Coaching with performance feedback allows paraeducators to identify errors and may include additional modeling of the implementation steps, which may help to correct errors in the implementation setting. Follow-up training and support ensures that paraeducators continue to implement procedures with high fidelity when training is complete. When used in combination, these strategies can be used to successfully train paraeducators to implement a variety of evidence-based practices (Brock & Anderson, 2021).

Most training studies focus on training paraeducators to implement a practice with one student to teach a single skill. However, the demands of a paraeducator's job require them to be able to implement practices across students and skills. This is known as generalization, which is the use of acquired skills across settings, situations, and individuals without additional training (Stokes & Baer, 1977). Generalization is a key piece of staff training (Reinke et al., 2012), and is especially critical for paraeducators. Wiggs et al. (2021) found that most K-5 paraeducators worked with 2 to 4 students, with some working with up to 10 students. Almost 40% reported working with students across multiple grade levels. The expectation for paraeducators to work across students and grade levels requires that they generalize their training to new contexts.

However, there is limited information on how to effectively train paraeducators to generalize. Although numerous studies have shown that training can increase implementation fidelity within the confines of the study, few studies have focused specifically on generalization of training outcomes. In a comprehensive review of school practitioner training studies, Brock et al. (2017) found that 25% (n = 29) of the 118 single-case studies reviewed measured generalization. The results of this review and previous reviews (e.g., Shawbitz & Brock, 2022) provide mixed results for how to promote generalization.

Generalization may be particularly difficult for paraeducators. First, because most paraeducators have no formal training in special education (Carter et al., 2009), it is unsurprising that they may not naturally understand how some interventions can be used to target very different skills. For example, if a paraeducator is taught to use constant time delay to teach science vocabulary words, they understandably might categorize time delay as a vocabulary intervention. Without further training and support, they would be unlikely to guess that the same strategy could be used to effectively target math, social, or self-help skills (Hume et al., 2021).

Second, also due to a lack of background knowledge and training, paraeducators are likely to have a difficult time differentiating between key components of an evidence-based practice that must remain intact and aspects of the intervention that could be changed when generalizing to a new student or situation. For example, a paraeducator may be taught to implement time delay with a student who responds vocally. They may not understand how time delay can also be used with students who respond differently, such as by using an augmentative and alternative communication device. They may also have difficulty moving from implementing time delay with a skill that is discrete (i.e., one-step) to a chained skill with multiple steps. Paraeducators may not understand how to break down the skill and provide a prompt after each step.

Several promising strategies have been shown to promote generalization of student outcomes and may likely produce generalization of paraeducator training outcomes. Generalization for student outcomes has been examined across multiple studies, and scholars have identified several strategies that promote student generalization (Stokes & Baer, 1977). Because generalization is a ubiquitous concept, it may apply to all learners, including paraeducators. Stokes and Baer (1977) described nine approaches for generalization: train and hope, sequential modification, introduce to natural maintaining contingencies, train sufficient exemplars, train loosely, use indiscriminable contingencies, program common stimuli, mediate generalization, and train "to generalize." "Train sufficient exemplars" is also known as multiple exemplar training. In multiple exemplar training, the trainer presents a variety of stimulus conditions, response variations, and response topographies (Cooper et al., 2020). Providing a high-quality training that specifically targets generalization through the use of multiple exemplars is a promising strategy that may promote paraeducator generalization.

Although strategies exist to train paraeducators to effectively implement and generalize evidence-based practices, there are few research-supported models for how these approaches can be used under real-world circumstances. Single-event workshops are prevalent because they are often not time-intensive and are often more feasible for schools. For example, it may be difficult for schools to hire consultants who are available to provide support across several months. However, as previously discussed, single-event workshops are not effective at changing paraeducator practice long-term. Many of these trainings also rely on a trainer or expert who may not be available for the critical follow-up support needed to maintain implementation.

Therefore, it is critical to evaluate the efficacy of models that do not completely rely on researchers or expert trainers. One promising model is teacher-delivered coaching with performance feedback (Walker & Smith, 2015). Previous research has shown that coaching following training is an effective tool for ensuring that implementation fidelity continues to be high in the intervention setting (e.g., the classroom; Walker & Smith, 2015). Special education teachers are a natural source for supervision and support for paraeducators and have been successfully trained in the past to provide support. Training teachers to provide support to their own paraeducators may extend traditional training practices, reduce the time and cost of bringing in expert trainers, and allow teachers to continue to implement these skills with future paraeducators (Andzik & Cannella-Malone, 2017; 2019).

Previous studies have demonstrated that teacher-delivered coaching with performance feedback allows paraeducators to continue to implement evidence-based practices with high fidelity (Gregori et al., 2022). However, special educators are often not prepared to supervise and support paraeducators. One-third of pre-service teacher training programs provided no coursework in this area and in-service training is also rarely provided (Sobeck et al., 2021;

Wiggs et al., 2021). Additionally, special education teachers report a need for training in this area (Irvin et al., 2018), but more research is needed to determine effective, efficient methods that enable special educators to support paraeducators working with students with disabilities.

I have designed to the present study to address this problem by studying the efficacy of training with teacher-delivered coaching for paraeducators to acquire and generalize an evidence-based practice. The evidence-based practice I selected was constant time delay. Constant time delay is a procedure in which an educator inserts a delay between the cue to engage in a behavior and a controlling prompt that enables the student to answer correctly (Collins et al., 2018). Constant time delay is an ideal choice for a number of reasons. First, there is a large evidence base for training paraeducators to use it (Shawbitz & Brock, 2022). Second, it is an extremely versatile procedure that is well-suited for generalization across students and situations (Hume et al., 2021).

Without evidence-based training, paraeducators struggle to implement evidence-based practices, such as time delay, with fidelity. Because most students with significant disabilities receive some one-on-one academic instruction from paraeducators, it is crucial to provide proper training and support for paraeducators. More research is needed to (a) examine strategies that promote generalization of paraeducator training outcomes to untrained student goals, (b) evaluate the efficacy of a teacher-delivered coaching with performance feedback model on paraeducator training outcomes, and (c) assess the feasibility, acceptability, and value of these training strategies. Therefore, the purpose of this study is to address the following questions:

1. What are the effects of an initial training consisting of oral instruction, modeling, role play, performance feedback, and multiple exemplars on paraeducator implementation fidelity of constant time delay?

2. To what degree does teacher-delivered coaching with performance feedback further improve implementation fidelity?
3. To what degree do these approaches enable paraeducators to generalize implementation fidelity to novel, untrained student goals?
4. What are paraeducators' and teachers' perceptions of the feasibility, acceptability, and value of the intervention?

Method

Participants

Participants included three paraeducators, two special education teachers, and three students with intellectual and developmental disabilities (IDD). Each paraeducator was paired with a special education teacher and a student, with one special education teacher supervising two paraeducators. I recruited participants by asking administrators in the participating school district to identify special education teachers and paraeducators who might be interested in participating. I then contacted interested teachers to meet with them to discuss the purpose of the study.

Paraeducators were eligible to participate in the study if they (a) had not received previous training on response prompting procedures and (b) provided one-on-one instruction to students with significant disabilities. Teachers were eligible to participate if they (a) had not received training on coaching paraeducators and (b) supervised a paraeducator who provided one-on-one instruction to students with significant disabilities. Students were eligible to participate if they (a) received special education services under a label of intellectual disability, autism, or multiple disabilities and received instruction on a modified curriculum and (b) had IEP goals or goals aligned with the general curriculum that were addressed via one-on-one

instruction from a paraeducator. Characteristics of all student participants are reported in Table 4.

Name	Age	Grade	Educational label	Adaptive behavior/IQ score	IEP goals addressed
Chloe	5	K	Autism	69 – Vineland	Primary: Counting 10-15 objects with one-to-one correspondence Generalization: Segmenting individual phonemes in CVC words
Lionel	9	3	Autism	40 – DP-4 48 – Vineland	Primary: Counting 4-10 objects with one-to-one correspondence Generalization: Naming the next number in a sequence up to 10
Oliver	10	4	Intellectual disability	57 – WISC 72 – Vineland	Primary: Identifying community signs Generalization: Match a picture of fraction to the fraction's number or write the numeral of a fraction given a picture

Note. WISC = Weschler Intelligence Scale for Children; DP-4 = Developmental Profile 4

Table 4. Student Demographics and Individualized Education Program Goals

Paraeducators, Teachers, and Students

Three paraeducators participated in the study. Aubrey was a 45-year-old White woman with a bachelor's degree and 6 months of experience in her current role. At the start of the study, Aubrey reported that she had participated in a full-day training in crisis management strategies but had received no other training. Aubrey was supervised by Kennedy, a 33-year-old White woman with a master's degree and 12 years of experience. Aubrey worked with Chloe, who was a 5-year-old White kindergarten student who received services under the educational label of autism. Her IEP goals selected for the study addressed basic math skills (e.g., counting objects with 1:1 correspondence) and basic literacy skills (e.g., segmenting individual phonemes).

The second paraeducator was Stephanie. Stephanie was a 45-year-old White woman with an associate degree and two years of experience in her current role. At the start of the study,

Stephanie reported that she had participated in a full-day training in crisis management strategies but had received no other training. Stephanie shared that she was not familiar with time delay. Stephanie was supervised by Breana, a 34-year-old White woman with a master's degree and 9 years of experience. Stephanie worked with Lionel, a 9-year-old bi-racial (i.e., White and Asian) third grader who communicated using alternative and augmented communication (AAC) device. Lionel was served under the educational label of autism and had an additional medical diagnosis of Down syndrome. His IEP goals selected for the study addressed basic math skills (e.g., counting objects with 1:1 correspondence, naming the next number in a sequence).

The third paraeducator was Riya, a 36-year-old Asian woman with a master's degree and 6 months of experience. Riya also reported receiving a crisis management training and reported receiving training once a month. Riya was also supervised by Breana. Riya worked with Oliver, a 10-year-old White fourth-grade student who received special education services under the educational label of intellectual disability and had an additional medical diagnosis of Down syndrome. Oliver's IEP goals used in the study targeted identifying community signs using pictures (e.g., "do not walk," "hospital") and identifying or writing fractions.

Setting and Materials

This study was conducted at a public suburban elementary school in the Midwestern United States. The school's population was about 90% White, 5% Asian, and 3% or less identifying as Black, Hispanic, or two or more races. 2% of students qualified for free and reduced lunch. All observations took place in a self-contained special education classroom.

All data were recorded using paper and pencil. Videos of paraeducators implementing time delay with students in the teacher-delivered coaching phase were recorded and viewed using a Microsoft Surface Go 2.

Trainer

The trainer was the author of this study, a fourth-year doctoral student in special education who had six years of experience working with children and adults with IDD as a paraeducator and behavior analyst. The trainer had a master's degree in applied behavior analysis and was a Board Certified Behavior Analyst (BCBA).

Dependent Variables

I observed paraeducators as they delivered one-on-one instruction to students with disabilities. These observations occurred during the time of day when paraeducators were typically working with these students. During these observations, I measured paraeducator implementation fidelity of time delay and student progress toward IEP goals. Measurement was the same for both the primary and the generalization measure.

Paraeducator Implementation Fidelity

I measured paraeducators' adherence to the constant time delay steps using an implementation checklist, and their quality of implementation using a rating scale. Measuring multiple dimensions of implementation fidelity reflects best practice in implementation science (O'Donnell, 2008). This same implementation checklist and rating scale have been used in Brock et al. (2020) and Brock et al. (2021). Adherence was the primary dependent variable while quality was a secondary descriptive variable.

Both adherence and quality were scored while observing the first three trials of each teaching session. For example, if a paraeducator was teaching ten different multiplication facts to a student, my observation focused on implementation fidelity for the first three multiplication facts. Paraeducator implementation fidelity was measured twice during each session: once for the

primary IEP goal and once for the generalization IEP goal. Paraeducators did not receive training specific to using time delay to teach the generalization IEP goal.

Aubrey and Riya were trained to implement a 5-second time delay. Stephanie was trained to implement a 3-second time delay. The delays were chosen in collaboration with the students' teacher.

Adherence. Steps on the implementation checklist included (a) delivering a cue or task directions, (b) waiting the specified time (e.g., 3-seconds) for the student to respond or make an incorrect response, and (c) providing the controlling prompt after an incorrect response/no response or behavior specific praise after a correct response. Each step of the time delay procedure was scored as correct or incorrect. Adherence was calculated as the number of correct steps divided by the number of total steps and multiplied by one hundred.

Quality. Quality of implementation was measured using a checklist that rated elements of implementation that were related to overall teaching quality, rather than the specific steps of time delay. I assessed the quality of pacing between trials; the match between the cue/task direction and the student target behavior; the quality of prompts and student responsiveness to the prompts; the quality, immediacy, and type of reinforcement used; the quality of the transition to instruction; and the overall quality of implementation. I also assessed the quality of student responsiveness to instruction. I measured how often the student was engaged, how often the student attempted to respond, how often the student attended to key information, and how often the student provided a correct unprompted response. See Appendix A for both the adherence and quality measures.

Student Progress

Each student's IEP was reviewed with their teacher at the start of the study to determine goals that could be supported appropriately with constant time delay. Student progress on IEP goals was measured as the percent of correct responses. See Appendix B for the student measure.

Chloe. Chloe's primary IEP goal was counting 10-15 objects with one-to-one correspondence. It was measured as a chained skill. For this goal, Chloe counted stackable counting blocks. Her targets at the time of the study were groups of 10, 11, 12, 13, 14, and 15. Each trial began with the paraeducator asking Chloe to show her a specified number of blocks. Chloe then responded by counting each block verbally until she reached the final number. Prompting for the last three numbers was measured for paraeducator implementation fidelity (e.g., blocks 9, 10, and 11 if the target was 11). For the IEP progress measure, the accuracy of counting each individual block was recorded.

Chloe's generalization goal was segmenting individual phonemes in consonant-vowel-consonant (CVC) words. For this goal, the paraeducator gave Chloe a word (e.g., "cat") and Chloe responded with each individual phoneme of the word (e.g., /c/ /a/ /t/). It was measured as a chained skill, with each sound counting as a trial. A list of 30 CVC words was used (see Appendix C). Each day, the researcher randomly selected 3 words for the paraeducator to present and 10 words for the student progress probe. Probes for segmenting were conducted by the researcher.

Lionel. Lionel's primary IEP goal was counting 4-10 objects with one-to-one correspondence. It was measured as a discrete skill. The paraeducator used backward chaining to teach this goal. For each trial, she counted each object as she placed them into a cup and asked, "What comes next?" Lionel responded by selecting the correct number in the sequence on his AAC device.

Lionel's generalization goal was naming the next number in a sequence up to 10. It was measured as a discrete skill. For each trial, the paraeducator pointed to numbers on a number line on Lionel's AAC device and asked, "What comes next?" Lionel responded by selecting the correct next number on his AAC device.

Oliver. Oliver's primary IEP goal was identifying community signs from pictures. It was measured as a discrete skill. For each trial, Oliver was shown a card with a sign (e.g., "hospital," "do not enter"). Three possible answers were written at the bottom of each card. The paraeducator read the three possible answers and asked Oliver which sign was shown. Oliver responded with the correct answer. A list of 30 signs was used (see Appendix C). Each day, the researcher randomly selected 10 words for the paraeducator to present.

Oliver's generalization goal was matching a picture of a fraction to the fraction's number expression. It was measured as a discrete skill. Fractions from one-half to five-sixths were used. For each trial, the paraeducator drew a circle, divided it, and shaded a number of pieces. She then wrote three different fractions using numbers at the bottom of the whiteboard and asked Oliver, "What fraction is this?" Oliver responded verbally or by circling the fraction's number on the white board. Halfway through the study, given Oliver's progress and in collaboration with his teacher, matching fractions was changed to writing the numeral expression of a fraction given a picture representation of a fraction (e.g., a circle with one of two halves shaded). It was measured as a discrete skill. For each trial, Oliver was presented with a picture representation of a fraction. The paraeducator asked Oliver, "What fraction is this?" and Oliver responded by writing the fraction's numerator and denominator.

Interobserver Agreement (IOA)

Interobserver agreement was calculated for a minimum of 20% of sessions across all phases. A second independent observer, a doctoral student in special education, collected data on the dependent variables. Before collecting data, I trained this observer by (a) reviewing a coding manual through oral instruction, (b) practicing taking data using scenarios, and (c) achieving at least 95% agreement with me during a live observation. I calculated point-by-point agreement. Average overall agreement across variables was 95% (range = 50-100%) for paraeducator adherence, 91% (range = 53-100%) for paraeducator quality of implementation, and 94% (range = 70-100%) for student progress.

Experimental Design

A multiple probe across participants design was used (Gast et al., 2018). I provided the intervention to paraeducator-teacher dyads in a staggered manner. Decisions about when to make changes were based on the primary dependent variables, adherence to time delay steps for the primary student goal. All participants began in the baseline condition. The first paraeducator received intervention when (a) there were at least three baseline data points for all paraeducators and (b) baseline data was stable across level, variability, and trend for all three participants. Training was introduced to subsequent tiers when (a) implementation fidelity had been measured at least three times after the last participant received training and (b) trends were stable across all tiers.

Pre-baseline

Prior to beginning the study, I met with each teacher to determine appropriate student IEP goals that could be addressed with constant time delay. Through consultation with teachers and observation of teachers and paraeducators, I created a task analysis for each skill. Breana created

task analyses for her respective students' skills. In consultation with her, these were modified as needed.

Written Description (Baseline)

During baseline, paraeducators were observed working with students on their IEP goals. Paraeducators were asked to teach the student as they normally would. Paraeducators were provided with a written description of time delay from the National Professional Development Center on Autism Spectrum Disorders (Nietzel, 2009). No other materials or training were provided. Paraeducator implementation fidelity of the prompting procedure for both the primary target and generalization target and student outcomes were collected through each phase of the study.

Intervention

Initial Training

During the training phase, I provided one-on-one training to each paraeducator. Training for Aubrey was 24 minutes, 23 minutes for Stephanie, and 26 minutes for Riya. Training was provided using a training manual and scripted roleplays. A copy of the manual was given to the paraeducators. I began the training by providing an explanation and rationale for systematic prompting and time delay. Next, I provided an oral explanation of the implementation steps for time delay. Then, I modeled how to use time delay. Paraeducators then roleplayed the procedure with me in the role of the student. During these roleplays, paraeducators practiced the implementation steps and I provided performance feedback to the paraeducators until they reached 100% of steps completed correctly across three opportunities. The training included multiple examples of how to implement time delay across a variety of skills, including both discrete and chained skills, as well as across contents areas such as mathematics, literacy, and self-help skills. I included examples of both 3-second and 5-second time delay. During the

training, I emphasized to paraeducators how time delay can be used to teach a variety of skills and across a variety of students.

Following training, I observed each paraeducator implementing time delay to teach both the primary and the generalization IEP goals. After completing training, paraeducator implementation fidelity of the prompting procedure for both the primary target and the generalization target were measured for at least three observations to isolate the effects of the initial training before teachers began coaching. Due to research team and student illness as well as a semester break, there was a 3-week gap between Aubrey's first observation post-training and her next observation. A short (i.e., less than two-minute) refresher training was provided at that next observation before she implemented time delay with the student. This training consisted of reviewing the 5-second delay, the controlling prompt, and behavior-specific praise.

Teacher-delivered Coaching

All paraeducators received teacher-delivered coaching at least once following the initial training phase. If implementation fidelity for either the primary target or the generalization target fell below 90% for two or more observations in this phase, paraeducators received additional coaching until fidelity for both targets remained stable above 90%. Additional coaching for Stephanie occurred for her generalization target.

Prior to beginning the teacher-delivered coaching intervention, I trained teachers how to coach paraeducators. Training was conducted for 20 minutes. This training included a shortened version of the time delay training that was provided to paraeducators. This was done to ensure that teachers understood the implementation steps. I used a printed training manual to train teachers together. I used the same strategies described above: oral instruction, modeling,

roleplay, and feedback. This training also included a one-minute tutorial on how to use the tablet to access recorded videos of paraeducators.

Teachers were trained to provide coaching to paraeducators that included the following components: (a) an overall praise statement (i.e., "Great job working with the student today!"), specific information on what the paraeducator did correctly or well (i.e., "You waited 3-seconds before providing a prompt."), (b) specific information on what the paraeducator did incorrectly (i.e., "The most intrusive prompt that we have selected is pointing to the correct answer."), (c) a model of any steps that the paraeducator did not implement correctly, and (d) an opportunity to have questions answered.

During the teacher-delivered coaching phase, teachers used the tablet to watch a recording of the paraeducator implementing both skills with the student. The teacher and the paraeducator then met to watch the video together. The teacher provided performance feedback. Feedback was provided immediately before the paraeducator implemented the skill for Aubrey and one to two hours before implementation for Stephanie and Riya. During these sessions, the researcher was present to provide any necessary feedback to the teacher delivering coaching to paraeducators.

Generalization

During each session across all phases of the study, paraeducators worked with the same student on a second IEP goal. Paraeducators did not receive training specific to how to use time delay to address the generalization IEP goal nor did they receive teacher-delivered coaching specific to their implementation of instruction that targeted this goal. See Table 4 for a description of students' generalization goal.

Maintenance

A single maintenance probe was collected for all paraeducators two weeks after the last data point in the intervention phase. This maintenance probe was identical to baseline conditions: paraeducators did not receive any feedback on their implementation of time delay.

Procedural Fidelity

A second observer, a doctoral student in special education, was present for 33% of training sessions to assess procedural fidelity. Procedural fidelity of the paraeducator training was measured using a 23-item checklist. Trainer procedural fidelity was 100%. Procedural fidelity of the teacher training was measured using a 15-item checklist for 100% of training sessions. Trainer procedural fidelity was 100%. Procedural fidelity of teacher-delivered coaching was measured for 100% of sessions in the teacher-delivered coaching phase. It was measured using a 6-item checklist. Teacher-delivered coaching fidelity was 100% for both Kennedy and Breana.

Social Validity

Surveys

Social validity surveys were completed by paraeducators and teachers prior to beginning the study and after the study was complete. The pre-intervention survey assessed participants' comfort with using time delay and the amount and type of training they received/provided. The post-intervention survey assessed the acceptability, feasibility, and value of the respective intervention participants received. See Appendix D for social validity surveys.

Semi-Structured Interviews

I conducted semi-structured interviews with participating paraeducators and teachers following the completion of the intervention. Interviews were conducted after all intervention data were collected but prior to the maintenance probe. The primary purpose of the qualitative

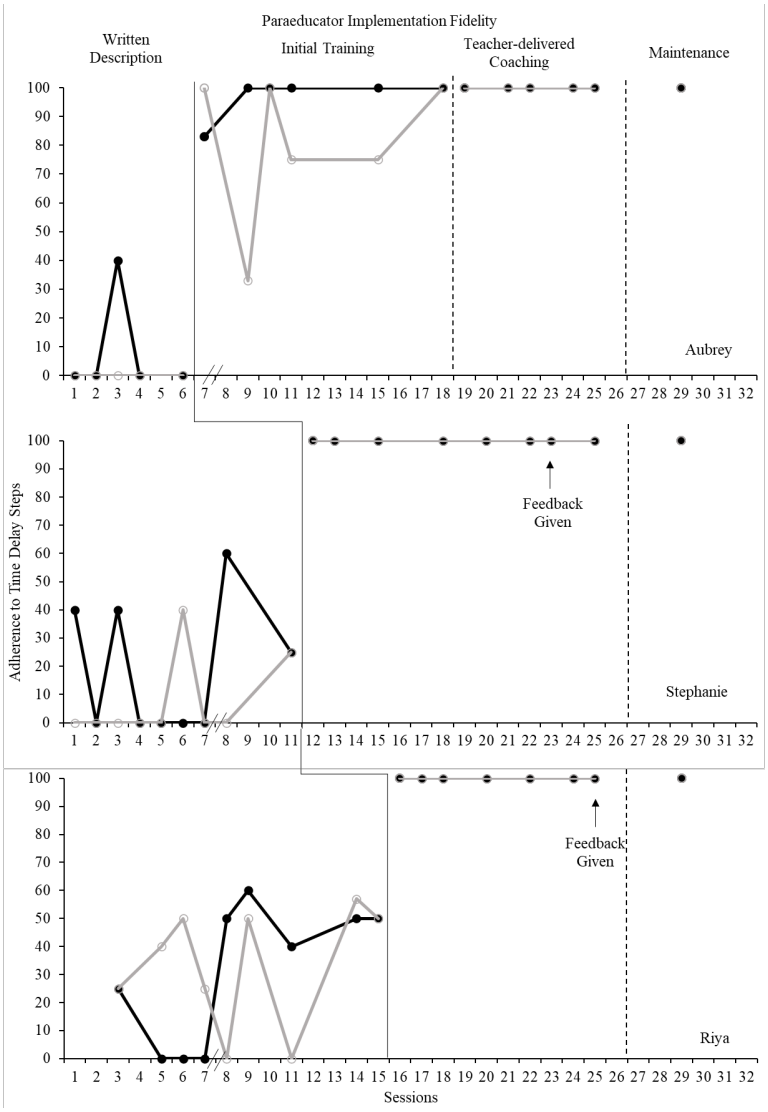
interviews was to assess participants' perceptions of the feasibility, acceptability, and value of the training interventions received. Further, traditional social validity surveys are limited in their scope. I decided to conduct interviews to gain a depth of perspectives on the training interventions. Additionally, I asked participants to share how the strategies used in the study met previously unmet training needs. See Appendix E for interview questions. Interviews were transcribed by hand using Microsoft Word. Recordings were played back and checked against the transcription for accuracy. I used a general inductive approach (Thomas, 2006) to analyze the data. In this approach, themes are derived from the raw data. I read the data multiple times and highlighted different themes as they emerged, modifying them as necessary as I gathered more data.

Results

Paraeducator Implementation Fidelity

I measured three dimensions of implementation fidelity: adherence to steps, implementation quality, and student responsiveness. The primary dependent variable that was graphed was adherence to steps. Visual analysis of this data (displayed in Figure 2) shows that immediately after introduction of initial training, all three paraeducators made immediately and substantial improvements in their adherence to implementation steps. Because this effect was demonstrated and replicated across three opportunities, it is reasonable to conclude that a functional relation exists between the initial training and paraeducator adherence to implementation steps. In addition, all three paraeducators generalized their adherence to a new teaching target—two after initial training alone, and one only after teacher-delivered coaching. All three paraeducators maintained high adherence throughout the intervention condition and two weeks later in the maintenance condition. Descriptive data on the quality of implementation

fidelity (Table 5) show that all paraeducators increased their quality after training. Data on student responsiveness was variable. Below I describe all implementation fidelity data in detail, with an emphasis on visual analysis of adherence data in terms of level, trend, variability, and immediacy of effect.



Note. Generalization goal is represented by open circles. Dashes on x-axis indicate 3-week break. Maintenance data were collected 2 weeks later.

Figure 2. Paraeducator Implementation Fidelity of Constant Time Delay

Aubrey

In baseline, Aubrey's adherence to the implementation steps was stable with no trend for the primary goal, counting objects with one-to-one correspondence, with a level between 0 and 40%. Following the initial training, Aubrey immediately increased her implementation fidelity. This initial increase maintained for the primary goal at a level between 83 and 100%, and maintained at 100%.

For the generalization goal, segmenting individual phonemes in consonant-vowel-consonant (CVC) words, there was no trend, no variability, and a low level of zero in the written directions phase. Following training, Aubrey's adherence to the implementation steps was variable with a level between 33 and 100%, but at a level higher than baseline. Because Aubrey's implementation of the generalization goal fell below 90% for two observations in the initial training phase, Aubrey received teacher coaching twice. Following the introduction of teacher coaching Aubrey reached and maintained 100% fidelity. Aubrey's implementation quality was variable in baseline (range of 64-87% for primary; 54-87% for generalization goal), increased after initial training (97-100% and 80-100%) and maintained at a high level during coaching and maintenance (100% for both goals).

In baseline, Chloe's average score for responsiveness to instruction was 55% (*SD* = 19; range 25-75%) for counting and 45% (*SD* = 14; range = 33-67%) for segmenting. After Aubrey received the initial training, Chloe's responsiveness to instruction scores increased for both goals, with an average of 83% (*SD* = 5; range = 75-92%) for the primary goal, counting, and an average of 65% (*SD* = 24; range = 25-92%) for the generalization goal, segmenting. In the teacher-delivered coaching phase, the average score for counting remained the same at 83% (*SD* = 6; range = 75-92%). The average score for segmenting increased to 90% (*SD* = 4; range = 83-92%).

Stephanie

In baseline, Stephanie's adherence to the implementation steps for her primary goal, counting objects with one-to-one correspondence, was variable with no trend for both goals with a level between 0 and 60%. Following the initial training, Stephanie's implementation fidelity increased to and maintained at 100%. Stephanie received coaching once. Following coaching, Stephanie maintained 100% adherence.

For the generalization goal, naming the next number in a sequence, Stephanie's adherence in baseline was stable with no trend and level between 0 and 40%. Following the initial training, Stephanie's implementation fidelity increased to and maintained at 100%.

Stephanie's implementation quality was variable in baseline (range of 77-87% for primary; 73-87% for generalization goal), increased to 100% for both goals after initial training and maintained at 100%.

In baseline, Lionel's average score for responsiveness to instruction was 41% (*SD* = 18; range 25-83%) for the primary goal, counting, and 46% (*SD* = 16; range = 25-75%) for the generalization goal, sequencing. After Stephanie received the initial training, Lionel's responsiveness to instruction scores increased slightly for both goals, with an average of 51% (*SD* = 30; range = 0-67%) for counting and an average of 49% (*SD* = 19; range = 0-67%) for the segmenting. Based on anecdotal notes, Lionel's responsiveness changed between the conditions. Specifically, Lionel previously hit random buttons on his AAC device, which sometimes resulted in the correct answer. After training, Lionel was given 3 seconds to make a correct response, but rarely did, resulting in each response being correct, but not independent, and thus did not count for the student measure.

Riya

In baseline, Riya's adherence to the implementation steps for the primary goal, identifying community signs, was highly variable with an increasing trend that remained variable, with a level between 0 and 60%. Following the initial training, Riya's implementation increased and remained stable at 100%. Riya received teacher coaching once. Following coaching, Riya maintained 100% and scored 100% in the maintenance phase.

For the generalization goal, matching or writing fractions, Riya's baseline adherence was highly variable with a level between 0 and 57%. Following the initial training, Riya's implementation increased and remained stable at 100% across the initial training phase and in maintenance.

Riya's implementation quality was variable in baseline (range of 14-93% for primary; 33-90% for generalization goal), increased after initial training (87-100% and 97-100%) and maintained at a high level during coaching and maintenance (100% for both goals).

In baseline, Oliver's responsiveness to instruction for his primary goal, identifying community signs, was an average of 82% (*SD* = 11; range = 67-100%). After his paraeducator, Riya, received training, Oliver's responsiveness to instruction score decreased to an average of 77% (*SD* = 22; range = 33-92%). Based on anecdotal notes, this variability may have been due to Riya presenting the task as written in his IEP goal. Previously, it was presented as a receptive task (i.e., select the correct card). After training, Riya presented it as a receptive task (i.e., say the name of the sign). In response to this change, Oliver communicated both verbally and nonverbally that he would not engage in the task unless it was presented the previous way. This corresponded to a decrease in correct responding. In baseline, Oliver's responsiveness for his generalization goal, identifying and writing fractions, was an average of 83% (*SD* = 15). After training, it increased to an average of 94% (*SD* = 4; range = 92-100%).

	Written Directions		Initial Training		Teacher-Delivered Coaching		Maintenance
	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range	Score
Aubrey							
Primary: Counting	80% (9)	64-87%	99% (1)	97-100%	100%	100-100%	100%
Generalization: Segmenting	73% (13)	54-87%	93% (8)	80-100%	100%	100-100%	100%
Stephanie							
Primary: Counting	81% (3)	77-87%	100% (0)	100%	-	-	100%
Generalization: Sequencing	82% (4)	73-87%	100% (0)	100%	-	-	100%
Riya							
Primary: Community signs	59% (25)	14-93%	97% (7)	87-100%	-	-	100%
Generalization: Fractions	70% (17)	33-90%	99% (2)	97-100%	-	-	100%

Note. *SD* = standard deviation

Table 5. Overall Quality of Implementation

	Written Directions		Initial Training		Teacher-Delivered Coaching		Maintenance
	Mean (*SD*)	Range	Mean (*SD*)	Range	Mean (*SD*)	Range	Score
Chloe							
Primary: Counting	55% (19)	25-75%	83% (5)	75-92%	83% (6)	75-92%	83%
Generalization: Segmenting	45% (14)	33-67%	65% (24)	25-92%	90% (4)	83-92%	83%
Lionel							
Primary: Counting	41% (18)	25-83%	51% (30)	0-67%	-	-	67%
Generalization: Sequencing	46% (16)	25-75%	49% (19)	0-67%	-	-	67%
Oliver							
Primary: Community signs	82% (11)	67-100%	77% (22)	33-92%	-	-	92%
Generalization: Fractions	82% (15)	50-92%	94% (4)	92-100%	-	-	92%

Note. SD = standard deviation

Table 6. Student Responsiveness to Instruction

Student Progress

Student progress was measured as a secondary, descriptive outcome. Intervention decisions were not made based on student data. One student, Chloe, improved on both her primary and generalization goals once her paraeducator received training to implement constant time delay. The other two students, Lionel and Oliver, did not improve when paraeducator training was introduced. Student data are displayed in Figure 3. Student responsiveness to instruction is displayed in Table 6. Below I describe my visual analysis of the percentage of correct responses data in terms of level, trend, variability, and immediacy of effect.

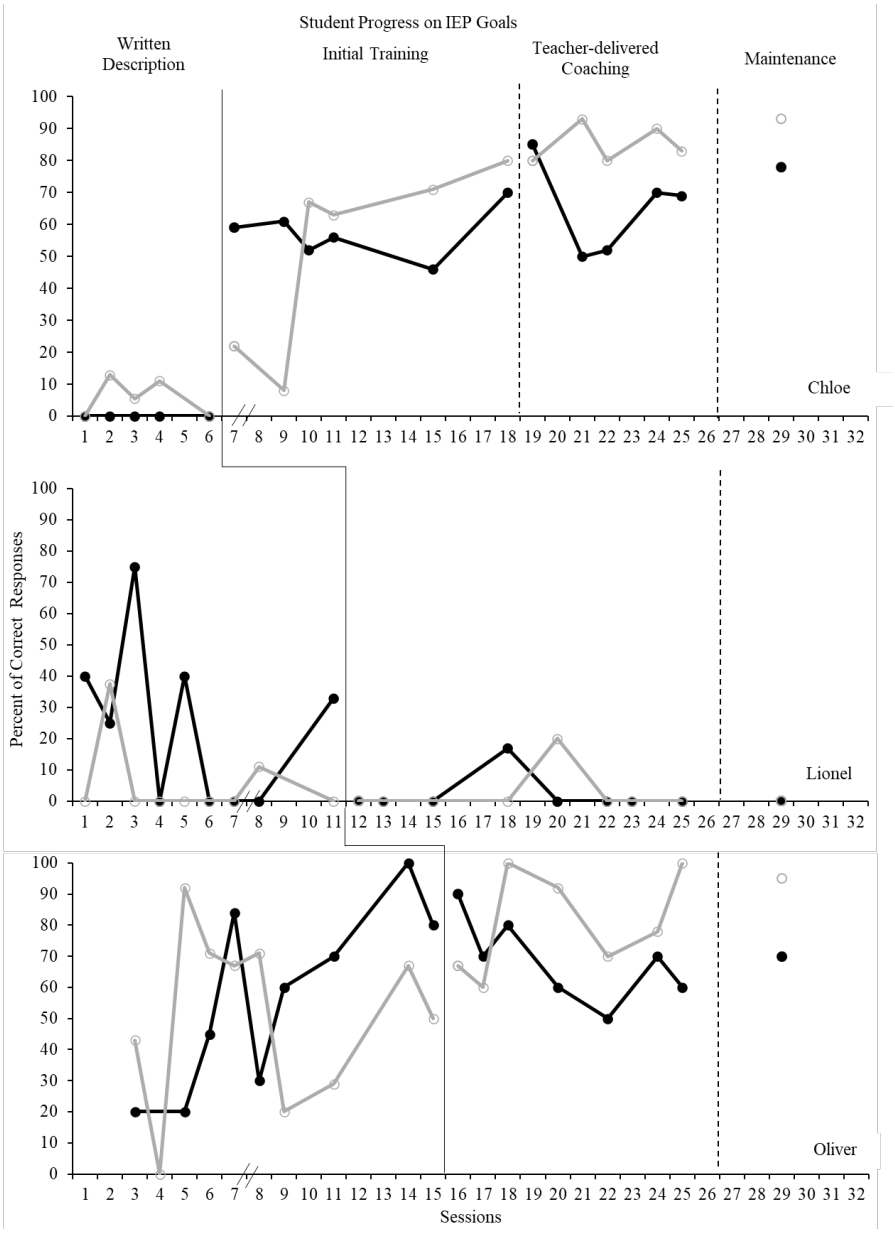
Chloe

In baseline, Chloe gave zero correct responses for counting objects and was correct for segmenting individual sounds in CVC words for an average of 6% of trials (range 0-13%). After Chloe's paraeducator Aubrey received the initial training, Chloe's percent of correct responses immediately increased for both goals, with a higher increase to 59% for her primary goal, counting, and 22% for her generalization goal. The percent of correct responses for counting and segmenting were at a higher level for the entire phase compared to baseline with an overall increasing trend. In the teacher-delivered coaching phase, Chloe's data for the primary goal were variable, but at a level higher than baseline and similar to the initial phase. Her data for the generalization goal were stable at a higher level.

Lionel

In baseline, Lionel's percent of correct responses for both goals was variable with no trend. For Lionel's primary goal, counting objects, the level was between 0 and 75% with a baseline average of 24% correct. For his generalization goal, naming the next number in a sequence, the level was lower between 0 and 37.5% with a baseline average of 5% correct.

Following the initial training, Lionel's percent of correct responses for both goals remained low at a level between 0 and 20%.



Note. Generalization goal is represented by open circles. Dashes on x-axis indicate 3-week break. Maintenance data were collected 2 weeks later.

Figure 3. Student Progress on IEP Goals

Oliver

In baseline, Oliver's percent of correct responses was highly variable for both the primary and generalization goals. For the primary goal, identifying community signs, the level was between 20 and 100%. For the generalization goal, fractions, the level was variable between 0 and 92%. Following the initial paraeducator training, Oliver's data remained highly variable at a level between 50 and 90% for identifying community signs. For Oliver's generalization IEP goal, fractions, the level was variable between 60 and 100%.

Social Validity

Survey Responses

At the end of the study, all paraeducators and teachers completed a post-intervention social validity survey. The paraeducators' survey assessed the effectiveness of the initial training. All paraeducators agreed that the initial training and teacher-delivered coaching was quite effective or very effective at helping them to implement time delay. Two paraeducators agreed that time delay was quite effective for their student, with one saying it was somewhat effective. Two paraeducators indicated that they were quite likely to use the same strategies with the same student or different students win the future, with one selecting that she was somewhat likely. All paraeducators indicated that they would be quite likely or very likely to participate in a similar training opportunity in the future.

Both teachers agreed that the training they received on how to provide coaching with performance feedback was quite effective. One teacher said she was very likely to use performance feedback again with her paraeducators. The other teacher indicated that she was quite likely. Both teachers gave answers for what they liked about the training. One teacher said it was nice that time was specifically set aside to train individually. The other said that the task

analysis was helpful. When asked how likely teachers were to recommend this kind of training to a colleague, one teacher said that she was somewhat likely, and the other said she was quite likely. Lastly, one teacher said she was very comfortable with providing feedback to her paraeducator team. The other teacher said she was quite comfortable.

Interview Responses

Brief, semi-structured interviews were conducted one-on-one with all participating paraeducators and teachers. Each interview lasted approximately 15 minutes. The purpose of these interviews was to evaluate paraeducators' and teachers' perceptions of the feasibility, acceptability, and value of the training and support that they received. Additionally, I asked participants about their unmet training needs and how the methods used in the study met those needs. I used a general inductive approach (Thomas, 2006) to analyze qualitative data. Using this approach, I identified five themes, namely, (a) lack of training opportunities, (b) collaboration and support, (c) interest in training opportunities, (d) emphasis on student learning, and (e) high social validity for training practices used in the study.

Lack of Training Opportunities. I defined "lack of training opportunities" as any expression given by paraeducators or teachers about topics, strategies, or information related to their positions that they either (a) did not receive prior to beginning their position (e.g., teacher education program) or (b) did not receive in their current position. All paraeducators shared that there was a lack of training opportunities. Each reported that at the start of their position, they received a day-long training in crisis prevention and intervention techniques. Beyond that, training was minimal. Aubrey said, "I got zero [training]." Riya shared that she never participated in any type of formal sit-down training beyond crisis intervention. Stephanie was able to shadow before she started but stated that "there really wasn't any standard training."

Shadowing was not beneficial to Stephanie because before she started working with the students she had shadowed; she was switched to a different classroom.

All paraeducators expressed disappointment with the lack of training they received. Aubrey talked about how her experience walking into school as her first day as a paraeducator was "overwhelming." She shared, "I walked in my first day – handed a schedule, handed a walkie [talkie]. That's it." Stephanie had a similar experience and said, "When I very first started, I thought there would be a lot more training, and I thought that I should have been trained better." Likely due to the lack of training opportunities, paraeducators reporting self-training or using a "trial-and-error" method. Riya said, "…we try to observe [students] on a day-to-day basis and from that we try to use our instinct of how we can tackle that student in a particular manner." Stephanie talked about how participating in training like the one used in the study was "adding tools to her trial-and-error toolbox" and that if something did not work, she had another tool to try.

Both teachers talked about the lack of training opportunities, the lack of time to meet with their paraeducator team, and the importance of collaboration. Breana shared that at the start of the school year, new paraeducators were able to spend a couple of days at school before the year started. This time was used to review the different students and their goals. However, if paraeducators are hired after the school year starts, which is typical with high paraeducator turnover rates, "training is pretty minimal." Kennedy shared that it would be beneficial to have time and a structured setting to discuss students.

Collaboration and Support. I defined this theme as time spent speaking with other educators (e.g., teachers, paraeducators) about issues with students or instruction. All paraeducators talked about collaboration and support from teachers and other paraeducators. All shared that their

classroom's intervention specialists, Breana or Kennedy, were always available when they needed help or had questions. Riya shared, "Every day you learn something, you [bring your] concern [to] somebody, [and] ask/find out how to tackle that situation." Although this support was available, paraeducators shared that they thought it would be beneficial to have a time to sit down together as a team to discuss students.

Interest in Training Opportunities. I defined "interest in training opportunities" as statements in which participants shared areas of training to pursue, given the opportunity. All paraeducators indicated a need for additional training and shared several ideas for training opportunities. Stephanie stated that it would be beneficial to receive training related to students' specific diagnoses, emphasizing that each student is different. Riya was interested in training in classroom and behavior management strategies, sharing how one of her barriers to effectively working with students was students refusing to work. She also shared how she experienced these issues in the general education classroom, which often resulted in pulling the student out of the classroom to manage the behaviors. Aubrey was interested in any type of training but said she would benefit from training that focused on strategies of instruction for students with more significant support needs, such as for students who are non-verbal.

Kennedy also expressed interest in additional training related to the training she received in the study. She shared how teacher education programs do not typically provide training in managing other adults in the classroom. She said, "I think that it would be helpful to have some sort of training on how to present information to aides and provide feedback."

Emphasis on Student Learning. All responses that referred to the impact of instruction or training on improvements or changes in student outcomes or responding were coded as "emphasis on student learning." Paraeducators spoke about the importance of their work in

relation to student learning. When asked about her favorite part of the training, Aubrey said, "I love seeing the difference in Chloe." Riya said about the training, "…it's really good that you got to know your student *better* and we can bring their potential out…those small tips really help us to bring strength out of students." Stephanie shared that the constant time delay strategy that she learned helped Lionel. She said, "I do think that it worked, that it helped him."

This desire to improve student outcomes was closely tied to training. Aubrey shared, "I want to do something that makes a difference, so I would love all the training anyone can give me." Riya stated that the feedback part of training was helpful to improve her work with kids. She said, "I was also ready to listen to the negative feedback so I can improve myself. And it's more beneficial for the kids, too."

High Feasibility of Training Interventions. I defined "high feasibility" as any positive statement that indicated the ease of use of the intervention procedures, their value, and their acceptability. All participants reported that the intervention procedures were feasible. Participants identified several specific components that contributed to this. Stephanie shared that she liked how the training was "short and sweet." She said, "It's not like it consumed half my morning, which can be hard if you're doing stuff like this." When asked how the training fit into her current classroom, she shared, "I think it's feasible…I think any new strategy that you can bring in to help any of these kiddos is always welcome as a [paraeducator.]" Stephanie also shared that the training "rolled into our routine." One teacher, Breana, said she believed it was feasible to hold short meetings with paraeducators in the future to give feedback. The other teacher, Kennedy, also agreed that the short time required to provide feedback was feasible.

All paraeducators also shared that they enjoyed the opportunity to receive feedback from their classroom teacher. One paraeducator, Aubrey, received feedback from her classroom

teacher twice after her implementation fidelity of the generalization target fell below the target criteria. Because of this, her feedback focused on steps of the time delay procedure that she was not implementing with fidelity. She said that "just getting feedback" was beneficial and "then implementing it the next time and seeing – you know – that it works." Stephanie and Riya received feedback once and that feedback was focused on their correct implementation only. There was high social validity for this type of feedback as well. Riya shared, "I liked that you took the videos. Sometimes though even when I'm working with the students, sometimes I don't recognize where I'm making mistakes. So, when you took the video…and I got feedback from [Breana], that was really wonderful." Stephanie said, "It was nice…to hear her say that she can see that it's working, or that I'm doing it correctly, or that I'm able to take knowledge from everybody…and apply it to her kids…and see that they'll work."

The teachers also reported that they enjoyed the opportunity to sit down with their paraeducators and give feedback. Breana shared, "I don't normally get to sit down and do anything with the [paraeducators]. Ever. So like it was nice." Kennedy agreed. She said, "I liked that there was a specific time set aside…to provide specific feedback to a chunk of instruction."

Lastly, all participants indicated that they would continue to use the strategies they learned in the study. All three paraeducators said that they would continue to use time delay with both the student in the study and with other students. Riya shared, "Lately, we are using the tips which you gave to us and that's been really helpful." Stephanie said, "I'll use parts of it going forward for sure with him on different things." Teachers shared that they would continue to use feedback. Kennedy discussed that she would mark out some time in the future to provide feedback to her paraeducators.

Discussion

Teaching students with significant disabilities requires a specialized skillset to address their complex needs. This study trained paraeducators to use constant time delay and generalize their implementation to untrained student goals. Findings showed that following the initial training, all paraeducators increased their implementation from baseline. Additionally, all paraeducators generalized their implementation. One paraeducator needed teacher-delivered coaching to reach 100% adherence to the implementation steps for her generalization goal. Lastly, there was high social validity for the training intervention. This study has quantitative and qualitative findings that move the field forward in a variety of ways.

First, following the initial training, all paraeducators implemented constant time delay with high adherence to the implementation steps for the primary student goal. This training used oral instruction, modeling, rehearsal, performance feedback, and included multiple examples of time delay procedures. These findings extend the results of previous studies that used similar training packages (e.g., Brock et al., 2021) and provide initial insight on how to promote generalization. All participants acquired high levels of implementation fidelity for the primary student goal without needing additional support. Only one participant, Aubrey, needed coaching to reach high fidelity for the generalization goal. This suggests that a tiered intervention in which only paraeducators who do not generalize receive feedback may be effective. A tiered intervention may be more feasible in practice as only paraeducators who need additional support receive coaching.

Second, this study provides initial insight and evidence for strategies that promote generalization of paraeducator training outcomes. The initial training paraeducators received used one generalization strategy described by Stokes and Baer (1977): multiple exemplar training. During training, paraeducators were shown multiple examples of how to use time delay

and were given the opportunity to practice time delay across curriculum areas. These examples used both chained and discrete skills and addressed skills across curriculum areas, such as mathematics and reading. The findings of this study suggest that adding multiple exemplar training to a high-quality training may help paraeducators to generalize across student goals. Multiple exemplar training may enable generalization because trainees may not realize how a practice can be applied across different contexts. Additionally this multiple exemplar training component did not increase the amount of time needed to train paraeducators; each training was less than 30 minutes. However, it is unclear if these training strategies would promote other types of generalization. This study only measured generalization to novel student targets. Generalization to new settings or to new students may present different demands and more support may be needed to support generalization. Because paraeducators often work with multiple students across settings and grade levels, it is important to consider all types of generalization (Wiggs et al., 2021).

Third, for one student participant, increased paraeducator implementation fidelity corresponded to increased correct student responding. For Chloe, increased paraeducator implementation fidelity of constant time delay increased her correct responding for both IEP goals. For Lionel and Oliver, outcomes were not as clear. This may be due to several factors. First, prior to the start of the study, paraeducators were not regularly implementing instruction on these skills with students. Simply implementing the same task with intentionality multiple times a week may have had an impact on student responding. Second, a practice's classification as evidence-based does not guarantee that it is an appropriate practice for every student (Cook et al., 2020). A different practice may have been more appropriate for students in the study. For students with more severe disabilities, such as Lionel, more time may have been needed to show

improvement in student responding. Toward the end of the study, both the research team and Lionel's paraeducator, Stephanie, noted that Lionel needed less intrusive prompting to get the correct answer. At the start of the intervention, Stephanie guided Lionel's hand. At the end of the study, guiding him lightly at the elbow was sufficient. For other students like Oliver, constant time delay may not have been appropriate.

Fourth, paraeducators were highly motivated to positively impact their student's learning and they highly valued the training and coaching. Although paraeducators provided positive feedback about training in the current study, it is important to note that they had very little experience prior to training. Therefore, they likely would have expressed value and appreciation for *any* training that was practically useful. Numerous studies have shown that with training, paraeducators can increase their implementation fidelity across a wide range of evidence-based practices (Brock & Anderson, 2021). Additionally, training paraeducators may be particularly important as it helps them to feel valued and appreciated (Giangreco et al., 2001).

Fifth, teachers expressed enthusiasm about the coaching process, indicating that it greatly varied from the typical support they provided to paraeducators. Both teachers expressed that they had not been previously prepared to provide coaching. This finding is consistent with calls for increasing teacher training in the supervision and management of paraeducators (Douglas et al., 2019). This study also confirms that despite coaching being an evidence-based practice shown to improve paraeducator implementation (Fallon et al., 2015), the individuals most naturally situated to provide it—teachers—are not doing it and are uncomfortable doing it. This study showed, however, that with support through a brief training, teachers can successfully use coaching to improve and maintain paraeducator implementation fidelity. These findings also show that teachers were receptive to this type of support.

Implications for Practice

Findings from this study have implications for practice. First, administrators and teachers can effectively train paraeducators to implement and generalize constant time delay using a brief training with oral instruction, modeling, role play, performance feedback and multiple exemplars. Second, teacher-delivered coaching can be used to support paraeducators who may not generalize to new student goals. Third, these interventions had high social validity. Both teachers and paraeducators agreed that the training provided in the study was feasible and that they would participate again. Fourth, researchers should continue to link improvement in paraeducator implementation fidelity to improvement in student outcomes. All paraeducators in this study indicated that this was an important piece of training and this, along with teacher-delivered coaching with performance feedback, may serve as reinforcement for high implementation fidelity.

Limitations and Future Directions for Research

Limitations to this study suggest avenues for future research. First, this study only examined one type of generalization: generalization to untrained student goals. There are many other types of generalization and teaching in special education requires that educators generalize across students and settings. Future research should explore strategies that promote additional types of generalization. Second, coaching with performance feedback was introduced after paraeducators received an initial training, and all paraeducators made substantial progress prior to coaching. Therefore, we cannot draw strong conclusions about the effects of teacher-delivered coaching from this study. Third, mixed results for student outcomes show that the time delay intervention as designed may have not been a good match for all students. In the future, researchers might design training and feedback to include opportunities to adapt and change the

intervention based on student performance. For example, researchers may train paraeducators to collect data and make changes based on that data. Fourth, given that the paraeducators all worked at the same school, both quantitative and qualitative findings likely cannot necessarily be generalized to all paraeducators. Future studies should explore the experiences of other paraeducators and students, including paraeducators and students from diverse populations. Lastly, a second coder did not review the themes identified from the qualitative data for consensus. Future studies should include consensus for codes.

Conclusion

In this study, I found that a combination of brief initial and teacher-delivered coaching enables paraeducators to acquire implementation fidelity of constant time delay, and to generalize their implementation to a new instructional goal. Very few paraeducator training studies focus on generalization of implementation, and results from this study suggest that training multiple exemplars might be one effective means to do so. All participants in the study found the training interventions to be feasible, enjoyed the opportunity to give and receive feedback, and shared that training helped to improve student outcomes. These findings contribute to the dearth of research on training paraeducators to generalize and provides promising evidence for strategies that are both socially valid and promote generalization of implementation fidelity.

Chapter 4. Research Paper

In this chapter, I provide the results of a secondary data analysis of data from the National Teacher and Principal Survey. Specifically, I examine professional development opportunities available to teachers in the United States during the 2017-2018 school year. This paper includes an introduction, detailed description of the methods, a description of the results, and a discussion of findings.

Abstract

In order to improve future professional development for teachers, it is crucial to understand the current nature of professional development that they typically receive. In this secondary analysis of data from the National Teacher and Principal Survey, I describe intensity and types of professional development received by 41,380 teachers who are representative of teachers across the United States. The most common topics of professional development were using technology to support instruction and differentiated instruction for all learners. Nearly two-thirds of teachers reported rarely or never participating in coaching or mentoring. There were small differences in professional development activities between special and general educators, with general educators co-planning more frequently and special educators consulting more often with other teachers about individual students. There were statistically significant differences in participation based on both years of teaching experience and the racial diversity of schools, but the magnitude of these differences does not seem to be practically significant.

How Much and What Kinds of Professional Development are Offered to Teachers? Results from a Nationally Representative Survey

More and more teachers are leaving the profession each year. Half of general and special education teachers quit within their first five years of teaching (Sims & Jerrim, 2020), and one in four special education teachers leave their position each year (McLeskey & Billingsley, 2008; Thornton et al., 2007). Teacher attrition—or teachers leaving the profession before the age of retirement—is one of the leading causes of the teacher shortage in the United States (den Brok et al., 2017). Indeed, there are not enough teachers to meet the needs of public schools in the United States. At the start of the 2022-2023 school year, more than half of public schools reported that they were understaffed. Additionally, over 50% of schools reported that it would be very difficult to fill special education positions and 22% said it would be very difficult to fill general education positions (Institute of Education Statistics, 2023).

Teacher attrition not only amplifies on-going teacher shortages in high-needs schools, but it is also detrimental to student outcomes. Ronfeldt and colleagues (2013) found that high teacher turnover significantly and negatively impacted student achievement in math and English language arts. Turnover was particularly harmful to students in schools with large populations of low-performing students and Black students compared to schools with fewer of these students. Teacher attrition rates are higher in schools that serve more students of color and students living poverty (Carver-Thomas & Darling-Hammond, 2017; Conley & You, 2017), putting these students at increased risk.

Although there are many factors that contribute to teacher attrition, one of the leading causes is burnout (Emery and Vandenberg, 2010). Burnout is characterized by three components: high levels of emotional exhaustion, depersonalization, and low levels of personal

accomplishment (Maslach, 2017) and is the result of prolonged exposure to job-related stress (Emery & Vandenberg, 2010). One source of burnout is lack of support for teachers through induction, collaboration, and professional development (Helou et al., 2016).

It is now more important than ever to take steps to retain teachers, and offering effective and supportive professional development is one way to do so. Professional development is defined as "facilitated teaching and learning experiences that are transactional and designed to support the acquisition of professional knowledge, skills, and dispositions as well as the application of this knowledge and practice" (National Professional Development Center on Inclusion, 2008, p. 3).

Professional development has been identified as a helpful way to reduce burnout across multiple studies (see Billingsley & Bettini, 2019 for a review). For example, teachers who stayed in the teaching profession valued professional development on behavior management, conference attendance, and meetings with other new teachers more than teachers who decided to leave (Gehrke & McCoy, 2007). In a study that examined the needs of special education teachers, Hagaman and Casey (2018) found that teachers listed specialized training as an area of need, with some stating that this training may have alleviated stress. Additionally, professional development may help to increase teachers' self-efficacy, which may increase their job satisfaction and thus improve teacher retention (Renbarger & Davis, 2019).

However, current professional development practices may not be meeting the needs of teachers. Teachers report professional development needs in the following areas: classroom management, collaboration between general and special education professionals, low incidence disabilities, and technology (Berry et al., 2011; Stough et al., 2015). Further, a lack of professional development and training in these areas may also contribute to teacher burnout.

Alvarez (2007) found that a lack of classroom management training increased teacher stress. Gilmour and Wehby (2020) found that general education teachers who taught students with disabilities, but had no background in special education, left the profession at higher rates. Therefore, providing professional development in these areas and others may help decrease teacher burnout and prevent teacher attrition.

It may be particularly important to provide relevant professional development to special educators who are at higher risk for attrition and in most need of support on specialized topics. For example, Gilmour and Wehby (2020) found that teachers certified in special education were 22% more likely to leave the profession. Differences in attrition can also be contributed to student population. Teachers who only taught students with emotional and behavioral disorders (EBD) were 4.37 times more likely to leave compared to 1.66 times for those with no students with EBD (Gilmour & Wehby, 2020). Special education teachers may also be more likely to leave the profession due to increasing caseloads and a lack of support from administration (Billingsley & Bettini, 2019). Due to the unique challenges of teaching students with disabilities, special education teachers have different professional development needs. For example, students with disabilities often require specialized instruction delivered via evidence-based practices. However, special education teachers report that they are not confident implementing evidence-based practices (Brock et al., 2014). Further, Morrier et al. (2011) found that less than 15% of teachers received training in their university teacher preparation programs on strategies to instruct students on the autism spectrum. Special education teachers, therefore, should receive professional development related to the unique instructional needs of the students they teach.

One type of professional development that may reduce burnout and support teachers is mentoring and coaching. Effective mentoring includes support provided by a mentor teacher who

teaches the same subject area and provides regular opportunities for collaboration and planning. Mentoring can be further enhanced with coaching, which includes one-to-one observation of teaching in the classroom (Sutcher et al., 2019). Lopez-Estrada and Koyama (2010) found that mentoring was one of the key pieces to retaining Mexican-American special education teachers. Similarly, others found that new teachers who received mentoring were less likely to leave the profession than those who did not (Nguyen & Springer, 2021).

Some teachers may benefit more from mentoring and coaching than others. Half of teachers leave the profession in the first five years of teaching (Sims & Jerrin, 2020). Providing new teachers with more support through coaching and mentoring may prevent attrition. Many teachers report high levels of stress in the first year of teaching. A mentor may help reduce that stress by helping to solve problems under the guidance of an experienced colleague (Sutcher et al., 2019). Additionally, teachers who work in schools that serve more students of color and students living in poverty may benefit from mentoring and coaching. Teachers in these schools are at higher risk of attrition. Teacher attrition was 50% higher in Title 1 schools compared to non-Title 1 schools and attrition was 70% higher for teachers who worked in schools with a higher percentage of students of color (Carver-Thomas & Darling-Hammond, 2017). Professional development for these teachers, therefore, is particularly important.

Given that lack of professional development is one cause of burnout, a better understanding of the nature of the professional development that teachers typically receive—and how it could be improved—is critically important. Surprisingly, the current research literature does not provide a clear picture of the type and intensity of professional development that teachers typically receive. For example, scholars often report anecdotally that best practice professional development tools such as coaching are rarely used in everyday practice (Lekwa &

Reddy, 2021), but the degree to which coaching is actually used across a representative sample of teachers has not been described in the literature. Furthermore, it is unclear whether increased rates of attrition for special educators may be linked to a lack of professional development that is well-aligned with teaching students with disabilities. In addition, it is established that teachers who serve students who are diverse or live in poverty are at increased risk of attrition, but it is unclear if the professional development these teachers receive is similar to other teachers. That is, it is unclear if these teachers are more likely to receive a lack of relevant professional development that may exacerbate the likelihood that they will leave the profession. Better understanding the nature of the professional development that teachers typically receive is the first step to inform how to improve professional development and thus retain more teachers.

The purpose of this study is to address these gaps in the literature by (1) providing a clear picture of the nature of professional development that teachers typically receive; and (2) testing factors that might impact differences in professional development opportunities. I hypothesize that the hours and frequency of professional development vary by a teacher's main assignment (i.e., general or special education teacher), teacher years of experience, and the percentage of non-White students in the school. I selected these covariates for several reasons. First, I hypothesized that there are differences between special and general education teachers due to their different professional development needs. Second, since coaching is a promising strategy to retain new teachers, I hypothesized that teachers with more years of experience would receive less coaching. Lastly, I included the percentage of non-White students because previous research indicates that the teacher shortage is especially prevalent in schools that serve more students of color (Carver-Thomas & Darling-Hammond, 2017). Specifically, I addressed the following research questions:

1. What types of professional development opportunities are offered to educators? How do professional development opportunities differ between general and special educators?
2. To what extent do teacher and school factors explain differences in the number of hours of professional development that teachers received?

Method

Data Sources

National Teacher and Principal Survey

Data analyzed came from this study came from the 2017-2018 National Teacher and Principal Survey (NTPS). These data are restricted and managed by the National Center for Education Statistics (NCES) and the analyses described in this study were conducted under a restricted-data license. The NTPS, a redesign of the School and Staffing Survey (SASS), is a national survey administered to school personnel across public and private elementary and secondary schools in the United States. The NTPS is a series of related questionnaires that provide descriptive data and statistics (Cox et al., 2022). Data are collected on core topics including school characteristics, teacher demographics, and teacher education and preparation. Each administration of the NTPS includes a different module. The 2017-2018 questionnaire module focused on professional development. For the present analysis, I used the Teacher Questionnaire. Teachers completed the questionnaires during the 2017-2018 school year via several methods including mail-based forms, Internet reporting, and telephone and in-person field follow-up (Cox et al., 2022).

Sample

The sample included responses from 41,380 public school teachers across the United States. Teachers at private schools were not included in this data set. The NTPS does not

randomly sample schools, but instead uses a systematic probability proportionate to size (PPS) sample. A PPS algorithm was used to systematically sample schools (Cox et al., 2022). Teachers were sampled if they worked at a school that was selected for the NTPS sample. The NTPS defined teachers as any staff who taught regularly scheduled classes to students in grades K-12 or comparable ungraded levels. The response rate for public school teachers was 79.8%.

In the sample, 10,790 teachers were male (26%) and 30,590 (74%) were female. The average number of school years taught was 13.5 years (*SD* = 9.25) with a median of 12 years and a range of 1 to 62 years. For highest degree earned, teachers had a master's degree (*n* = 19,990; 48%), bachelor's degree (*n* = 16,870; 41%), an education specialist or certificate of advanced graduate studies (*n* = 2,910; 7%), an associate degree or no degree (*n* = 1,130; 3%), or a doctorate or professional degree (*n* = 480; 1%). Teachers reported that they held a regular or standard state certificate or advanced professional certificate (*n* = 37,010; 89%); a temporary of provisional certificate that required additional coursework, student teaching, or passing an exam (*n* = 1,740; 4%); a probationary certificate that was issued after satisfying all the requirements except the completion of a probationary period (*n* = 1,330; 3%); a waiver or emergency certificate that was issued to persons who must complete a certification program to continue teaching (*n* = 460; 1%). In this sample, 840 (2%) reported that they did not hold any certifications in the state where they worked, although they may have held a teaching certification in a different state. See Table 7 for a breakdown of each variable by general and special education teachers.

School locale was also collected for each teacher's school. The National Center for Education Statistics (NCES; Geverdt, 2019) classifies school locales under four categories (i.e., city, suburban, town, and rural), each with three subtypes, for a total of 12 distinct categories.

Variable	General Education	Special Education	Total	Total Percent
Gender				
Male	9,910	880	10,790	26%
Female	26,620	3,970	30,590	74%
Highest Degree Earned				
Associate or no degree	1,030	100	1,130	3%
Bachelor's degree	15,230	1,640	16,870	41%
Master's degree	17,480	2,510	19,990	48%
Education specialist/advanced	2,350	560	2,910	7%
Doctorate or professional degree	440	40	480	1%
State Certification Held				
Regular or standard	32,760	4,250	37,010	89%
Temporary or provisional	1,150	190	1,330	3%
Probationary	1,480	260	1,740	4%
Waiver or emergency	390	70	460	1%
No certificate	760	80	840	2%
Region				
Northeast	6,710	1,160	7,880	19%
Midwest	7,860	1,150	9,000	22%
South	13,370	1,530	14,900	36%
West	8,590	1,010	6,900	17%

Source: National Teacher and Principal Survey (NTPS), Winter 2023.

Table 7. Teacher Demographics

The classifications use standard urban and rural designations defined by the United States Census Bureau. Of the schools sampled, 12,700 (31%) were classified as city; 14,000 (34%) as suburban; 5,750 (14%) as town; and 8,930 (22%) as rural. See Table 8 for a definition of each.

Teacher Questionnaire

Each iteration of the Teacher Questionnaire consists of a core module and a subject module. The core module included questions about teachers' general employment and background information, including demographics, professional experience and teacher preparation, class organization, education and training, and certification. The 2017-2018 subject module focused on teacher evaluation, teacher professional development, and teacher engagement (Cox et al., 2022). My analysis focused primarily responses from questions 6-1 and 6-2. Both were related to teacher professional development.

Variables

Frequency of Participation in Professional Development Activities

Question 6-1 on the Teacher Questionnaire asked teachers to indicate the frequency of participation in eight professional development activities during the past 12 months. These eight activities included planning lessons or courses with other teachers, consulting with other teachers about individual students, collaborating with other teachers on issues of instruction excluding administrative meetings, acting as a coach or mentor to other teachers or staff, receiving coaching or mentoring from other teachers or staff, participating in online or web-based professional development, participating in a workshop, and attending a conference. For each professional development activity, teachers were asked to indicate if they (a) did not participate, (b) participated once or a few times a year, (c) participated once or a few times a month, or (d) once or a few times a week.

Hours of Professional Development by Topic

Question 6-2 asked teachers to indicate how many hours they participated eight topics of professional development during the past 12 months. These eight topics of professional development included professional development directly related to your teaching assignment; using technology to support instruction; science, technology, engineering, or mathematics (STEM), or incorporating STEM into other subjects; professional development on classroom and behavior management; instructional strategies to teach students with disabilities or IEPs; differentiated instruction for all students; preparing students to take annual assessments; and analyzing and interpreting student achievement data. For each professional development topic, teachers were asked to indicate if they (a) did not participate, (b) participated for 8 hours or less, (c) 9 to 16 hours, (d) 17 to 32 hours, and (e) 33 hours or more.

	Description
Rural	*n* = 12,700
Fringe	Less than or equal to five miles from an urbanized area, as well as rural territory that is less than or equal to 2.5 miles from an urban cluster
Distant	More than five miles but less than or equal to 25 miles from an urbanized area, as well as a rural territory that is more than 2.5 miles but less than or equal to 10 miles from an urban cluster
Remote	More than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster
Town	*n* = 14,000
Fringe	More than 25 miles from an urbanized area and is also more than 10 miles from an urban cluster
Distant	Inside an urban cluster that is more than 10 miles and less than or equal to 35 miles from an urbanized area
Remote	Inside an urban cluster that is more than 35 miles from an urbanized area
Suburban	*n* = 5,750
Large	Outside a principal city and inside an urbanized area with a population of 250,000 or more
Midsize	Outside a principal city and inside an urbanized area with a population less than 250,000 and greater than or equal to 100,000
Small	Outside a principal city and inside an urbanized area with a population less than 100,000
City	*n* = 8,930
Large	Inside an urbanized area and inside a principal city with a population of 250,000 or more
Midsize	Inside an urbanized area and inside a principal city with a population less than 250,000 and greater than or equal to 100,000
Small	Inside an urbanized area and inside a principal city with a population less than 100,000

Source: National Teacher and Principal Survey (NTPS), Winter 2023.

Table 8. National Center for Educational Statistics (NCES) School Locale Classifications

Potential Predictors of Professional Development Opportunities

Teacher Factors. Two teacher-related variables were used. The first was the teacher's main teaching assignment as either a general education teacher or a special education teacher. I calculated whether a teacher was a general education or special education teacher based on what they listed as their main assignment. If teachers reported that they were special education teachers, I coded them as special education teachers. If teachers reported any other assignment (e.g., general education elementary, social sciences, foreign language), I coded them as general education teachers. Based on this, the sample contained 36,530 general education teachers and 4,850 special education teachers. See Table 9 for a breakdown of teachers' main assignments.

Category	*N*	Percent
Early childhood or general education elementary	12,470	30.1%
Special education	4,850	11.7%
Arts or music	2,440	5.9%
English or language arts	5,020	12.1%
ESL or bilingual education	590	1.4%
Foreign language	1,190	2.9%
Health education	1,990	4.8%
Math	3,940	9.5%
Natural sciences	3,270	7.9%
Social sciences	3,030	7.3%
Career or technical education	1,950	4.7%
All other	640	1.5%

Source: National Teacher and Principal Survey (NTPS), Winter 2023.

Table 9. General Field of Main Teaching Assignment

The second teacher variable was years of experience. This was a continuous variable. The number of school years taught was reported by survey respondents as a continuous variable. Respondents were asked to report the number of years worked full-time or part-time as K-12 or comparable ungraded level teacher in a public, public charter, or private school, excluding time on maternity/paternity leave or sabbatical. The average school years taught was 13.5 (SD = 9.25; range 1-62).

School-Level Factors. One school-level factor, the estimated percentage of non-White students in the school, was used. This variable was included in the dataset and was based on the percentages that each school reported in the 2014-2015 Common Core of Data nonfiscal school universe file (NCES, 2020). Non-White students were defined as students who were not one or more of the following: Asian, Hispanic, or Black. The average percentage of non-White students in schools in the sample was 47.45% (*SD* = 31.68).

Data Analysis

All analyses were completed using SPSS. To answer the first research question, I conducted a descriptive analysis using the crosstabs function in SPSS. I obtained the total number of general education teachers, special education teachers, and both types combined who responded in each category. I reported these as a percent in each response category. I also conducted a Chi-square difference test for each professional development activity to determine if there was difference between professional development opportunities for general and special education teachers. To do this, I compared teachers who had received any professional development under each category to those who had not participated.

To answer the second and third research questions, I conducted a multinomial logistic regression analysis. This method was used due to the outcome variables being categorical (i.e., did not participate, 8 hours or less, 9-16 hours, etc.). I ran separate analyses for each of the two outcome variables: hours of professional development directly related to assignment and teachers receiving coaching or mentoring. I built a series of models, adding additional predictors to each ascending model. The first model examined if a teacher's main assignment to general or special education had an effect on professional development opportunities. For the second model, I added teacher years of experience as a predictor, and for the third model, I added the percentage

of non-White students in the school. The comparison category for each regression was the "did not participate" category.

Results

Normality Tests

I examined the skewness and kurtosis for all continuous variables. The skewness for school locale was .406 (*SE* = .012), with a kurtosis of -1.187 (*SE* = .024). For the estimated percentage of non-White students, the skewness was .282 (*SE* = .012) with a kurtosis of -1.270 (*SE* = .024). For the number of school years taught, the skewness was .713 (*SE* = .012) and the kurtosis was -.009 (*SE* = .024). Based on this, I concluded that variables fell within normal distributions.

Missing Data

There were 41,380 participants in this sample. There were no missing data for the teacher main assignment variable, the school locale variable, or the years of teaching experience variable. The only variable with missing data was the percentage of non-White students in the survey respondent's school. The percent of missing data for this variable was 1.9%. Although there is no consensus on the acceptable percentage of missing data, a missing rate of 5% or less is generally considered to be inconsequential (Schaefer, 1999). I conducted Little's missing completely at random (MCAR) test, which was non-significant, indicating that data are likely missing completely at random ($\chi^2 = .495$, $p > .05$). Pairwise deletion was used due to the relatively low rate of missing data.

Frequency of Participation in Professional Development Activities

Table 10 displays the percent of general and special education teachers who reported participation in each professional development activity in the past 12 months. Most teachers in

the sample reported weekly participation in three activities: planning lessons or courses with other teachers, consulting with other teachers about individual students, and collaborating with other teachers on issues of instruction. Nearly two-thirds of teachers—both general and special education—rarely or never participated in coaching in the past year. Over half (62% and 60%, respectively) of teachers reported that they had participated in a workshop once or a few times a year. About half (54% and 52%, respectively) of teachers reported that they had attended a conference once or a few times in the past year.

Results of the Chi-square difference tests show that there are differences between general and special education teachers who reported any participation in these activities (i.e., once or a few times/year, once or a few times/month, or once or a few times/week) and those who did not (i.e., answered "did not participate). Three percent more general educators reported co-planning ($\chi^2 = 45.530$, $p < .001$), 1% more special educators reported consulting ($\chi^2 = 6.055$, $p < .05$), and 7% more special educators reported participating in online or web-based professional development ($\chi^2 = 85.885$, $p < .001$).

Number of Hours of Professional Development

Table 11 displays the percent of general and special education teachers who reported the hours of professional development they received in the past 12 months across each category. Most teachers (i.e., 94% of general education and 95% of special education teachers) reported that they received at least one hour of professional development directly related to their teaching assignment. Most general education teachers (i.e., 27%) reported 8 hours or less and most special education teachers (i.e., 30%) reported 9-16 hours. A little more than half of both general and special education teachers (i.e., 53% and 54%, respectively) received professional development related to using technology to support instruction. Most teachers reported that they had not

participated in professional development related to teaching or incorporating STEM (i.e., 49% and 58%), and close to a third received 8 hours or less (i.e., 31% and 29%). About half of teachers received 8 hours or less of professional development related to classroom and management, with 34% of general education and 25% of special education teachers not receiving this training. 40% of general education teachers did not participate in professional development regarding instructional strategies to teach students with disabilities or IEPs, but 46% had received 8 hours or less. 51% of general education teachers and 44% of special education teachers received 8 or less hours of professional development related to differentiated instruction for all students. About half of teachers (i.e., 46% and 49%; 50% and 48%, respectively) received 8 or less hours of training to prepare students to take annual assessments and for analyzing and interpreting student achievement data. Overall, most teachers reported that they received 8 hours or less of professional development across all categories. In most categories, 5% or less of teachers reported receiving more than 33 hours of professional development.

Results of the Chi-square difference tests show that there are differences between general and special education teachers who reported any participation in these activities (i.e., 8 hours or less, 9-16 hours, 17-32 hours, and 33 hours or more) and those who did not (i.e., answered "did not participate). There was a significant difference between general and special education teachers in the number of hours of professional development for all topics (i.e., $p < .05$; see Table 5 for values), except for analyzing and interpreting student achievement data (i.e., $p > .05$). Three percent more general educators reported co-planning ($\chi^2 = 45.530$, $p < .001$), 1% more special educators reported consulting ($\chi^2 = 6.055$, $p < .05$), and 7% more special educators reported participating in online or web-based professional development ($\chi^2 = 85.885$, $p < .001$). One percent more of general educators reported receiving professional development directly

Questionnaire item	χ^2	Did not participate		Once or a few times/year		Once or a few times/month		Once or a few times/week	
		Gen.	Sped.	Gen.	Sped.	Gen.	Sped.	Gen.	Sped.
Planned lessons or courses with other teachers	45.530***	9%	12%	25%	25%	27%	30%	40%	34%
Consulted with other teachers about individual students	6.055*	2%	1%	9%	5%	29%	17%	61%	77%
Collaborated with other teachers on issues of instruction	1.608	4%	4%	15%	12%	37%	36%	45%	48%
Acted as coach or mentor to other teachers or staff	.000	37%	37%	22%	21%	22%	22%	19%	20%
Received coaching or mentoring from other teachers or staff	1.741	32%	31%	29%	29%	25%	26%	14%	14%
Participated in online or web-based professional development	85.885***	34%	27%	45%	49%	15%	17%	6%	6%
Participated in a workshop	.375	8%	8%	62%	60%	24%	26%	5%	6%
Attended a conference	.144	36%	36%	54%	52%	6%	8%	3%	4%

Note. Total n = 41,380; general education teachers (Gen.) n = 36,530; special education teachers (Sped.) n = 4,850* $p < .05$; ** $p < .01$; ***$p < .001$

Source: National Teacher and Principal Survey (NTPS), Winter 2023.

Table 10. Frequency of Participation in Professional Development Activities in the Past 12 Month

related to their teaching assignment, 2% more reported professional development related to using technology to support instruction (i.e., 88% vs. 86%), and 9% reported more reported teaching STEM. 11% more of special educators reported receiving professional development focused on classroom and behavior management, 27% more reported participating in training related to instructional strategies focused on teaching students with disabilities, 5% more received training in differentiated instruction and in preparing students to take annual assessments (i.e., 68% vs. 63%).

Hours of Professional Development Directly Related to Assignment

Table 12 displays three nested multinomial logistic regression models of the number of hours of professional development directly related to teaching assignment. Model 1 adds effects for type of teacher (general vs. special education). Model 2 adds effects for teacher years of experience. Model 3 adds effects for the percentage of non-White students in the school. Table 6 shows model fit estimates and comparison tests of models using log likelihood values.

Model 1 adds the effect teachers' main teaching assignment in general or special education. All comparisons are reported using odds ratios and the percent change. Odds ratios (OR) represent the odds of being in a particular outcome category compared to the odds of not being in that category. In all examples in this analysis, the odds ratio represents the odds of participating for a number of hours compared to the base category. In this analysis the base category is "did not participate." Therefore, these interpretations focus on the odds of participating in a certain number of hours compared to those who did not participate. An odds ratio close to one indicates that there are no differences in groups between categories. Percent change is also reported. I calculated percent change using the following formula: $(e^{\beta i} - 1) * 100$,

where $e^{\beta i}$ represents the odds ratio. Percent change is similar to the odds ratio and represents the odds of being in one category.

All variables in all models are interpreted while controlling for other variables in the model. Compared to special education teachers, general education teachers are 34% less likely to participate in 8 hours or less of professional development directly related to assignment compared to those who did not participate (*OR* = .656, *p* <.001). The results for the other response categories (i.e., 9-16 hours, 17-32 hours, and 33 or more hours) are similar to the results for the 8 hours or less response. Compared to special education teachers, general education teachers are 40.6% less likely to receive 9-16 hours (*OR* = .594, *p* < .001), 31.8% less likely to receive 17-32 hours (*OR* = .682, *p* < .001), and 16.7% less likely to receive 33 hours or more (*OR* = .833, *p* < .05) compared to those who did not participate.

Model 2 adds the effect for teacher years of experience. All variables in all models are interpreted while controlling for other variables in the model. Based on model fit indices, Model 2 is a better fitting model than Model 1 (χ^2 = 4111.086, *p* < .05). Across all four response categories, the results are similar to Model 1 for main teaching assignment in general or special education (i.e., general education teachers are slightly less likely to participate). There are no statistically different results for school years taught, with the exception of participating in 33 hours of more of professional development directly related to assignment. Compared to teachers with no experience, for each additional year of experience, teachers are 0.8% less likely to participate in 33 hours of professional development compared to those who did not participate (*OR* = .992, *p* < .05). It should be noted that although statistically significant, the percent change is small.

		Did not participate		8 hours or less		9-16 hours		17-32 hours		33 hours or more	
Questionnaire item	χ^2	Gen.	Sped.	Gen.	Sped.	Gen.	Sped.	Gen.	Sped	Gen.	Sped
Related directly to teaching assignment	27.476***	6%	4%	27%	28%	26%	30%	21%	21%	20%	16%
Using technology to support instruction	6.994**	12%	13%	53%	54%	22%	21%	9%	8%	4%	3%
Teaching STEM or incorporating STEM into other subjects	145.208***	49%	58%	31%	29%	11%	8%	5%	3%	4%	2%
Classroom and behavior management	186.887***	34%	25%	47%	46%	12%	18%	4%	8%	2%	4%
Instructional strategies to teach students with disabilities or IEPs	1363.090**	39%	12%	46%	37%	10%	27%	3%	15%	2%	9%
Differentiated instruction for all students	48.261***	21%	17%	51%	44%	18%	23%	7%	11%	3%	6%
Preparing students to take annual assessments	64.802***	38%	32%	46%	49%	11%	12%	4%	5%	2%	2%
Analyzing and interpreting student achievement data	.443	22%	22%	50%	48%	18%	19%	7%	8%	3%	3%

Note. Total n = 41,380; general education teachers (Gen.) n = 36,530; special education teachers (Sped.) n = 4,850
* $p < .05$; ** $p < .01$; ***$p < .001$
Source: National Teacher and Principal Survey (NTPS), Winter 2023.

Table 11. Hours of Professional Development by Topic

Model 3 adds the effects for school ethnicity, which is coded as the percentage of non-White students. Based on model fit indices, Model 3 is a better fitting model than Model 2 ($\chi^2 = 57.363$, $p < .05$). Results for teacher main assignment are similar to results from Model 1 and 2. There is no effect for school ethnicity for the 8 hours or more, 9-16 hours, or 17-32 hours categories. Similar to Model 2, there is a significant effect for 33 hours or more. Compared to schools with zero non-White students, for each one-percent increase in the percentage of non-White students, teachers are .3% less likely to participate in professional development directly related to their teaching assignment compared to those who did not participate. Compared to teachers with no experience, for each additional year of experience, teachers are 0.3% less likely to participate in 33 hours of professional development compared to those who did not participate ($OR = 1.003$, $p < .001$). While this difference is statistically significant, its magnitude is so small that it might not be practically important.

Summary of Statistically Significant Predictors

Overall results for this analysis indicate that teacher main assignment in general or special education has an effect on hours of professional development, with general education slightly less likely to receive more hours of professional development related to their teaching assignment. There are also statistically significant effects for school years taught and the percentage of non-White students in the school for the 33 hours or more category.

Teachers Receiving Coaching or Mentoring

Table 13 displays three nested multinomial logistic regression models of the frequency of receiving coaching or mentoring from other teachers or staff. Model 1 adds effects for type of teacher (general vs. special education). Model 2 adds effects for teacher years of experience.

Model 3 adds effects for the percentage of non-White students in the school. Table 7 shows model fit estimates and comparison tests of models using log likelihood values.

Model 1 adds the effect of teacher main assignment to general or special education. All variables in all models are interpreted while controlling for other variables in the model. There are no statistically significant results in Model 1 and the odds ratios are approaching one, indicating that there is no difference between general and special education teachers.

Model 2 adds the effect of teacher years of experience. Based on model fit indices, Model 2 is a better fitting model than Model 1 ($\chi^2 = 31.032$, $p < .05$). The results for teacher main assignment are similar to Model 1: there are no differences between general and special education teachers. There are significant effects for teacher years of experience. Compared to teachers with no experience, for each additional year of experience, teachers are 3.2% less likely to participate in coaching or mentoring once or a few times a year compared to those who did not participate ($OR = .968$, $p < .001$). These results are similar for the other two response categories, with teachers with more years of experience being 6.6% less likely to participate in coaching or mentoring once or a few times a year ($OR = .934$, $p < .001$) and 10.7% less likely to participate in coaching or mentoring once or a few times a week ($OR = .893$, $p < .01$) compared to those with fewer years of experience.

Model 3 adds the effects for school ethnicity, which is coded as the percentage of non-White students. Based on model fit indices, Model 3 is a better fitting model than Model 2 ($\chi^2 = 57.094$, $p < .05$). Results are similar to Models 1 and 2 for teacher main assignment (i.e., no effect) and school years taught. Compared to teachers with a low percentage of non-White students in school, for each additional percent of non-White students, teachers are .2% less likely

	Model 1: Teacher Assignment				Model 2: Years of Experience				Model 3: Percent of Non-White Students			
	Coef.	(SE)	OR	% Change	Coef.	(SE)	OR	% Change	Coef.	(SE)	OR	% Change
8 hours or less												
Special vs. general education	-.422***	(.080)	.656	34.4%	-.422***	(.080)	.656	34.4%	-.443***	(.081)	.642	35.8%
School years taught					.000	(.002)	1.000	0%	.000	(.002)	1.000	0%
Non-White students in school									.000	(.001)	1.000	0%
9-16 hours												
Special vs. general education	-.520***	(.082)	.594	40.6%	-.052***	(.080)	.595	40.5%	-.542***	(.081)	.581	
School years taught					-.001	(.002)	.999	0.1%	.000	(.002)	1.000	0%
Non-White students in school									.000	(.001)	1.000	0%
17-32 hours												
Special vs. general education	-.383***	(.084)	.682	31.8%	-.381***	(.082)	.683	31.7%	-.402***	(.081)	.669	33.1%
School years taught					-.002	(.002)	.998	0.2%	-.002	(.002)	.998	0.2%
Non-White students in school									.0001	(.001)	1.001	0%
33 hours or more												
Special vs. general education	-.183*	(.084)	.833	16.7%	-.175*	(.084)	.839	16.1%	-.204*	(.085)	.815	18.5%
School years taught					-.008**	(.003)	.992	0.8%	-.007*	(.003)	.994	0.6%
Non-White students in school									.003***	(.001)	1.003	0.3%
Pseudo R^2	.002				.003				.004			
Log-likelihood	72.986				2101.720				117803.143			
Chi-square (df)	83.868*** (4)				114.900*** (8)				171.994 (12)			

Note. * $p < .05$; ** $p < .01$; ***$p < .001$
Source: National Teacher and Principal Survey (NTPS), Winter 2023.

Table 12. Multinomial Logistic Regression for Hours of Professional Development Directly Related to Assignment

to participate in coaching or mentoring once or a few times a year compared to teachers who did not participate in coaching or mentoring ($OR = 1.002$, $p < .001$). The results are similar for the other response categories, with teachers being 0.4% less likely to participate in coaching or mentoring once or a few times a month ($OR = 1.004$, $p < .001$). and 0.5% less likely to participate once or a few times a week ($OR = 1.005$, $p < .001$). However, the odds ratios are close to one, indicating that there is only a slight difference.

Summary of Statistically Significant Predictors

Overall results for this analysis indicate that years of experience and school diversity have an effect on hours of professional development, with both slightly decreasing the odds of participating in coaching or mentoring.

Diagnostic Tests and Results

I conducted a series of diagnostic tests using Model 3. Tests were conducted separately for each regression model. First, I checked the cross-tabulations between the categorical outcomes and all the categorical predictors. I found no cell counts less than 50. Second, to test if multicollinearity was a concern, I examined the variance inflation factor (VIF) for the final regression model. The highest VIF was 1.25 for the estimated percentage of non-White students. The average VIF was 1.12 for all variables. Therefore, I concluded that multicollinearity was not an issue for either model.

Discussion

Increasing access to effective and relevant professional development is one way to combat teacher attrition and address the critical teacher shortage. A critical first step to improving access to professional development is a clearer understanding of the types and intensity of professional development that teachers currently receive, and if opportunities differ

	Model 1: Teacher Main Assignment				Model 2: Years of Experience				Model 3: Percent Non-White Students			
	Coef.	(SE)	OR	% Change	Coef.	(SE)	OR	% Change	Coef.	(SE)	OR	% Change
Once or a few times a year												
Special vs. general education	-.071	(.037)	.996	4%	.023	(.04)	1.023	2.3%	.030	(.040)	1.030	3%
School years taught					-.032***	(.001)	.968	3.2%	-.032***	(.001)	.968	3.2%
Non-White students in school									.002***	(.000)	1.002	0.2%
Once or a few times a month												
Special vs. general education	-.074	(.041)	.929	7.1%	-.015	(.042)	.985	1.5%	-.016	(.042)	.984	1.6%
School years taught					-.069***	(.002)	.934	6.6%	-.067**	(.002)	.935	6.5%
Non-White students in school									.004***	(.000)	1.004	0.4%
Once or a few times a week												
Special vs. general education	-.071	(.049)	.931	6.6%	.022	(.051)	1.023	2.3%	.041	(.052)	1.042	4.2%
School years taught					-.113**	(.002)	.893	10.7%	-.067**	(.002)	.895	10.5%
Non-White students in school									.006***	(.001)	1.005	0.5%
Pseudo R^2	.000				.095				.098			
Log-likelihood	56.557				3430.256				100482.882			
Chi-square (df)	5.149 (3)				4116.235** (6)				4173.598** (9)			

Note. * $p < .05$; ** $p < .01$; ***$p < .001$

Source: National Teacher and Principal Survey (NTPS), Winter 2023.

Table 13. Multinomial Logistic Regression for Receiving Coaching or Mentoring

for educators who are the highest risk of attrition (e.g., special educators, teachers with less experience, teachers who work in diverse schools). The purpose of this study was to describe the types and intensities of professional development offered to 41,380 educators who are representative of all teachers in the United States, and to examine factors that predicted professional development opportunities. Overall, teachers most often received professional development focused on using technology to support instruction, analyzing and interpreting student achievement data, and topics focused directly on their teaching assignment. There were small differences in professional development activities between special and general educators, with general educators co-planning more frequently and special educators consulting more often with other teachers about individual students. There were statistically significant differences in participation based on both years of teaching experience and the racial diversity of schools, but the magnitude of these differences would not seem to be practically significant. These findings extend the literature regarding teacher professional development in a number of ways.

First, nearly two-thirds of general and special education teachers reported rarely or never participating in coaching or mentoring. Coaching has been shown to be a powerful practice to support teachers in the literature, with a meta-analysis by Brock et al. (2017) providing 102 studies (86% of studies included) that supported its use to promote educator implementation fidelity of evidence-based practices. However, the current analysis shows that teachers are not receiving coaching in practice. This may exacerbate the teacher shortage, with many teachers leaving the profession due to a lack of support and burnout. Coaching and mentoring are strategies known to reduce burnout, yet they are not being used in practice.

Second, this analysis reveals that many teachers receive strikingly little professional development focused on topics often identified as critical needs. Nearly 40% of general

education teachers did not participate in any professional development related to instructional strategies to teach students with disabilities or IEPs. This finding highlights a critical issue within teacher professional development. Most general education teachers have students with IEPs in their classroom and would benefit from training on instructional strategies specific to these students. This is type of training is especially critical to provide as more students with disabilities are educated in the general education classroom each year (Gilmour & Wehby, 2020). One-third of general education teachers did not receive training on classroom and behavior management and almost half received 8 hours or less, though many report a need in this area (Stough et al., 2015). Student problem behavior is one of the leading causes of teacher burnout (Hastings & Bham, 2016), thus neglecting to provide teachers with this support amplifies the teacher shortage and negatively impacts student learning (Ronfeldt et al., 2013).

Third, this analysis shows that there are differences in professional development opportunities between general education and special education teachers. Although this analysis is only descriptive in nature, and does not show where these differences lie, it has important implications for in-service teacher education. Some special education teachers report attending training that is not related to their assignment and may be attending a "one-size-fits-all" training meant to broadly cover topics that are not related to their daily practice. This is an issue as professional development opportunities are often limited to several in-service days across the school year. Additionally, professional development is the primary means in which teachers receive new skills to integrate into their practice (Kretlow et al., 2011). This analysis showed that general and special education teachers differed in the number of hours they received across all eight professional development topics on the NTPS questionnaire (see Table 11). Although it is true that general and special education teachers have different professional development needs, it

is expected that such differences would not exist on topics that apply to both, such as classroom and behavior management and instructional strategies to teach students with disabilities or IEPs.

Lastly, most teachers reported that they received at least some professional development relevant to their teaching assignment. General education teachers were slightly less likely to access relevant professional development compared to special education teachers. It is concerning, however, that *any* teachers report zero participation in professional development relevant to them, and there are clear opportunities to increase access for many teachers who report getting relatively few hours of meaningful professional development.

Implications for Practice

Findings from this analysis have implications for administrators, policy makers, and school principals who are responsible for selecting and providing professional development opportunities. First, administrators should examine current professional development practices and modify them as needed to meet both teacher and student needs. Second, professional development should focus on opportunities for coaching and mentoring rather than single-event workshops which have been shown to be ineffective (Brock & Carter, 2015). Increasing opportunities for coaching and mentoring, especially for new teachers and teachers in high-risk schools, may reduce teacher attrition and improve student instruction. Third, school districts should continue to provide professional development that teachers have identified as a critical area of need, such as classroom management. Additionally, districts may increase opportunities for professional development that may have been overlooked in past years, such as providing general education teachers with training on working with students with IEPs since most general education teachers have at least one student with an IEP each year (Kretlow et al., 2011).

Limitations and Future Directions

Limitations of this analysis suggest areas for future research. First, there are multiple definitions of coaching and mentoring in the literature, and the NTPS questionnaire did not provide teachers with a definition. Therefore, it is difficult to determine if teachers are receiving the type of coaching and mentoring that is known to be effective in the literature (i.e., individualized, context-specific, sustained, and intensive; Kraft et al., 2018). Future surveys should include a definition of coaching. Second, it is not possible to gauge the quality of professional development opportunities that teachers received. Frequency or duration of training is not synonymous with quality. Future surveys should measure the quality of professional development opportunities. Third, this sample looked at all general education teachers. It is probable that teachers in different subject areas have different professional development needs than others. For example, a foreign language teacher may not teach many students with disabilities and may not need as many hours of training on working with students with IEPs. Future surveys should capture the nature of teacher roles to account for a teacher's subject area and the ages of the students they serve. Lastly, this analysis was confined to the variables made available by the survey. Non-continuous measures of professional development were used (i.e., 8 hours or less, 9-16 hours), which represent arbitrary categories. Future studies should use continuous measures to allow for more precise analysis.

Conclusion

The results of this analysis showed that teachers in the United States received a range of professional development activities that varied in frequency and intensity. Professional development and teacher support through coaching and mentoring are critical to retain teachers in the profession and reduce the teacher shortage. This analysis showed that there is a critical research-to-practice gap in the format of professional development that teachers receive, with

nearly two-thirds of teachers reporting very little to no access to coaching or mentoring. Many teachers reported receiving relatively few hours of professional development that was directly relevant to them, and many received little or no professional development on pivotal topics such as classroom management or instructional strategies for students with disabilities. Although improved professional development alone is unlikely to completely solve our field's issues with teacher burnout and attrition, it represents one important part of the solution.

Chapter 5. Discussion

The preceding three chapters of my dissertation focus on a review of strategies that have been used to promote generalization in educator training (Chapter 2), the effects of a training intervention package used to promote generalization (Chapter 3), and an examination of the factors affecting professional development opportunities for educators (Chapter 4). In this chapter, I will discuss how I will continue to move this line of research forward in my future work. Specifically, I will describe my career goals and future research agenda, draw connections between this dissertation and my future research agenda, and explain how my future research will continue to support educator training.

Career Goals

Throughout my career, I have trained numerous pre-service teachers, in-service teachers, and behavior analyst candidates to implement evidence-based practices with students with intellectual and developmental disabilities (IDD). This experience has taught me two crucial lessons. First, no one achieves their maximum potential without a system of support that incorporates timely feedback that enables them to improve their practice. Second, lasting changes in behavior occur only through seeing the "why" of what we do as educators: improving student outcomes.

I want to continue to work with all these individuals to continue to provide high-quality training that enables educators and behavior analysts to maximize their impact. I will accomplish this by furthering my two lines of research. These lines of research include (1) developing and testing training models that enable educators to maximize student outcomes by identifying and

validating strategies that promote generalization of training outcomes to new students, settings, and situations and measuring the social validity of these models and (2) examining educational placement for students with IDD.

Research Aims

First, I plan to expand my dissertation work to examine specific strategies that enable educators to generalize their implementation to new settings, students, and situations. Findings from this dissertation (see Chapter 2) show that although many researchers have successfully trained educators to generalize, there is no consensus around which specific strategies best support generalization of implementation in staff training. My dissertation (see Chapter 3) examined one promising strategy: multiple exemplar training.

Second, I plan to develop and test training models that enable educators to implement evidence-based practices with fidelity. I am particularly interested in developing training models that have high social validity for educators to ensure that they are used in practice. To do this, I plan to use an implementation science lens to study and adapt training opportunities so that they will be more readily adopted into everyday practice. My future work will focus on understanding the factors that lead to the adoption of promising professional development strategies under naturally occurring conditions in schools.

Third, similar to the analyses conducted in Chapter 4, I plan to continue to evaluate the types of training that are offered to educators. To accomplish this, I will continue to conduct secondary data analyses of surveys like the National Teacher and Principal Survey (NTPS).

Fourth, I am interested in the incongruence between the federal mandate for least restrictive environment and patterns of educational placement for students with IDD across different regions of the United States over time. My research in this area will focus next on the

policy implications of the current state of educational placement and how this relates to the training needs of pre-service and in-service teachers and behavior analysts. I believe that one step toward improving inclusion for students with IDD is training practitioners to be successful in meeting students' academic and behavioral needs across all educational environments. But in order to make an impact in this area, we first need to understand the contextual factors that impact where students are educated and seek to address those factors.

Development of Dissertation

My interest in this area began before my doctoral training. After completing my bachelor's degree, I worked in a school where I supported a student on the autism spectrum in an inclusive classroom. Much like the paraeducators in my study, I felt unprepared to effectively work with this student. Additionally, I felt like the research-based strategies that I had learned in my undergraduate career were missing in practice. I later came to understand this as the research-to-practice gap. I recognized how educators needed strategies to ensure that evidence-based practices were used with students in schools. My time in this position lead me to seek effective ways to train school personnel to work with students with IDD. This experience led me to be interested in studying effective paraeducator training, and by extension, teacher training.

I became interested in performance feedback as a tool to promote implementation fidelity of basic evidence-based practices. I reviewed the work of other researchers who had used performance feedback to support teachers, pre-service teachers, and paraeducators implementing evidence-based practices (i.e., Fallon et al., 2015). To begin my own research, I reviewed the educator training literature that focused on training educators to implement a specific evidence-based practice: systematic prompting (i.e., Shawbitz & Brock, 2022). I found that many studies used performance feedback, and some used performance feedback to promote generalization to

new settings, students, or situations. However, I also found that the existing literature focuses primarily on initial acquisition of implementation fidelity for a single student and situation, largely ignoring the degree to which educators generalize evidence-based practice or how to best support them to do so. For my dissertation, I decided to delve deeper into educator training studies that included data on generalization (Chapter 2). I found a lack of consensus, and decided to design a training intervention that included a specific strategy to promote generalization: multiple exemplar training.

When I was working as a paraeducator, I found myself seeking out the advice and direction of the special education teacher. In my current work as a researcher and previous experience as a student teaching supervisor, I have found that teachers often are not trained to support other adults in the classroom. This is reflected in the literature, with less than half of universities reporting that they have a dedicated course on supervising paraeducators (Sobeck et al., 2021). I noticed a need for special education teachers to receive this type of support and I decided to train teachers in my study to provide performance feedback to paraeducators. I selected performance feedback because it is relatively easy to provide with little time and cost associated with it (Sleiman et al., 2020).

However, even the most effective training intervention will not be used if educators and administrators do not find it socially valid and feasible. I became interested in how researchers could better assess our interventions for social validity. During the third year of my doctoral program, I was fortunate to take two courses in qualitative methods. In these classes, I learned that qualitative methods could be used to supplement and expand the information gathered from traditional social validity surveys given at the end of studies. I decided to pair qualitative

methods with my single-case methods to further contextualize the effects of my intervention package.

Future Research Aims

As I progress in my career, I plan to continue to pursue my research aims in a number of ways. First, I plan to conduct a series of studies that extend my dissertation work. These studies will focus on educator generalization across students, settings, and situations. Based on the results of my dissertation studies, I will conduct a series of single-case studies that will culminate in a randomized-controlled trial. The primary focus of these studies will be to develop and test a training model that incorporates strategies to promote generalization. Throughout this series of studies, I will also focus on different types of generalization (e.g., generalization to novel students and settings). At the end of the series of single-case studies, I will select the generalization strategy that has been most effective and test it on a larger scale in a randomized-controlled trial.

Second, I will continue to assess the social validity of training interventions to ensure that these approaches continue to be used in practice by educators. To accomplish this, I will continue to pair quantitative and qualitative research methods. I will continue to conduct in-depth social validity analyses using qualitative methods, such as semi-structured interviews, at the end of my studies on educator training. A second step toward accomplishing this goal is conducting an online survey using a sample of both special education teachers and paraeducators. The purpose of this survey is to ask about current training practices and perceptions of the efficacy of these training approaches. This work is closely related to the analysis of the National Teacher and Principal Survey (NTPS) that I conducted in Chapter 4. I believe that it is important to examine what training opportunities are made available to educators so that we can continue to

improve these offerings. Additionally, through qualitative methods, I hope to give a "voice" to the educators in our schools and share their needs.

To continue to develop effective training models, I plan to submit a NCSER Early Career Grant that focuses on developing and testing a training model that promotes generalization and examines social validity.

To continue my second line of research study, educational placement of students with IDD, I will focus next on the policy implications of the current state of educational placement and how this relates to the training needs of pre-service and in-service teachers and behavior analysts. Results of the analyses conducted in Chapter 4 of my dissertation indicate that general education teachers do not receive an adequate amount of professional development related to instructing students with disabilities or IEPs. Further examining educational placement to describe how many students are educated in the regular education classroom will help contribute to policy changes. Lastly, I would like to replicate and extend the work of Causton-Theoharis et al. (2011) and use qualitative methods to evaluate the quality of different educational placements for students with IDD as research in this area is lacking.

Conclusion

As I continue my career, I hope to continue to improve outcomes for students with intellectual and developmental disabilities by focusing on generalization of educator training, understanding the factors that influence the adoption of training strategies, and examining the educational environments in which students are educated. Specifically, I hope to develop a socially valid training model that enables educators to implement evidence-based practices with high fidelity and apply that knowledge across students, settings, and situations. Additionally, I hope that my examination of educational placement will contribute to policy changes that

support high-quality education for all students. I believe that providing educators with more support and that by examining the educational environments in which students are educated will further increase student outcomes.

References

Aljadeff-Abergel, E., Peterson, S.M., Wiskirchen, R.R., Hagen, K.K., & Cole, M.L. (2017). Evaluating the temporal location of feedback: Providing feedback following performance vs. prior to performance. *Journal of Organizational Behavior Management, 37*(2), 171-195. https://doi.org/10.1080/01608061.2017.1309332

*Andzik, N.R., & Cannella-Malone, H.I. (2019). Practitioner implementation of communication intervention with students with complex communication needs. *American Journal on Intellectual and Developmental Disabilities, 124*(5), 396-410. https://doi.org/10.1352/1944-7558-124.5.395

*Andzik, N.R., Schaefer, J.M., & Christensen, V.L. (2021). The effects of a teacher-delivered behavior skills training on paraeducators' use of a communication intervention for a student with autism who uses AAC. *Augmentative and Alternative Communication, 37*(1), 1-13. https://doi.org/10.1080/07434618.2021.1881823

Alvarez, H.K. (2007). The impact of teacher preparation on responses to student aggression in the classroom. *Teaching and Teacher Education, 23*(7), 1113-1126. https://doi.org/10.1016/j.tate.2006.10.001

*Barton, E.E., Chen, C., Pribble, L., Pomes, M., & Kim, Y. (2013). Coaching preservice teachers to teach play skills to children with disabilities. *Teacher Education and Special Education, 36*(4), 330-349. https://doi.org/10.1177/0888406413505113

*Barton, E.E., Pribble, L., & Chen, C. (2013). The use of e-mail to deliver performance-based feedback to early childhood practitioners. *Journal of Early Intervention, 35*(3), 270-297. https://doi.org/10.1177/1053815114544543

*Barton, E.E., Fuller, E.A., & Schnitz, A. (2016). The use of email to coach preservice early childhood teachers. *Topics in Early Childhood Special Education, 36*(2), 78-90. https://doi.org/10.1177/0271121415612728

*Barton, E.E., Pokorski, E.A., Gossett, S., Sweeney, E., Qiu, J., & Choi, G. (2018). The use of email to coach early childhood teachers. *Journal of Early Intervention, 40*(3), 212-228. https://doi.org/10.1177%2F1053815118760314

Berry, A.B., Petrin, R.A., Gravelle, M.L., & Farmer, T.W. (2011). Issues in special education teacher recruitment, retention, and professional development: Considerations in supporting rural teachers. *Rural Special Education Quarterly, 30*(4). https://doi.org/10.1177/875687051103000402

*Bethune, K.S., & Wood, C.L. (2013). Effects of coaching teachers' use of function-based interventions for students with severe disabilities. *Teacher Education and Special Education, 36*(2), 97-114. https://doi.org/10.1177/0888406413478637

Billingsley, B., & Bettini, E. (2019). Special education teacher attriton and retention: A review of the literature. *Review of Educational Research, 89*(5), 697-744. https://doi.org/10.3102/0034654319862495

Borenstein, M., Hedges, L.V., Higgins, J.P., & Rothstein, H.R. (2011). *Introduction to meta-analysis.* John Wiley & Sons.

Brock, M.E., & Anderson, E.J. (2021). Training paraprofessionals who work with students with intellectual and developmental disabilities: What does the research say? *Psychology in the Schools, 58*, 702-722. https://doi.org/10.1002/pits.22386

*Brock, M.E., Barczak, M.A., Anderson, E.J., & Bordner-Williams, N.M. (2021). Efficacy of tiered training on paraeducator implementation of systematic instructional practices for students with severe disabilities. *Exceptional Children, 87*(2), 217-235. https://doi.org/10.1177/0014402920947641

*Brock, M.E., Biggs, E.E., Carter, E.W., Cattey, G.N., & Raley, K.S. (2016). Implementation and generalization of support arrangements for students with severe disabilities in inclusive classrooms. *The Journal of Special Education, 49*(4), 221-232. https://doi.org/10.1177/0022466915594368

Brock, M.E., & Carter, E.W. (2015). Effects of a professional development package to prepare special education paraprofessionals to implement evidence-based practice. *The Journal of Special Education, 49*(1), 39-51. https://doi.org/10.1177/0022466913501882

Brock, M.E., & Carter, E.W. (2017). A meta-analysis of educator training to improve implementation of interventions for students with disabilities. *Remedial and Special Education, 38*(3), 131-144. https://doi.org/10.1177/0741932516653477

Brock, M.E., Barczak, M.A,. & Dueker, S.A. (2020). Effects of delayed video-based feedback and observing feedback on paraprofessional implementation of evidence-based practices for students with severe disabilities. *Focus on Autism and Other Developmental Disabilities, 35*(3), 153-164. https://doi.org/10.1177/1088357620902492

Brock, M.E., Barczak, M.A., Anderson, E.J. & Bordner-Williams, N.M. (2021). Efficacy of tiered training on paraeducator implementation of systematic instructional practices for

students with severe disabilities. *Exceptional Children, 87*(2), 217-235. https://doi.org/10.1177/0014402920947641

Brock, M.E., Cannella-Malone, H.I., Seaman, R.L., Andzik, N.R., Schaefer, J.M., Page, E.J., Barczak, M.A., & Dueker, S.A. (2017). Findings across practitioner training studies in special education: A comprehensive review and meta-analysis. *Exceptional Children*, *84*(1), 7-26. https://doi.org/10.1177/0014402917698008

Brock, M.E., Dynia, J.M., Dueker, S.A., & Barczak, M.A. (2020). Teacher-reported priorities and practices for students with autism: Characterizing the research-to-practice gap. *Focus on Autism and Other Developmental Disabilities, 35*(2), 67-78. https://doi.org/10.1177/0022466913501882

Brock, M.E., Huber, H.B., Carter, E.W., Juarez, A.P., & Warren, Z.E. (2014). Statewide assessment of professional development needs related to educating students with autism spectrum disorder. *Focus on Autism and Other Developmental Disabilities, 29*(2), 67-79. https://doi.org/10.1177/1088357614522290

*Catania, C.N., Almeida, D., Liu-Constant, B., & DiGennaro-Reed, F.D. (2009). Video modeling to train staff to implement discrete-trial instruction. *Journal of Applied Behavior Analysis, 42*(2), 387-392. https://doi.org/10.1901/jaba.2009.42-387

Carter, E.W., O'Rourke, L., Sisco, L.G., & Pelsue, D. (2009). Knowledge, responsibilities, and training needs of paraprofessionals in elementary and secondary schools. *Remedial and Special Education, 30*(6), 344-359. https://doi.org/10.1177/0741932508324399

Carver-Thomas, D. & Darling-Hammond, L. (2017). *Teacher turnover: Why it matters and what we can do about it.* Learning Policy Institute. https://doi.org/10.54300/454.278

Causton-Theoharis, J., Cosier, M., Theoharis, G., & Orsati, F. (2011). Does self-contained special education deliver on its promises? A critical inquiry into research and practice. *Journal of Special Education Leadership, 24*(2), 61-78. https://eric.ed.gov/?id=EJ963383

*Cheek, A.E., Rock, M.L., & Jimenez, B.A. (2019). Online module plus eCoaching: The effects on special education teachers' comprehension instructions for students with significant intellectual disability. *Education and Training in Autism and Developmental Disabilities, 54*(4), 343-357. https://www.jstor.org/stable/26822513

Collins, B.C., Lo, Y., Park, G., & Haughney, K. (2018). Response prompting as an ABA-based instructional approach for teaching students with disabilities. *TEACHING Exceptional Children, 50*(6), 343-355. https://doi.org/10.1177/0040059918774920

Conley, S., & You, S. (2017). Key influences on special education teachers' intentions to leave: The effects of administrative support and teacher team efficacy in a mediational model. *Educational Management Administration and Leadership, 45*(3), 521-540. https://doi.org/10.1177/1741143215608859

*Coogle, C.G., Rahn, N.L., & Ottley, J.R. (2015). Pre-service teacher use of communication strategies upon receiving immediate feedback. *Early Childhood Research Quarterly, 32*(3), 105-115. https://doi.org/10.1016/j.ecresq.2015.03.003

*Coogle, C.G., Ottley, J.R., Rahn, N.L., & Storie, S. (2018). Bug-in-ear eCoaching: Impacts on novice early childhood special education teachers. *Journal of Early Intervention, 40*(1), 87-103. https://doi.org/10.1177/1053815117748692

*Coogle, C.G., Ottley, J.R., Storie, S., Rahn, N.L., & Kurowski-Burt, A. (2020). Performance-based feedback to enhance preservice teachers' practice and preschool children's

expressive communication. *Journal of Teacher Education, 71*(2), 188-202. https://doi.org/10.1177/0022487118803583

*Coogle, G.C., Storie, S., Ottley, J.R., Rahn, N.L., & Kurowski-Burt, A. (2021). Technology-enhanced performance-based feedback to support teacher practice and child outcomes. *Topics in Early Childhood Special Education, 41*(2), 72-85. https://doi.org/10.1177/0271121419838624

Cook, B.G., Buysee, V., Klingner, J., Landrum, T.J., McWilliam, R.A., Tankersley, M., & Test, D.W. (2015). CEC's standards for classifying the evidence base of practices in special education. *Remedial and Special Education, 36*(4), 220-234. https://doi.org/10.1177/0741932514557271

Cook, B.G., Collins, L.W., Cook, S.C., & Cook, L. (2020). Evidence-based reviews: How evidence-based practices are systematically identified. *Learning Disabilities Research and Practice, 35*(1), 6-13. https://doi.org/10.1111/ldrp.12213

Cook, B.G., & Odom, S.L. (2013). Evidence-based practices and implementation science in special education. *Exceptional Children, 79*(2), 135-144. https://doi.org/10.1177/001440291307900201

Cooper, J. O., Heron, T. E., & Heward, W. L. (2019). *Applied Behavior Analysis (3rd Edition).* Hoboken, NJ: Pearson Education.

Cox, S., Gilary, A., Simon, D., and Thomas, T. (2022). *Documentation for the 2017–18 National Teacher and Principal Survey* (NCES 2022-718). U.S. Department of Education. Washington, DC: National Center for Education Statistics. https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022718

*D'Agostino, S., Douglas, S.N., & Horton, E. (2020). Inclusive preschool practitioners' implementation of naturalistic developmental behavioral intervention using telehealth training. *Journal of Autism and Developmental Disorders, 50*, 864-880. https://doi.org/10.1007/s10803-019-04319-z

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional learning in the learning profession: A status report on teacher development in the U.S. and abroad. Alexandria, VA: ASCD.

Den Brok, P., Wubbles, T., & Van Tartwijk, J. (2017). Exploring beginning teachers' attrition in the Netherlands. *Teachers and Teaching, 23*(8), 881-895. https://doi.org/10.1080/13540602.2017.1360859

Douglas, S.N., Uitto, D.J., Reinfelds, C.L., & D'Agostino, S. (2019). A systematic review of paraprofessional training materials. *The Journal of Special Education, 52*(2), 195-207. https://doi.org/10.1177/0022466918771707

*Downs, A., Downs, R.C., & Rau, K. (2008). Effects of training and feedback on discrete trial teaching skills and student performance. *Research in Developmental Disabilities, 29*(3), 235-246. https://doi.org/10.1016/j.ridd.2007.05.001

Eccles MP, & Mittman BS (2006). Welcome to implementation science. *Implementation Science, 1*, 1–3. https://doi.org/10.1186/1748-5908-1-1

Emery, D.W., & Vandenberg, B. (2010). Special education teacher burnout and ACT. *International Journal of Special Education, 2*(3), 119-131. https://eric.ed.gov/?id=EJ909042

Every Student Succeeds Act, 20 U.S.C. § 6301. (2015).

Fallon, L.M., Collier-Meek, M.A., Maggin, D.M., Sanetti, L.M.H., & Johnson, A.H. (2015). Is performance feedback for educators an evidence-based practice? A systematic review and evaluation based on single-case research. *Exceptional Children, 81*(2), 227-246. https://doi.org/10.1177/0014402914551738

*Fetherston, A.M., & Sturmey, P. (2014). The effects of behavioral skills training on instructor and learner behavior across responses and skill sets. *Research in Developmental Disabilities, 35*(2), 541-562. https://doi.org/10.1016/j.ridd.2013.11.006

*Feldman, E.K., & Matos, R. (2012). Training paraprofessionals to facilitate social interactions between children with autism and their typically developing peers. *Journal of Positive Behavior Interventions, 15*(3), 169-179. https://doi.org/10.1177/1098300712457421

Fisher, M., & Pleasants, S.L. (2012). Roles, responsibilities, and concerns of paraeducators: Findings from a statewide survey. *Remedial and Special Education, 33*(5), 287-297. https://doi.org/10.1177/0741932510397762

*Flynn, S.D., & Lo, Y. (2016). Teacher implementation of trial-based functional analysis and differential reinforcement of alternative behavior for students with challenging behavior. *Journal of Behavioral Education, 25*, 1-31. https://doi.org/10.1007/s10864-015-9231-2

Freeman, J., Sugai, G., Simonsen, B., & Everett, S. (2017). MTSS coaching: Bridging knowing to doing. *Theory into Practice, 56*, 29-37. https://doi.org/10.1080/00405841.2016.1241946

*Ganz, J.B., Goodwyn, F.D., Boles, M.M., Hong, E.R., Rispoli, M.J., Lund, E.M., & Kite, E. (2013). Impacts of a PECS instructional coaching intervention on practitioners and children with autism. *Augmentative and Alternative Communication, 29*(3), 210-221. https://doi.org/10.3109/07434618.2013.818058

Garwood, J.D., & Harris, A.H. (2020). Screencast-delivered professional development targeting teachers' self-efficacy and beginning-of-the-year classroom management practices. *Australasian Journal of Special and Inclusive Education, 44*, 60-72. https://doi.org/10.1017/jsi.2020.3

Gast, D.L., & Ledford, J.R. (2014). *Single subject research methodology in behavioral sciences*. Routledge.

Gast, D.L., Lloyd, B.P., & Ledford, J.R. (2018). Multiple baseline and multiple probe designs. In J.R. Ledford, & D.L. Gast (Eds.). *Single case research methodology: Applications in special education and behavioral sciences* (pp. 239-282). Routledge.

Gehrke, R.S., & McCoy, K. (2007). Considering the context: Differences between the environments of beginning special educators who stay and those who leave. *Rural Special Education Quarterly, 26*(3), 32–40. https://doi.org/10.1177/875687050702600305

*Gerenscer, K.R., Higbee, T.S., Contreras, B.P., Pellegrino, A.J., & Gunn, S.L. (2018). Evaluation of interactive computerized training to teach paraprofessionals to implement errorless discrete trial instruction. *Journal of Behavioral Education, 27*, 461-487. https://doi.org/10.1007/s10864-018-9308-9

Geverdt, D. (2019). *Education Demographic and Geographic Estimates Program (EDGE): Locale Boundaries File Documentation, 2017* (NCES 2018-115). U.S. Department of Education. Washington, DC: National Center for Education Statistics. http://nces.ed.gov/pubsearch

Giangreco, M. F., Edelman, S. W., & Broer, S. M. (2001). Respect, appreciation, and acknowledgment of paraprofessionals who support students with disabilities. *Exceptional Children, 67*(4), 485–498. https://doi.org/10.1177/001440290106700404

*Gianoumis, S., Seiverling, L., & Sturmey, P. (2012). The effects of behavioral skills training on correct teacher implementation of natural language paradigm teaching skills and child behavior. *Behavioral Interventions, 27*(2), 57-74. https://doi.org/10.1002/bin.1334

Gilmour, A.F., & Wehby, J. H. (2020). The association between teaching students with disabilities and teacher turnover. *Journal of Educational Psychology, 112*(5), 1042–1060. https://doi.org/10.1037/edu0000394

Gregori, E., Rispoli, M.J., Lory, C., Kim, S.Y., & David, M. (2022). Effects of teachers as coaches for paraprofessionals implementing functional communication training. *Journal of Positive Behavior Interventions, 24*(2), 133-144. https://doi.org/10.1177/1098300720983538

Grima-Farrell, C. (2018). Bridging the research-to-practice gap: Implementing the research-to-practice model. *Australasian Journal of Special and Inclusive Education, 42*(1), 82-91. https://doi.org/10.1017/jsi.2018.9

Hagaman, J.L., & Casey, K.J. (2018). Teacher attrition in special education: Perspectives from the field. *Teacher Education and Special Education, 41*(4), 277-291. https://doi.org/10.1177/0888406417725797

Hall, L.J., Grundon, G.S., Pope, C. & Romero, A.B. (2010). Training paraprofessionals to use behavioral strategies when educating learners with autism spectrum disorders across environments. *Behavioral Interventions, 25*(1), 37-51. https://doi.org/10.1002/bin.294

*Halle, J.W., Baer, D.M., & Spradlin, J.E. (1981). Teachers' generalized use of delay as a stimulus control procedure to increase language use in handicapped children. *Journal of Applied Behavior Analysis, 14*(4), 389-409. https://doi.org/10.1901/jaba.1981.14-389

Helou, M.E., Nabhani, M., & Bahous, R. (2016). Teachers' views on causes leading to their burnout. *School Leadership & Management, 36*(5), 551-567. https://doi.org/10.1080/13632434.2016.1247051

*Hemmeter, M.L., Hardy, J.K., Schnitz, A.G., Adams, J.M., & Kinder, K.A. (2015). Effects of training and coaching with performance feedback on teachers' use of *Pyramidal Model* practices. *Topics in Early Childhood Special Education, 35*(3), 144-156. https://doi.org/10.1177/0271121415594924

Hume, K., Steinbrenner, J. R., Odom, S. L., Morin, K. L., Nowell, S. W., Tomaszewski, B., ... & Savage, M. N. (2021). Evidence-based practices for children, youth, and young adults with autism: Third generation review. *Journal of Autism and Developmental Disorders*, 1-20. https://doi.org/10.1007/s10803-020-04844-2

*Hyer, G., & Cooper-Duffy, K. (2019). Preparing interns to use functional story-based instruction to teach students with a severe intellectual disability in rural schools. *Rural Special Education Quarterly, 38*(4), 217-230. https://doi.org/10.1177/8756870519826928

Individuals With Disabilities Education Improvement Act, 20 U.S.C.§1400 (2004).

Individuals with Disabilities Education Improvement Act, U.S.C. § 1400 (2004).

Institute of Education Statistics. (2023). *School Pulse Panel.* Institute of Education Statistics. https://ies.ed.gov/schoolsurvey/spp/

Irvin, D.W., Ingram, P., Huffman, J., Mason, R., & Wills, H. (2018). Exploring paraprofessional and classroom factors affecting teacher supervision. *Research in Developmental Disabilities, 73*, 106-114. https://doi.org/10.1016/j.ridd.2017.12.013

Jones, C.R., Ratcliff, N.J., Sheehan, H., & Hunt, G.H. (2012). An analysis of teachers' and paraeducators' roles and responsibilities with implications for professional development. *Early Childhood Education Journal, 40,* 19-24. https://doi.org/10.1007/s10643-011-0487-4

Knight, V.F., Huber, H.B., Kuntz, E.M., Carter, E.W., & Juarez, A.P. (2019). Instructional practices, priorities, and preparedness for educating students with autism and intellectual disability. *Focus on Autism and Other Developmental Disabilities, 34*(1), 3-14. https://doi.org/10.1177/1088357618755694

Kraft, M.A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. *Review of Educational Research, 88*(4), 547-588. https://doi.org/10.3102/0034654318759268

Kratochwill, T.R., & Levin, J.R. (2010). Enhancing the scientific credibility of single-case intervention research: Randomization to the rescue. *Psychological Methods, 15*(2), 124-144. https://doi.org/10.1037/a0017736

Kratochwill, T.R., Hitchcock, J., Horner, R.H., Levin, J.R., Odom, S. L., Rindskopf, D.M., & Shadish, W.R. (2010). Single-case designs technical documentation. http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf.

*Kretlow, A.G., Cooke, N.L., & Wood, C.L. (2012). Using in-service and coaching to increase teachers' accurate use of research-based strategies. *Remedial and Special Education, 33*(6), 348-361. https://doi.org/10.1177/0741932510395397

Ledford, J.R., & Gast, D.L. (2014). *Single-case research methodology: Applications in special education and behavioral sciences.* Routledge.

Ledford, J.R., Hall, E., Conder, E., & Lane, J.D. (2016). Research for young children with autism spectrum disorder: Evidence of social and ecological validity. *Topics in Early Childhood Special Education, 35*(4), 223-233. https://doi.org/10.1177/0271121415585956

Lekwa, A.J., & Reddy, L.A. (2021). Current status and future directions in assessment of paraprofessional practices. *Psychology in the Schools, 58*(4), 648-668. https://doi.org/10.1002/pits.22480

*Lerman, D.C., Vorndran, C.M., Addison, L., & Kuhn, S.C. (2004). Preparing teachers in evidence-based practices for young children with autism. *School Psychology Review, 33*(4), 510-526. https://doi.org/10.1080/02796015.2004.12086265

*Lerman, D.C., Tetreault, A., Hovanetz, A., Strobel, M., & Garro, J. (2008). Further evaluation of a brief, intensive teacher-training model. *Journal of Applied Behavior Analysis, 41*(2), 243-248. https://doi.org/10.1901/jaba.2008.41-243

Lopez-Estrada, V., & Koyama, M. (2010). Retaining Mexican American special education teachers in Texas. *Journal of Hispanic Higher Education, 9*(1), 82-97. https://doi.org/10.1177/1538192709357032

*Lylo, B.J., & Lee, D.L. (2013). Effects of delayed audio-based self-monitoring on teacher completion of learning trials. *Journal of Behavioral Education, 22*, 120-128. https://doi.org/10.1007/s10864-012-9166-9

Maslach C. (2017). Burnout: A multidimensional perspective. In Schaufeli W. B., Maslach C., Marek T. (Eds.), *Professional burnout* (pp. 19–32). Taylor & Francis.

Matherson, L., & Windle, T.M. (2017). What do teachers want from their professional development? Four emerging themes. *Delta Kappa Gamma Bulletin, 83*(3), 28-32. https://www.dkg.org/DKGDocs/2017_Jour_83-3_Systems-to-Address-Quality-Teaching.pdf#page=28

*McBride, B.J., & Schwartz, I.S. (2003). Effects of teaching early interventionists to use discrete trials during ongoing classroom activities. *Topics in Early Childhood Special Education, 23*(1), 5-17. https://doi.org/10.1177/027112140302300102

*McLeod, R.H., Kim, S., & Resua, K.A. (2019). The effects of coaching with video and email feedback on preservice teachers' use of recommended practices. *Topics in Early Childhood Special Education, 38*(4), 192-203. https://doi.org/10.1177/0271121418763531

McLeskey, J., & Billingsley, B.S. (2008). How does the quality and stability of the teaching force influence the research-to-practice gap? A perspective on the teacher shortage in special education. *Remedial and Special Education, 29*(5), 293-305. https://doi.org/10.1177/0741932507312010

*McMillan, J.M., & Renzaglia, A. (2014). Supporting speech generating device use in the classroom. Part 1: Teacher professional development. *Journal of Special Education Technology, 29*(3), 31-47. https://doi.org/10.1177/016264341402900303

Morin, K.L., Nowell, S., Steinbrenner, J., Sam, A., Waters, V., & Odom, S.L. (2022). A survey of the experiences of paraprofessionals with roles, training, and communication when working with students with autism. *Focus on Autism and Other Developmental Disabilities, 37*(2), 96–107. https://doi.org/10.1177/10883576211066897

Morrier, M. J., Hess, K. L., & Heflin, L. J. (2011). Teacher training for implementation of teaching strategies for students with autism spectrum disorders. *Teacher Education and Special Education, 34*, 119–132. https://doi.org/10.1177/0888406410376660

*Mouzakitis, A., Codding, R.S., & Tryon, G. (2015). The effects of self-monitoring and performance feedback on the treatment integrity of behavior intervention plan implementation and generalization. *Journal of Positive Behavior Interventions, 17*(4), 223-234. https://doi.org/10.1177/1098300715573629

*Nabeyama, B., & Sturmey, P. (2010). Using behavioral skills training to promote safe and correct staff guarding and ambulation distance of students with multiple physical disabilities. *Journal of Applied Behavior Analysis, 43*(2), 341-345. https://doi.org/10.1901/jaba.2010.43-341

National Professional Development Center on Inclusion. (2008). *What do we mean by professional development in the early childhood field?* Chapel Hill: The University of North Carolina, FPG Child Development Institute, National Professional Development Center on Inclusion.

Neitzel, J. (2009). *Overview of time delay*. Chapel Hill, NC: National Professional Development Center on Autism Spectrum Disorders, Frank Porter Graham Child Development Institute, The University of North Carolina.

Nguyen, T.D., & Springer, M.G. (2021). A conceptual framework of teacher turnover: A systematic review of the empirical international literature and insights from the employee turnover literature. *Educational Review.* https://doi.org/10.1080/00131911.2021.1940103

*Nigro-Bruzzi, D., & Sturmey, P. (2010). The effects of behavioral skills training on mand training by staff and unprompted vocal mands by children. *Journal of Applied Behavior Analysis, 43*(4), 757-761. https://doi.org/10.1901/jaba.2010.43-757

O'Donnell, C.L. (2008). Defining, conceptualizing, and measuring fidelity of implementation and its relationship to outcomes in K-12 curriculum intervention research. *Review of Educational Research, 78*(1), 33-84. https://doi.org/10.3102/0034654307313793

Odom, S. L. (2009). The tie that binds: Evidence-based practice, implementation science, and early intervention. *Topics in Early Childhood Special Education*, *29*, 53–61. https://doi.org/10.1177/0271121408329171

*Peck, C.A., Killen. C.C., & Baumgart, D. (1989). Increasing implementation of special education instruction in mainstream preschools: Direct and generalized effects of nondirective consultation. *Journal of Applied Behavior Analysis, 22*(2), 197-210. https://doi.org/10.1901/jaba.1989.22-197

*Phillips, B., & Halle, J. (2004). The effects of a teacher-training intervention on student interns' use of naturalistic language teaching strategies. *Teacher Education and Special Education, 27*(2), 81-96. https://doi.org/10.1177/088840640402700201

*Pollard, J.S., Higbee, T.S., Akers, J.S., & Brodhead, M.T. (2014). An evaluation of interactive computer training to teach instructors to implement discrete trials with children with autism. *Journal of Applied Behavior Analysis, 47*(4), 765-776. https://doi.org/10.1002/jaba.152

Reichow, B., & Volkmar, F.R. (2010). Social skills intervention for individuals with autism: Evaluation for evidence-based practices within a best evidence synthesis framework.

Journal of Autism and Developmental Disorders, 40, 149-166. https://doi.org/10.1007/s10803-009-0842-0

*Reid, D.H., Parsons, M.B., McCarn, J.E., Green, C.W., Phillips, J.E., & Schepis, M.M. (1985). Providing a more appropriate education for severely handicapped persons: Increasing and validating functional classroom tasks. *Journal of Applied Behavior Analysis, 18*(4), 289-301. https://doi.org/10.1901/jaba.1985.18-289

Reinke, W.M., Stormont. M., Webster-Stratton, C., Newcomer, L.L., & Herman, K.C. (2012). The incredible years teacher classroom management program: Using coaching to support generalization to real-world classroom settings. *Psychology in the Schools, 49*(5), 416-428. https://doi.org/10.1002/pits.21608

Renbarger, R., & Davis, B.K. (2019). Mentors, self-efficacy, or professional development: Which mediate job satisfaction for new teachers? A regression examination. *Journal of Teacher Education and Educators, 8*(1), 21-34. https://dergipark.org.tr/en/pub/jtee/issue/44909/55913

*Robinson, S.E. (2011). Teaching paraprofessionals of students with autism to implement pivotal response treatment in inclusive school settings using a brief video feedback training package. *Focus on Autism and Other Developmental Disabilities, 26*(2), 105-118. https://doi.org/10.1177/1088357611407063

Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American Educational Research Journal, 50*(1), 4-26. https://doi.org/10.3102/0002831212463813

*Rosenberg, N.E., Artman-Meeker, K., Kelly, E., & Yang, X. (2020). The effects of a bug-in-ear coaching package on implementation of incidental teaching by paraprofessionals in a K-

12 school. *Journal of Behavioral Education, 29*, 409-432. https://doi.org/10.1007/s10864-020-09379-1

Sawyer, M.R., Andzik, N.R., Kranak, M.P., Willke, C.P., Curiel, E.S.L., Hensley, L.E., & Neef, N.A. (2017). Improving pre-service teachers' performance skills through behavioral skills training. *Behavior Analysis in Practice, 10,* 296-300. https://doi.org/10.1007/s40617-017-0198-4

*Sarokoff, R.A., & Sturmey, P. (2008). The effects of instructions, rehearsal, modeling, and feedback on acquisition and generalization of staff use of discrete trial teaching and student correct responses. *Research in Autism Spectrum Disorders, 2*(1), 125-136. https://doi.org/10.1016/j.rasd.2007.04.002

Schafer JL. (1999). Multiple imputation: A primer. Statistical Methods in Medical Research, 8(1), 3–15. https://doi.org/10.1191/096228099671525676

*Scheeler, M.C., Congdon, M., & Stansbery, S. (2010). Providing immediate feedback to co-teachers through bug-in-ear technology: An effective method of peer coaching in inclusion classrooms. *Teacher Education and Special Education, 33*(1), 83-96. https://doi.org/10.1177/0888406409357013

Scheeler, M.C., McKinnon, K., & Stout, J. (2012). Effects of immediate feedback delivered via webcam and bug-in-ear technology on preservice teacher performance. *Teacher Education and Special Education, 35*(1), 77-90. https://doi.org/10.1177/0888406411401919

*Schwartz, I.S., Anderson, S.R., & Halle, J.W. (1989). Training teachers to use naturalistic time delay: Effects on teacher behavior and on the language use of students. *Journal of the*

Association for Persons with Severe Handicaps, 15(1), 48-57. https://doi.org/10.1177/154079698901400106

*Seaman-Tullis, R.L., Cannella-Malone, H.I., & Brock, M.E. (2019). Training a paraprofessional to implement video prompting with error correction to teach a vocational skill. *Focus on Autism and Other Developmental Disabilities, 34*(2), 107-117. https://doi.org/10.1177/1088357618794914

Shawbitz, K.N., & Brock, M.E. (2022). A systematic review of training educators to implement response prompting. *Teacher Education and Special Education.* 1-19. https://doi.org/10.1177/08884064221114130

*Shepley, C., Grisham-Brown, J., Lane, J.D., & Ault, M.J. (2020). Training teachers in inclusive classrooms to collect data on individualized child goals. *Topics in Early Childhood Special Education, 41*(4), 1-14. https://doi.org/10.1177/0271121420915770

Shepley, C., Lane, J.D., & Ault, M.J. (2019). A review and critical examination of the system of least prompts. *Remedial and Special Education, 40*(5), 313-327. https://doi.org/10.1177/0741932517751213

Sims, S., & Jerrim, J. (2020). *TALIS 2018: Teacher working conditions, turnover and attrition.* Department for Education.

Sleiman, A.A., Sigurjonsdottir, S., Elnes, A., Gage, N.A., & Gravina, N.E. (2020). A quantitative review of performance feedback in organizational settings (1998-2018). *Journal of Organizational Behavior Management, 40*(3-4), 303-332. https://doi.org/10.1080/01608061.2020.1823300

Sobeck, E.E., Douglas, S.N., Chopra, R., & Morano, S. (2021). Paraeducator supervision in pre-service teacher preparation programs: Results of a national survey. *Psychology in the Schools, 58*(4). https://doi.org/10.1002/pits.22383

Spooner, F., Knight, V.F., Browder, D.M., & Smith, B.R. (2012). Evidence-based practice for teaching academics to students with severe developmental disabilities. *Remedial and Special Education, 33*(6), 374-387. https://doi.org/10.1177/0741932511421634

Spooner, F., Knight, V.F., Browder, D.M., Jimenez, B., & DiBiase, W. (2011). Evaluating evidence-based practice in teaching science content to students with severe developmental disabilities. *Research and Practice for Persons with Severe Disabilities, 36*(1-2), 62-75. https://doi.org/10.2511/rpsd.36.1-2.62

Stokes, T.F., & Baer, D.M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10*(2), 349-367. https://doi.org/10.1901/jaba.1977.10-349

Stough, L.M., Montague, M.L., Landmark, L.J., & Williams-Diehm, K. (2015). Persistent classroom management training needs of experienced teachers. *Journal of Scholarship of Teaching and Learning, 15*(5), 36-48. https://doi.org/10.14434/josotl.v15i5.13784

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2019). Understanding teacher shortages: An analysis of teacher supply and demand in the United States. *Educational Policy Analysis Archives, 27*(32). https://eric.ed.gov/?id=EJ1213618

*Tekin-Iftar, E., Collins, B.C., Spooner, F., & Olcay-Gul, S. (2017). Coaching teachers to use a simultaneous prompting procedure to teach core content to students with autism. *Teacher Education and Special Education, 40*(3), 225-245. https://doi.org/10.1177/0888406417703751

Thomas, D.R. (2006). A general induction approach for analyzing qualitative evaluation data. *American Journal of Evaluation, 27*(2), 237-246. https://doi.org/10.1177/1098214005283748

Thornton, B., Peltier, G., & Medina, R. (2007). Reducing the special education teacher shortage. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 80*(5), 233-238. https://doi.org/10.3200/TCHS.80.5.233-238

U.S. Department of Education. (2018). *40th Annual Report to Congress on the Implementation of the Individuals with Disabilities. Education Act Parts A, B, and C.* Washington, DC: U.S. Department of Education. https://www2.ed.gov/about/reports/annual/osep/2018/parts-b-c/40th-arc-for-idea.pdf

U.S. Department of Education. (2021). *43rd Annual Report to Congress on the Implementation of the Individuals with Disabilities. Education Act Parts A, B, and C.* Washington, DC:

U.S. Department of Education. https://sites.ed.gov/idea/2021-individuals-with-disabilities-education-act-annual-report-to-congress/

Wagner, M., Newman, L., Cameto, R., and Levine, P. (2006). *The Academic Achievement and Functional Performance of Youth With Disabilities. A Report from the National Longitudinal Transition Study*-2 (NLTS2*)*. (NCSER 2006-3000). Menlo Park, CA: SRI International.

*Walker, V.L., Carpenter, M.E., Lyon, K.J., Garcia, M., & Johnson, H. (2021). Coaching paraeducators to implement functional communication training involving augmentative and alternative communication for students with autism spectrum disorder. *Augmentative and Alternative Communication, 37*(2), 129-140. https://doi.org/10.1080/07434618.2021.1909650

Walker, V.L., & Smith, C.G. (2015). Training paraprofessionals to support students with disabilities: A literature review. *Exceptionality, 23*(3), 170-191. https://doi.org/10.1080/09362835.2014.986606

Walker, V.L., Douglas, K.H., & Brewer, C. (2020). Teacher-delivered training to promote paraprofessional implementation of systematic instruction. *Teacher Education and Special Education, 43*(3), 257-274. https://doi.org/10.1177/0888406419869029

Wiggs, N.B., Reddy, L.A., Bronstein, B., Glover, T.A., Dudek, C.M., & Alperin, A. (2021). A mixed-methods study of paraprofessional roles, professional development, and needs for training in elementary schools. *Psychology in the Schools, 58*(11), 2238-2254. https://doi.org/10.1002/pits.22589

Appendix A. Time Delay Adherence and Quality of Implementation Measure

Directions for running probe:

- Say, "Show me how you would teach the student using a ____ second time delay."
- Begin scoring first trial immediately after paraprofessional provides an opportunity for the student to respond by providing a cue or task direction
- Each subsequent trial begins immediately after a correct student response
- Stop scoring a trial after (a) any step is scored as incorrect; (b) the student provides a correct response; or (c) step 4b(ii) is scored as correct.
- Continue the observation until any of the following occurs (i.e., whichever happens first): all 3 trials have been scored, or 2 minutes have elapsed without a correct student response
- Do not provide any feedback; Be sure to thank the participant for his/her/their time and for doing his/her/their best

Student IEP goal: _____ Circle one: Primary or Generalization

Implementation Step	Trial		
	1	2	3
1. After providing cue or task direction, paraprofessional waits ___seconds or until the student responds without providing any prompt	1 0	1 0	1 0
2a. Immediately after a correct response, paraprofessional delivers specific praise.	1 0	1 0	1 0
2b(i). Immediately after an incorrect response or after ____ seconds without a response, paraprofessional provides a controlling prompt	1 0	1 0	1 0
2b(ii). The topography of the prompt (verbal, gestural, model, and/or physical) matches the first prompt provided in the observation		1 0	1 0
3a. Immediately after a correct response, paraprofessional delivers specific praise.	1 0	1 0	1 0
Row A: Sum of items scored correct			
Row B: Sum of items scored incorrect			
Note: 1 = step scored as correct; 0 = step scored as incorrect Independent; no circle = step not scored. Steps may not be scored if (a) a previous step in the score was scored as incorrect, (b) the learner did not provide the response (correct or incorrect) that would necessitate the paraprofessional to implement the given step, or (c) the observation was terminated before all three trials were scored.			

Total A: Total items scored correct:

(Sum Row A across trials) _____

Topography of first prompt:

Total B: Total items scored incorrect:

(Sum Row B across trials) _____

Overall Percentage Fidelity _____

Directions:

Score these items after completing the probe. Check only one box per item.

Quality of Implementation

Quality of pacing

- ☐ Virtually no pause (< 1 second) between all trials [0]
- ☐ Long pause (>5 seconds) between all trials [0]
- ☐ Brief pause for less than half of trials [1]
- ☐ Brief pause for at least half, but not all trials [2]
- ☐ Brief pause (1-5 seconds) between trials [3]

Match between cue/task direction and target behavior

- ☐ Cue/task direction is NOT a logical match for the target behavior (note why not) [0]
- ☐ Cue/task direction is a logical match for the target behavior [3]

Quality of prompts/student responsiveness

Prompt topography (list all used)	Aligned with the target behavior?	Appropriate given student's vision and hearing abilities?	Delivered with consistent presentation?	Given this prompt, the student attempted a response…	Given this prompt, the student provided a correct response…
1.	☐ Yes [1] ☐ No [0]	☐ Yes [1] ☐ No [0]	☐ Yes [1] ☐ No [0]	☐ 100% [3] ☐ 50-99% [2] ☐ 1-49% [1] ☐ 0% [0]	☐ 100% [3] ☐ 50-99% [2] ☐ 1-49% [1] ☐ 0% [0]
2.	☐ Yes [1] ☐ No [0]	☐ Yes [1] ☐ No [0]	☐ Yes [1] ☐ No [0]	☐ 100% [3] ☐ 50-99% [2] ☐ 1-49% [1] ☐ 0% [0]	☐ 100% [3] ☐ 50-99% [2] ☐ 1-49% [1] ☐ 0% [0]
3.	☐ Yes [1] ☐ No [0]	☐ Yes [1] ☐ No [0]	☐ Yes [1] ☐ No [0]	☐ 100% [3] ☐ 50-99% [2] ☐ 1-49% [1] ☐ 0% [0]	☐ 100% [3] ☐ 50-99% [2] ☐ 1-49% [1] ☐ 0% [0]
4.	☐ Yes [1] ☐ No [0]	☐ Yes [1] ☐ No [0]	☐ Yes [1] ☐ No [0]	☐ 100% [3] ☐ 50-99% [2] ☐ 1-49% [1] ☐ 0% [0]	☐ 100% [3] ☐ 50-99% [2] ☐ 1-49% [1] ☐ 0% [0]

Quality of verbal praise

- ☐ At least some praise has a negative tone that sounds insincere and disingenuous [0]
- ☐ Tone of praise is inconsistent; it is sometimes positive and sometimes neutral [2]
- ☐ All praise has a neutral tone; although not negative, there is room for improvement [1]
- ☐ Praise has a positive tone that is sincere and genuine [3]

Immediacy of reinforcement

- ☐ Reinforcement is never delivered [0]
- ☐ Reinforcement is very delayed (>3 second after a correct response) [1]
- ☐ Reinforcement is somewhat delayed (1-3 seconds after a correct response) [2]
- ☐ Reinforcement is immediate (≤ 1 second after a correct response) [3]

Type of Reinforcement [descriptive item]

- ☐ No reinforcement [0]
- ☐ Reinforcement involves only verbal praise [1]
  - Describe praise statement: _____
- ☐ No verbal praise is used, but another reinforcer is [2]
  - Describe: _____
- ☐ Verbal praise is paired with another reinforcer (e.g., tangible, edible, a short break) [3]
  - Describe: _____

Quality of transition to target instruction

- ☐ Instructor does not say anything to the student (e.g., silently physically prompts student) [0]
- ☐ When directing student to transition to instruction, the instructor uses a negative tone that communicates a negative feeling about the activity [0]
- ☐ When directing student to transition to instruction, the instructor uses a neutral voice tone that neither communicates excitement nor a negative feeling about the activity [2]
- ☐ When directing student to transition to instruction, the instructor uses a positive voice tone that communicates excitement about the activity [3]

Overall quality of implementation (check only one)

- ☐ Poor: There is one significant problem with implementation quality (e.g., negative tone, poorly chosen prompt, ineffective reinforcer), and there may be additional minor issues (e.g., sometimes reinforcement is slightly delayed, wording of task direction is sometimes slightly different) that could be improved. [0]
- ☐ Fair: Overall, there were no significant problems with implementation quality, but there are two or more minor issues that could be improved [1]
- ☐ Good: Overall, there were no significant problems with implementation quality, but there is one minor issue that could be improved. [2]
- ☐ Excellent: Overall, there are no significant or minor issues related to quality of implementation that could be improved. [3]

Quality of Student Responsiveness to Instruction

Across the entire instructional session, how often was the student was engaged?

- ☐ Never [0]
- ☐ Less than half the time [1]
- ☐ More than half the time [2]
- ☐ Always [3]

How often did the student attempt an unprompted response during independent response intervals?

- ☐ Never [0]
- ☐ Less than half the time [1]
- ☐ More than half the time [2]
- ☐ Always [3]

When the student provided an unprompted response during an independent response interval, s/he…

- ☐ Consistently did not attend to key information that would be needed to provide a correct response (e.g., did not look at flashcard, attempted to provide a response before a cue was provided that would determine the correct response) [0]
- ☐ Consistently provided the same wrong response regardless of the stimulus for the trial. [0]
- ☐ Less than half of the time the student attended to key information and attempted to provide a different responses given different stimuli [1]
- ☐ More than half of the time, the student attended to key information and attempted to provide a different responses given different stimuli [2]
- ☐ Always attended to key information and attempted to provide a different responses given different stimuli, even if they were not always correct [3]

How often did the student provide a correct unprompted response during independent response intervals?

- ☐ Never [0]
- ☐ Less than half the time [1]
- ☐ More than half the time [2]
- ☐ Always [3]

Appendix B. Student Progress Measure

Student Progress Toward IEP Goal Data Collection

Student IEP Goal: _____

Date:							
Trial/Stimuli							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
Total							

Student IEP Goal: _____

Date:							
Trial/Stimuli							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
Total							

Instructions: Mark a + if the student gave the correct response and a – if the student gave the incorrect response. Write "NR" if the student gave no response. When applicable, write the name of the stimuli next to the trial number.

Appendix C. Student Word Lists

Chloe's CVC Words

Cat	Fit
Mad	Hut
Pin	Dog
Yen	Yet
Win	Rig
Tug	Tad
Log	Bet
Pit	Cod
Men	Fun
Jig	Lad
Set	Den
Mat	Lit
Bed	Sun
Sad	Tin
Ran	Net

Oliver's Community Signs

First aid

Exit

Stop

Hospital

School crossing

Fire

Emergency

Do not enter

Don't walk

Walk

Open

Women (room)

Men's room

No diving

Poison

No swimming

Wash hands

No trespassing

Power

Crosswalk

Elevator

Danger

Recycle

Yield

Trash

No dogs

Fast forward

Bike route

Appendix D. Social Validity Surveys

Social Validity Survey: Before intervention, TEACHER

1. To what degree do you feel comfortable providing training to the paraeducator(s) in your classroom?
   1 = Not Comfortable at All

   2 = Not Very Comfortable

   3 = Somewhat Comfortable

   4 = Quite Comfortable

   5 = Very Comfortable

2. What training do you provide to your paraeducators?

3. To what degree to do you feel that the training you received in the past was effective in helping you to teach new strategies to your paraeducators? (circle a choice below)

   1 = Not Effective at All

   2 = Not Very Effective

   3 = Somewhat Effective

   4 = Quite Effective

4. How effective are you at prompting students using least to most prompting/time delay/simultaneous prompting?
   1 = Not Effective at All

2 = Not Very Effective

3 = Somewhat Effective

4 = Quite Effective

5. How often do you train your paraeducators now?

    a. _____ times per year

6. Do you feel prepared to provide training to your paraeducators?

Social Validity Survey: Before intervention, PARAEDUCATOR

1. How often do you receive training from your school or teacher?

    a. _____ times per Week / Month / Year (Circle one)

2. How much training do you receive per year? _____

    a. Who provides that training?

3. How effective are you at prompting students using time delay?
   1 = Not Effective at All

   2 = Not Very Effective

   3 = Somewhat Effective

   4 = Quite Effective

Social Validity Survey: After intervention, TEACHER

1. To what degree to do you feel that the training was effective in helping you provide **performance feedback** to your aides? (circle a choice below)

   1 = Not Effective at All

   2 = Not Very Effective
   3 = Somewhat Effective
   4 = Quite Effective
   5 = Very Effective

2. Was there anything in particular that you liked about the training package?

3. Was there anything that you did not like about the training package you received? Or something that you think would be helpful for us to know in the future as we design trainings for other teachers?

4. How likely would you be to use **performance feedback** with the same or different aide in the future?

   1 = Not at All Likely
   2 = Not Very Likely
   3 = Somewhat Likely
   4 = Quite Likely
   5 = Very Likely

5. Was there anything about the **feedback** you used with the aide that you did not like? Or something you think would be helpful for us to know in the future as we design instructional plans for other teachers?

6. What is the likelihood that you would recommend this kind of training for your paraeducator to a colleague? That is – an initial training that uses instruction, modeling, role-play, and performance feedback with multiple examples AND teacher-delivered coaching. (circle a choice below)

   1 = Not at All Likely
   2 = Not Very Likely
   3 = Somewhat Likely
   4 = Quite Likely
   5 = Very Likely

7. How comfortable are you providing **performance feedback** to your paraeducators?

   1 = Not at All Comfortable
   2 = Not Very Comfortable
   3 = Somewhat Comfortable
   4 = Quite Comfortable
   5 = Very Comfortable

Social Validity Survey: AFTER intervention, PARAEDUCATOR

1. To what degree to do you feel that the initial training and role-play was effective in helping you to implement time delay? (circle a choice below)

   1 = Not Effective at All

   2 = Not Very Effective
   3 = Somewhat Effective
   4 = Quite Effective
   5 = Very Effective

2. To what degree to do you feel that receiving feedback from your classroom's teacher was effective in helping you to implement time delay? (circle a choice below)

   1 = Not Effective at All

   2 = Not Very Effective

   3 = Somewhat Effective

   4 = Quite Effective

   5 = Very Effective

3. Was there anything in particular that you liked about the training package?

4. Was there anything that you did not like about the training package? Or something that you think would be helpful for us to know in the future as we design trainings for other aides?

5. To what degree do you feel that time delay was effective for your student? (circle a choice below)

   1 = Not Effective at All

2 = Not Very Effective

3 = Somewhat Effective

4 = Quite Effective

5 = Very Effective

6. How likely would you be to use these same strategies with the same student or a different student in the future?

   1 = Not at All Likely
   2 = Not Very Likely
   3 = Somewhat Likely
   4 = Quite Likely
   5 = Very Likely

7. Was there anything about the instructional strategies you used with the student that you did not like? Or something you think would be helpful for us to know in the future as we design instructional plans for other aides?

8. What is the likelihood that you would participate in a similar professional development opportunity in the future? (circle a choice below)

   1 = Not at All Likely
   2 = Not Very Likely
   3 = Somewhat Likely
   4 = Quite Likely
   5 = Very Likely

9. What is the likelihood that you would recommend this kind of professional development opportunity to a colleague? (circle a choice below)

   1 = Not at All Likely
   2 = Not Very Likely
   3 = Somewhat Likely
   4 = Quite Likely
   5 = Very Likely

Appendix E. Interview Questions

Sample Interview Questions - TEACHER

Script: "First, I am going to ask you a set of questions about your previous training experiences prior to being involved in this study with my research team"

1. Tell me about what training for your aides typically looks like for you.
2. What type of training did you receive related to training aides?

Script: "The remainder of the questions will focus on the current training. We appreciate your honest feedback to help us improve the training in the future."

3. What did you like about the training/support you received in this study – how to deliver feedback for time delay?
4. What didn't you like about the training/support you received?
5. What would you change about the training/support?
6. How does this training/support fit into your current classroom?
7. How does this training/support fit into other classrooms?
8. Would you participate in this type of training/support again?
9. What do you want other professionals to know about the training/support you receive in your classroom?

Sample Interview Questions - PARAEDUCATOR

Script: "First, I am going to ask you a set of questions about your previous training experiences prior to being involved in this study with my research team"

1. Tell me about what training typically looks like for you.
2. What support do you typically receive when working with students?
3. What did your initial orientation/training look like?

Script: "The remainder of the questions will focus on the current training. We appreciate your honest feedback to help us improve the training in the future."

4. What did you like about the training/support you received in this study - the initial training with instruction, modeling, rehearsal, feedback, and multiple examples and teacher-delivered feedback.
5. What didn't you like about the training/support you received?
6. What would you change about the training/support?
7. How does this training/support fit into your current classroom?
8. How does this training/support fit into other classrooms?
9. Would you participate in this type of training/support again?
10. What do you want other professionals to know about the training/support you receive in your classroom?