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## Evidence-Based Teaching Strategies for Children Diagnosed with Autism Spectrum Disorder

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Evidence-Based Teaching Strategies for Children Diagnosed with Autism Spectrum Disorder

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A Literature Review Presented

in Partial Fulfillment of the Requirements

For the Degree of Master of Education

Table of Contents

Abstract .....3

Introduction .....4

Review of Literature .....7

Need for Translating Neuroscience into Educational Practice .....7

TEACCH ..... 10

Applied Behavior Analysis (ABA) Based Instructional Practices..... 12

Visuals ..... 14

Conclusion ..... 16

References.....21

### **Abstract**

The number of school-aged children diagnosed with autism spectrum disorder (ASD) has been increasing over the past decades. As the students enter the education system, school districts and educators face challenges in meeting the academic needs of students with ASD. A 2014 report by the United States Centers for Disease Control and Prevention emphasized that although ASD varies significantly in severity, it occurs in all racial, ethnic, and socioeconomic groups, and is almost five times more common among boys than girls. Thus, contemporary education professionals in all schools are likely to work with students with ASD (CDC, 2014). Teachers in both, the general education and special education setting need to be trained in evidence-based practices, feel confident, and intend to use evidence-based practices when teaching students with ASD. Students with ASD have unique sensory and behavioral needs which must be considered and addressed during academic learning. This literature review examines three evidence-based practices based on student growth and ease of application in a school setting. The strategies examined are TEACCH, Applied Behavior Analysis, and Picture Exchange Communication Systems. The possibility of combining multiple components of strategies to use simultaneously is discussed. The lack of literature translating neurological, behavioral, and psychological-based research findings into educational practice is highlighted and discussed.

*Keywords: Autism, Evidence-Based Practices*

**Evidence-Based Teaching Strategies for Children with Autism Spectrum Disorder**

The incidence rate of school-aged children diagnosed with Autism Spectrum Disorder has increased tremendously over the past decades and continues to be on the rise. In 2020, the CDC found that 1 in every 54 school-aged children was identified with Autism Spectrum Disorder (ASD) in the US (CDC Report, 2020). The number of school-aged children identified with ASD has increased from 1 in 150 children in 2000 to the above stated 1 in every 54 children. (CDC Report).

The American Psychiatric Association's Diagnostic and Statistical Manual, Fifth Edition (DSM-5) criteria for an Autism diagnosis include persistent deficits in social communication and social interaction across multiple contexts and restricted, repetitive patterns of behavior, interests, or activities. Hyper- or hypo reactivity to sensory input or unusual interest in sensory aspects of the environment. Students with ASD have unique sensory and processing needs and a high need for structure and predictability.

Further, federal legislation such as the No Child Left Behind Act of 2001 (PL 107-110) and the Individuals with Disabilities Education Improvement Act of 2004 (PL 108-446) mandate educational institutions utilize evidence-based practices (EBP) for students with disabilities, such as ASD, to improve and/or develop socially significant behaviors in the least restrictive environment. In addition, current legislation mandates that every child, regardless of disability, is entitled to a free and appropriate public education in the least restrictive environment (Individuals with Disabilities Education Improvement Act of 2004). The high prevalence of ASD and the increasing numbers of children diagnosed with ASD entering the school system poses a challenge to teachers and school districts as disability-specific interventions are needed due to the unique sensory, social, communication, and processing deficits presented with ASD.

Professionals in the education field are presented with a two-fold problem. First, the topic of Autism and its unique characteristics has been examined from various independent standpoints. A plethora of research and literature is based on a medical, psychological, neuroscientific, and behavioral perspective.

There is an abundance of literature available in the area of neuroscience. These research findings need to be translated into academic learning strategies, as teachers are presented with students with unique neurological differences. These differences manifest in unique sensory, processing, and behavioral needs. A study by Lambert-Lee et al. (2015) used an ABA approach to learning in a school setting and found that “integration of ABA-based learning within a pre-existing system was possible, and beneficial to students.” (Lambert-Lee et al., 2015).

Teachers need to provide evidence-based interventions to ensure more time on academic tasks, as problem behaviors are decreased by these interventions. Educators and school districts are left with a handful of strategies based on the unique strengths and weaknesses of students with ASD. Wong et al. (2015) reviewed 456 studies conducted on evidence-based interventions for children with ASD and found that research findings focused on evidence-based interventions need to be translated into educational practice.

This literature review examines evidence-based educational strategies available to teach students with ASD. The instructional strategies examined are TEACCH, Applied Behavior Analysis (Verbal Behavior, Discrete Trial), and Visuals such as PECS and PPD. The teaching strategies were examined based on student growth and ease of application in an educational setting, decrease in problem behaviors. In addition, this literature review highlights the lack of translating neurological and psychological differences in children with Autism into educational practice and the imminent need for specialized teacher training.

In 2011, Mesibov et al. requested “more diverse groups to be included into research” and that “studies need to be more defined and translated into practice” (Mesibov et al., 2011).

Magiati, et al. (2012) summarized research on a broader range of interventions and concluded that evidence supports EIBI and some other comprehensive preschool interventions. However, they also highlighted the pressing need for comparative studies of different models of studies.

For this review, the terms “Autism and TEACCH and strategies,” “evidence-based practices,” and “Autism and Behavior, and ABA” were used as Keywords in searches of several databases, including ERIC, DeWitt Library, and ProQuest. Government agencies such as the CDC and American Psychological Association (APA) provided important data on the prevalence of Autism and its diagnostic criteria. Sources ranged from 2011-2021 publication dates with older documents laying theoretical backgrounds instrumental in understanding the current issues.

Neuroscience, Psychology, Applied Behavior Analysis, and Behavior Management are paramount in educating students with ASD successfully. Each of these areas provided important data to support the need for evidence-based education practices based on Neuroscience and Behavior Analysis where the future of our instructional practices lay. The findings in Neuroscience and Behavior Analysis need to be translated into educational practice.

## **Review of the Literature**

### **The Need for Translating Neuroscience into Educational Practice**

Analyzing the existing literature has shown that there is a significant lack of recent research in the field of evaluating current academic strategies and their efficiency in teaching students with ASD. In addition, a significant unmet need for translating neuroscience into educational practice was detected. Due to the challenges of translating neuroscience into educational practice, there have been calls for educational psychology to serve as a translational bridge between the two fields.

Failure to create a bridge between neuroscience and educational practice has resulted in a lack of literature evaluating teaching strategies for children with Autism in a school setting. "It has been challenging in many fields, but there are additional barriers in educational settings, and there is a significant research to practice gap resulting in low levels of EBP" (Forman et al., 2013).

Barriers to implementing neuroscientific research in education are well-established and include theoretical barriers such as the two disciplines having fundamentally different goals and scales of investigation (Willingham, 2009; Devonshire and Dommett, 2010). Although there is substantial research available to inform practice, a significant gap exists between current knowledge about EBPs and their implementation by practitioners (Corona, Christodulu & Rinaldi, 2017; Koffel & Reidt, 2015; Pazey, Gevarter, Hamrick & Rojeski, 2014). For students to be successful, "Precise interventions available to teachers are necessary to successfully teach children with ASD" (Stichter et al., 2016; Lambert-Lee et al., 2015). The pressing need for translation was a recurring theme throughout this literature review. throughout this literature review was the lack of translating advances in the field of neuroscience into educational practice.



The lack of interdisciplinary collaboration and approach was identified by numerous studies. Siguita, 2016 notes that “specialists and support personnel need to find ways to partner across disciplines”. Numerous studies identified gaps in the literature, and the need to collaborate across disciplines as areas of future research (Stichter et al., 2016; Fishman et al., 2018; Mesibov & Shea, 2011).

One study held 26 semi-structured interviews with neuroscientists and education professionals to learn about perceptions concerning the gap between science and practice and the role they play in creating, managing and disrupting this boundary (Edelenbosh et al., 2015). This study by Edelenbosch et al. (2015) discovered that structured and long-term cooperation between neuroscientists and educators does not take place. They identified the fundamental nature of neuroscience research, language and communication barriers, epistemological differences between research and practice, and a rigid educational culture as some of the hindering factors (Edelenbosch et al, 2015).

In contrast, Stringer and Tommerdahl 2016 concluded that the fields of neuroscience and cognitive science are making regular advances in both our knowledge of the neurological architecture of the brain as well as the psychological structures of the mind. However, literature revealed that little progress has been made to connect “ these advances to improvement in human learning, despite a strong interest from educators in applying scientific findings informal educational settings" (Stringer & Tommerdahl, 2016). Educators seem generally enthusiastic about the possibilities for connecting findings from laboratory research to the domain of teachers and students. However, the research-to-practice gap poses a big deficit which can lead to a lack of implementation by teachers. Educators have been given few guidelines regarding how to address the unique characteristics and needs of students with severe disabilities in various settings.

Although the current literature contains numerous studies attesting to the efficacy of instructional techniques that have positively affected the skills of many students with autism, the impact of this information on educators' practices has limitations (Williams et al., 2011). The gap between research and practice seems to affect teacher preparation and training and might also cause a lack of implementation of EBPs.

Unfortunately, with limited research in the area, it is difficult to ascertain the current knowledge and use of evidence-based practices by teachers in the school setting. Further research is warranted, as the use of non-evidence-based practices is a drain on resources at best and harmful to children at worst (Sulek et al., 2019). The disconnect between available EBPs and their implementation in educational settings appears to reflect the research to practice gap that is frequently cited in ASD research (Sulek et al., 2019).

One possible reason causing difficulty in bridging this gap seems to lay in the attributes of scientific research. The Scientific Method is at the core of all research. The scientific method is defined by Merriam-Webster as "principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses". Scientific research in its essence is strictly adhering to fixed protocols. To test the validity of results, experiments should be able to be re-created and yield similar results. Children with ASD have very unique needs varying from student to student. Therefore, interventions and combinations of EBPs are individualized to meet student needs. In contrast, clinicians' and researchers' ability to individualize the intervention and to make adjustments to best meet the day-by-day and minute-by-minute needs of participants (Leaf et al., 2016). In other words,

scientific findings need to be able to be replicated to be valid. The very nature of education and the uniqueness of each student make this a hard task to accomplish.

### **TEACCH**

The division of Treatment and Education of Autistic and Related Communication-Handicapped Children (TEACCH) defines structured teaching as organizing the environment while providing clear physical and visual boundaries, minimizing distractions, using consistent scheduling, providing visual structure to activities, and having a working system in place with a clear beginning and end (Virtues-Ortega et al., 2013). TEACCH takes advantage of the perceptual ability of children with autism, their strong point, to clarify the 'where-how-when-how long, and makes these children more independent in handling their own space and time.

In their 2014 study, O'Hara and Hall found that the engagement of students with Autism during recess increased using structured work systems. During their study, students were provided recess schedules, and all activities were marked with cones and timers. The recess environment was set up based on structured teaching methodology. Two of the three students showed an increase in engagement and an increase in independence during recess activities.

Mavropoulou et al. (2011) found similar outcomes in respect to on-task behavior, task accuracy, and task performance. Throughout 18 sessions, independent play, on-task behavior, and task completion increased with the use of visual organization based on structured teaching principles. Mavropoulou et al. refer to task organization as "a valuable tool for increasing independence in students with ASD" (Mavropoulou et al., 2011).

Hume et al. (2014) conducted similar research regarding task accuracy and independence in students. In their study, the intervention took place in a special education classroom serving students with ASD. The researchers structured student work using structured work systems.

Students worked left to right, signaled when finished, used schedules, and the amount of work to be completed was clearly defined throughout the activity. The results revealed task accuracy increased and prompt dependency decreased with the implementation of structured work systems.

On the contrary, Virués-Ortega et al. (2013) concluded in their meta-analysis of 172 students that TEACCH had only small effects on perceptual, motor, verbal, and cognitive skills. They further concluded that effects on communication, ADL, and motor functioning were negligible or small. Further, Boyd et al. (2014) compared TEACCH, LEAP, and high-quality special education effects on 198 public school students with ASD. Over 12 months, their research determined students benefited academically from all interventions. The study highlighted a greater benefit to students with lower cognitive ability when using TEACCH strategies. These findings could be attributable to “children with lower cognitive abilities likely having more severe symptoms of autism and thus more room for improvement; or it may suggest that some of the environmental and behavioral supports used in TEACCH are more beneficial to children with greater cognitive impairments “ (Boyd, et al., 2014).

Task organization seems to help students with ASD to understand task requirements, sequence of steps, and instructions better. "The organization of materials provides clear guidelines on the positional relationship between the parts and task completion" (Schopler et al. 1995, p. 258). Task organization can be implemented with ease and used cross-curricular. Overall, TEACCH relies heavily on task organization and seems to be an EBP helping students to understand and finish tasks more independently. Further research is needed to evaluate the specific effectiveness of task organization for a variety of individuals with ASD and across different curriculum areas and naturalistic settings.

### **Applied Behavior Analysis (ABA) Based Instructional Practices**

Early intensive behavioral intervention (EIBI) for autism, first described by Lovaas (1987), is based on the principles of ABA. Research evaluations of Applied Behavior Analysis (ABA)-based interventions for children with autism demonstrate positive outcomes. ABA seems to deliver promising results in the area of behavior management, which in turn leads to more periods of on-task behavior and instruction. For example, one study by Flynn & Lo (2016) found a reduction in challenging behavior and improvement in replacement behavior for all students after teachers were properly trained in DRA techniques. Specifically, data on all six students' challenging behavior demonstrated immediate decreases in level when compared to data before DRA implementation with feedback (Flynn & Lo, 2016). However, little research has focused on the translation of these evidence-based interventions into service delivery models within existing education systems (Lambert-Lee et al., 2015).

In 2015 Lambert-Lee et al. conducted a study in the UK analyzing student files over 12 months. This particular study took place at the Tree House School, which is a special school providing education services to students with ASD. To measure the effect of ABA-based learning within a school setting, the VABS and the ABLLS tests of 54 students were analyzed. The students were given both tests at the beginning of the study and again at the end of the 12 months. Based on the results, students showed a major increase in their test scores on both tests. Moreover, the fact that all domains within the ABLLS demonstrated a statistically significant increase in percentage scores indicates that students were learning and making progress over a variety of key curriculum-related areas, rather than progress being focused on smaller areas of development" (Lambert-Lee et al., 2015).

Furthermore, the study found that the length of time students had been attending the school was positively correlated with change within the VABS outcomes. It needs to be noted that students attending the school longer were also older, making it hard to pinpoint what the growth is attributed to. It was noted that “may indicate that the use of a behavioral education model for children and young people with autism throughout their educational career continues to bear fruit and may indeed have a larger impact over time” (Lambert-Lee et al., 2015).

In addition, a positive correlation between students exposed to ABA treatment and their social skills was determined by Leaf et al. in their 2017 study. In their pre-test -post-test randomized design research format, 15 students were instructed in social skills using a variety of ABA-based strategies. Students received a total of 64 hours of instructions divided into 32 sessions, lasting two hours each. The results of this study revealed significant improvement in social behavior for the 15 participants. Leaf et al. 2017 also determined that students maintained acquired social skills when probed after 16 and 32 weeks.

It is important to note that within this study no single, specific social skills curriculum was followed. Instead, the teachers individualized each session’s curriculum based upon multiple factors. These factors included: (1) the student’s deficits; (2) the group deficits as a whole; (3) deficits identified on the various assessments; and (4) parent concerns. The level of individualization of instruction needed based on student characteristics and the use of various instructional tools used has been a recurring theme throughout the review of literature suggesting the need for a more uniform curriculum across the academic setting based on evidence-based strategies. Mohammadzaheri et al. 2015 compared two intervention conditions, Pivotal Response Treatment (PRT) with an adult-directed ABA approach on disruptive behavior during language

intervention in public schools. In their randomized clinical trial study, 30 students were instructed during Speech sessions using both approaches.

Despite the positive outcomes of using a progressive model of ABA (e.g., learner skill acquisition), this model also has some limitations concerning research. For one, it requires in-the-moment assessments and decisions by the teacher which may lead to one teacher selecting to provide a prompt or teach a skill with a certain procedure and a different teacher selecting different prompts or procedures. This may create difficulties in quantifying treatment decisions and ensuring a high degree of fidelity across teachers (Leaf et al., 2016). Teachers perceived they did not have the resources and knowledge to assist students effectively. Concerns have also been raised about whether EIBI discourages spontaneity and interactive communication restricts the child's capacity to develop generalization skills and increases the risk of behaviors that challenge (Schreibman et al., 2015; Shyman, 2016).

### **Visuals**

The Picture Exchange Communication System (PECS) is described as an augmentative communication system frequently used with non-verbal children with autism. PECS can facilitate functional communication, improve severe impairments of functional speech, decrease the behaviors problem. The Picture Exchange Communication System (PECS) is a common treatment choice for nonverbal children with autism. Visual strategies

Numerous research studies show that PECS can be an effective program to assist individuals with ASD to become more effective communicators. Once more, the recurring theme emerges that decisions about the use of the PECS program must complement and reflect the needs of the individual. PECS as any other educational tool needs to be individualized for each

learner. The need for individualization of strategies based on learner needs and ability level is an example that might widen the gap between neuroscience and education. The level of individualization makes it hard to replicate and generalize study results. In the moment adjustments while teaching are just that, in the scientifically valid.

Visual aids such as schedules, calendars, choice boards, and menus serve the primary functions of giving information in a structured, orderly format (Carson et al., 2008; Hodgdon, 2011). In their 2018 study, Cohen et al. used a non-concurrent, multiple baseline design across participants to study the effectiveness of visual supports on increasing independence and reducing staff prompting for task engagement and completion. Results indicated dramatic improvement in task completion without the support of adults. Prompt dependency decreased. In addition, research supported the need for pairing the intervention with instruction. Cohen et al. note “presentation of visual supports paired with systematic teaching use of the supports as a highly effective intervention. Simply providing the support is insufficient to change behavior; instruction on how to use the support is also needed” (Cohen et al., 2018).

In general, the use of visuals seems to be a very promising evidence-based practice in regard to independence, task completion, and reduction of problem behaviors. A variety of visual supports can be used to help decrease challenging behavior, reduce latency, and promote independence during transitions (Hume et al., 2014).

The use of PPD (Picture Plus discussion) was another strategy used to help text comprehension for students. Shurr and Taber-Doughty measured the increase of comprehension in high school students when the PPD approach was used instead of simple story-retell. In their 2017 study, three high school students were given pictures of a story to boost comprehension. The method for selecting represented photos included identifying a list of five key concepts,



events, and ideas within the text and selecting representative images. Students received the images and discussed the pictures before and after reading the text. Evidence was provided that students with significant disabilities can increase their comprehension abilities when reading typical and age-appropriate expository texts when using the PPD approach (Shurr & Taber-Doughty, 2017).

Shurr and Taber-Doughty's 2017 study is an extension of their 2013 study on the same subject. The 2013 study focused on students in the primary grades but yielded very similar results. Shurr and Taber-Doughty 2017 concluded that "this provides an expansion of the current literature focusing primarily on younger students accessing adapted narratives and an extension of the PPD intervention". Overall, the use of visuals seems to help students with ASD comprehend instructions, expectations, and help them navigate throughout the school day, However, the use of visuals seems more successful when paired with other EBPs.

### **Conclusion**

The review of the current literature revealed several studies describing and analyzing the effectiveness of evidence-based practices and strategies when teaching children with ASD. The most documented and researched was the ABA approach. The literature on ABA was most current and inclusive. Literature on TEACCH and PECS was available, but only very few studies were within the last decade. The search term had to be extended from PECS to Visuals to produce sufficient literature for review.

The literature on ABA effectiveness in a school setting revealed some limitations such as lack of control groups in different educational settings, and lack of research in non- Autism specific school settings. Studies have shown that interventions are implemented in the "context of complex systems of care that can vary widely across jurisdictions, even between adjacent, demographically similar provinces. That assumptions about program effectiveness cannot be

divorced from the contexts in which the programs are implemented is central to the field of implementation science" (Smith et al., 2019).

Research on ABA in a school setting lacks studies across varying environments, including mainstreaming classrooms. Another limitation found through this review was the fact that ABA requires in-the-moment assessments and decisions by the teacher which may lead to one teacher selecting to provide a prompt or teach a skill with a certain procedure and a different teacher selecting different prompts or procedures. This may create difficulties in quantifying treatment decisions and ensuring a high degree of fidelity across teachers (Leaf et al. 2016).

Research further suggested that educating students with ASD is a complex task as their individual needs and ability vary greatly from student to student, resulting in the need of combining various approaches and evidence-based practices depending on student characteristics. Students seem to benefit from integrated approaches the most, but Rubin 2007 stated that "an integrated approach of EBPs to address multiple needs, rather than a single strategy to address all needs have been viewed as the optimal model for improving student outcomes". However, the current literature suggests that integrated approaches need to be further assessed and evaluated in the future.

Integrated approaches, when not well-defined or monitored, run the risk of simply becoming an eclectic "buffet of choices" that reflect personal preference or targeted advocacy efforts of specific stakeholders. Developing assessment and analysis strategies that focus on identifying responses to treatment, profiles are essential for the evidence-based practices to move forward (Rubin 2007). Similar results were reported by Watkins et al. In their 2019 meta-analysis study, they tested the effect of 28 evidence-based practices on ASD students in the

inclusive setting. “Multiple intervention types were frequently combined to create unique treatment packages” (Watkins et al., 2019).

There is a significant lack of literature translating neuroscience into educational practices. Throughout this review, school psychologist emerged as a profession potentially bridging the gap as individuals to potentially provide a bridge between the two disciplines. The collaboration between the two disciplines is a promising approach in teaching children with ASD. Psychological and educational practices for training and teaching students with ASD continue to evolve however, a significant gap between theory and practice remains (Sugita, T., 2016). Two observational studies by Fishman et al. 2017 measured the strength of teachers’ intentions to use different evidence-based practices (EBPs), assess variability in intentions, and test whether intentions predict future teacher behavior. The results of the study showed that most attempts to increase the implementation of EBPs in schools have focused on changing teacher behavior through training.

The importance of intentions to implement the EBPs by the teacher is an additional variable needing to be considered. One study observed that teachers not using the EBP of interest had not received any training on the intervention. Further, to aid the implementation of EBPs, implementation strategies can provide additional skills training, reminders, or improvements to the environment that reduce constraints such as providing needed materials, staffing, or problem-solving (Fisherman et al, 2017). More research with fewer limitations is necessary to build a solid foundation of evidence-based practices for teachers to put in their toolbox.

Limitations such as lack of control group in different educational settings, and research in non- Autism specific school settings were recurring themes throughout this review. Another

emerging theme was the lack of research beyond the elementary school age. More inclusive research is needed outside of the elementary age group. (Long & Simpson 2017).

Teacher preparation plays a big role in utilizing evidence-based practices when educating students with ASD. Considering the growing number of students with ASD, both, special education and general education teachers alike need to be trained and feel competent to use these strategies. Two observational studies by Fishman et al. (2018) enrolled public school teachers who work with students with autism. The studies measured the strength of teachers' intentions to use each of 4 different evidence-based practices, assess variability in intentions. Results suggested teachers were willing and motivated to use evidence-based practices. The question about how teachers view their competence level using special programming when working with students with ASD was raised throughout this review. Mills & Chapparo (2018) concluded that “ teachers perceived that they did not have the resources and knowledge to assist students effectively.”

Further, research has correlated positive teacher attitudes as a determining factor in the success of students with ASD in general education classrooms (Nishimura, 2014). Teachers are including students with ASD when they feel confident in their ability level to do so.

Another factor to consider when evaluating evidence-based practices and their success is how the severity of ASD might influence the effectiveness of interventions. Statistical analyses suggested that the severity of ASD at baseline might influence the effectiveness of the treatment. Further analysis indicated that the treatment effect was moderated by the severity of ASD (Young et al., 2016). The severity of ASD symptoms and the unique combination of symptoms seem to influence the teacher's choice of practices and student outcome. Unfortunately, despite the recent trend, there are few models in the field that facilitate the successful placement of

students with ASD in general education classrooms. Teachers, service providers, parents, and others are faced with the daunting task of designing instructional programs for students with ASD without clear guidelines and protocols (Siguita, 2016). It is going to be interesting to witness how much more growth students with ASD will have when presented with an interdisciplinary approach to teaching

Ocampo (2011) found a significant relationship between utilizing joint sessions in speech and language and mental health and goal obtainments, specifically regarding social skills. The study indicated that effective growth is made when students can transfer the skills they are taught in therapy to a variety of settings. Interdisciplinary collaboration provides support for students from different professional perspectives to help master, sustain, and transfer the skills across settings.

Co-teaching might be a promising approach for the future. The special education teacher could serve as the behavior and sensory strategist expert and the general education teacher could provide content level expertise.

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