Promoting Academic Success

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Abstract Students with Autism Spectrum Disorder (ASD) comprise a large percentage of students receiving special education services in schools. Students with ASD have particular areas of need that may influence their academic and school success. In this chapter, we describe some of the reading, mathematics, and communication difficulties students with ASD may have in schools and provide an overview of effective strategies and interventions. Using an applied fictional case example, we highlight how interdisciplinary collaboration can be used within schools to maximize the success of all students with ASD.

One in 59 children have Autism Spectrum Disorder (ASD) and an average of 65–70% of these children receive special education services (Baio et al., 2018).[1] Autism is the largest growing special education eligibility category for students under the Individuals with Disabilities Education Act (IDEA, 2004; Kim, Bal, & Lord, 2018; McDonald et al., 2019). Students with ASD have a wide range of academic skills and abilities and are served in a variety of educational placements, from specialized

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[1] Autism refers the special education eligibility category whereas autism spectrum disorder (ASD) refers to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5; American Psychiatric Association, 2013) disorder. Autism is used to describe students who receive special education services under this eligibility category whereas ASD describes individuals with a medical diagnosis of ASD. It should be noted that a child may have both a medical diagnosis of ASD AND receive special education services or one or the other. In this chapter, although we are focusing on the school setting, we are referring to children with ASD who are students in schools, including those who do and do not receive special education services.

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schools and self-contained classrooms, to fully inclusive general education settings (McDonald et al., 2019). Most students with ASD in public schools are included in general education settings for at least some of the school day (McDonald et al., 2019).

Students with ASD may require services at different times throughout their lives. This chapter focuses on services and supports for K-12 students with ASD under IDEA Part B by (a) describing broadly what students with ASD need to be successful in school, (b) providing an overview of the strengths and needs of students with ASD in reading, mathematics, and communication, (c) describing the associated research-based interventions that address these needs, (d) highlighting how interdisciplinary collaboration between school service providers can best meet the needs of students with ASD in academic settings, and (e) illustrating a case example of a successful interdisciplinary collaboration within multi-tiered systems of support.

What Supports Do Students with ASD Need to Be Successful in School?

Students with ASD experience a wide range of educational outcomes, in part due to the broad range of skills and abilities of individuals with ASD. Even though approximately half of the students diagnosed with ASD have average to above average cognitive skills (White et al., 2016) they have lower rates of college enrollment compared to other students with and without disabilities (Wei, Yu, Shattuck, & Blackorby, 2017). These indicators, combined with the increasing prevalence rates of ASD (McDonald et al., 2019), necessitate that school and community professionals work collaboratively to improve the academic success of students with ASD (Guldberg et al., 2011).

When working with students who have ASD, it is important to avoid focusing solely on academic deficits. Instead, practitioners should assess and recognize the strengths of students with ASD and use them when designing proactive and responsive instructional supports and interventions. Additionally, practitioners should recognize that the presence of ASD does not automatically mean that students will face academic deficits. In fact, many students with ASD are gifted in a variety of content areas (Kim et al., 2018). As a result, instructional planning for students with ASD should also include opportunities for extension and enrichment to allow gifted students with ASD opportunities to meet their academic potential and incorporate their personal preferences (Bianco et al., 2009).

Students with ASD may have specific areas of need related to school success. Multiple authors (e.g., Kasari & Patterson, 2012; Prelock & McCauley, 2012) have also identified difficulties in joint attention as a core difficulty for students with ASD, a skill which is typically developed during early childhood (before age 2). In a review of cognitive training technologies used to treat emotion, language-literacy, and social skills, Wass and Porayska-Pomsta (2014) found that while students made some

improvement when using technologies, there was a little carry over into other settings. Based on these results, they conclude that the difficulties students with ASD may have in transferring and generalizing knowledge may in part be due to difficulties applying new knowledge and skills in noisy, distracting, real-world settings. Therefore, when working with students with ASD, it is important to attend not only to their needs related to skills and knowledge, but also to consider how to support generalization of these skills to novel environments. With these needs in mind, we turn to patterns of academic performance of students with ASD.

School Functioning and Students with ASD

The achievement needs and supports of students with ASD vary within and across individuals. When students with ASD receive services in inclusive environments, priority should be placed on providing them access to the general education environment and curriculum. Within these settings, it is essential that professionals within and outside of schools collaborate to meet the needs of students with ASD. Similar to all individuals, people with ASD can have varying cognitive abilities and achievement across academic domains (Bianco et al., 2009; Kim et al., 2018). Practitioners should rely primarily on individual student assessment when determining specific profiles of academic and functional performance and only use the information below for general guidance.

Reading

Students with ASD exhibit variable reading skills and predictive factors (i.e., decoding abilities, vocabulary, social communication skills, attention, eye-tracking, language abilities, cognitive abilities) of reading skills within this population are also wide-ranging (e.g., Brown, Oram-Cardy, & Johnson, 2013; Micai, Holly, Vulchanova, & Saldana, 2017; Nation, Clarke, Wright, & Williams, 2016; Norbury & Nation, 2011). In comparison to neurotypical peers, many students with ASD demonstrate comparable reading fluency skills, but significantly poorer reading comprehension skills (McIntyre et al., 2017). Subsequently, many students with ASD may appear to be strong readers when they read text fluently (reading fluency), but they may not be understanding what they read (reading comprehension). Text that is high in social content or requires inferential skills may be even more challenging for students with ASD (e.g., Davidson, Kaushanskaya, & Weismer, 2018; Tirado & Saldaña, 2016). The development of reading comprehension skills is important as students begin to use these skills to learn content from and demonstrate mastery of other academic areas (e.g., science). The assessment of both reading fluency and comprehension skills for students with ASD is critical to adequately determine needs and educational planning surrounding literacy.

Mathematics

Several studies indicate that the mathematical abilities of autistic children are also highly variable. Within-group research suggests that there may be multiple profiles of ASD and math performance, ranging from very low to very high while controlling for intellectual quotient (IQ) and other competencies (Chen et al., 2019; Jones et al., 2009; Wei et al., 2015). For example, Jones et al. (2009) found three distinct math/IQ profiles for 14- to 16-year-olds diagnosed with ASD, including groups whose numerical operations abilities exceeded, fell short of, or matched their full-scale IQ . Similarly, Chen et al. (2019) found that while typically developing 7- to 12-year-olds exhibited homogeneous math and reading abilities, age-matched children with an ASD could be distinctly divided into two groups: those with lower math than reading skills and those with higher math than reading skills.

When students with ASD reach higher levels of academic mathematics, their performance may be largely affected by their verbal comprehension, perceptual reasoning (e.g., the ability to abstract and comprehend conceptual relationships), and anxiety (Oswald et al., 2016). In other words, inferior mathematics performance may not be the result of an auxiliary deficit, but rather may be a consequence of hallmark social and communication deficits at the core of ASD. Given that mathematics instruction is inextricably linked to language comprehension, as well as social interaction between the teacher and the student, deficits may relate more to instructional method than to subject matter.

Communication

Communication skills are tied to student performance in all content areas and are integral to navigating the academic and social context of schools (White et al., 2016). In 1943, when Kanner described students with what we now call ASD, he noted "if language developed" it was marked by echolalia, pronoun reversals, and concreteness (Volkmar et al., 2014). As we have improved and changed the diagnostic criteria for ASD, we now understand that students may have these difficulties, but their difficulties in speech, language, and communication are varied. Difficulties in communication, particularly in social-pragmatic communication, are now considered one of the defining characteristics of individuals who are identified as having ASD. The DSM-5 (APA, 2013) describes the social-pragmatic difficulties in greeting, sharing, using verbal and non-verbal communication, and difficulties in understanding idioms, humor, metaphors, and multiple meaning in varied contexts. Consequently, most research in the communication of individuals with ASD has focused on the pre-linguistic and developing language skills of students with ASD (see chapter 'Coordinating Speech-Language Pathology Services for Youth with Autism Spectrum Disorder' for additional information) rather than on the academic language needs of these same students as they age and progress through the educational system.

The heterogeneity of symptoms in students with ASD is also evidenced in their communication skills. Difficulties in communication are found in non-verbal, as well as verbal skills. Students with ASD often do not point to express interest (DSM-5, 2013; Volkmar et al., 2014). For those who are non-verbal or deaf or hard of hearing, difficulties in use and understanding of gestures may mean that sign language will not be an appropriate alternative communication modality. Other students may have superior receptive and expressive language skills and yet lack understanding of social norms within their classroom or school. Some individuals with ASD are also noted to use restricted or stereotyped communication (they may be an expert on the solar system), or repetitive phrases (e.g., "hmmm, let me think a minute" becomes an automatic response each time the student is asked a question). Many students with ASD have difficulties in the use of correct prosody or intonational patterns in speech. This makes it difficult for the listener to know if the student is excited or distraught without looking for more information. This difference in understanding the prosody of others, sometimes referred to as a supralinguistic aspect of communication also makes it difficult for them to understand the subtle difference in the utterances (e.g., Is this yours? vs. Is THIS yours? vs. Is this YOURS?). Difficulties in supralinguistic skills may mean that these students may have difficulty understanding things not explicitly stated, understanding figurative language or jokes that their peers laugh at, problem-solving, and identifying the main idea and supporting arguments. These difficulties may occur in the classroom when information is presented verbally, when students read information, and when students are presented with higher level math word problems (Knight & Sartini, 2015).

While communication difficulties are a hallmark of ASD, they are also one of the best predictors of outcomes. A child's overall cognitive ability and communication at the sentence level at 5 years of age is the best predictor of long-term prognosis (Volkmar et al., 2014). Kim and colleagues (2018) also found that students with IQ scores below 85 showed consistently lower academic achievement and that students who displayed a significant difference between their cognitive and academic scores on standardized assessments also had a discrepancy in at least one academic area. Even for those with average cognitive abilities, 22% of 9-year-old and 32% of 18-year-old students in the study were below or low average in at least one academic domain (Kim et al., 2018).

Speech in ASD

There is little consistent information available regarding the speech sound production, speech fluency, nor speech prosody of students with ASD. A systematic review by Broome, McCabe, Docking, and Doble (2017) was inconclusive in identifying specific characteristics of the speech (articulation, voice problems, prosody, fluency) of students with ASD. As discussed above, while difficulties in prosody can be heard in the communication of some students with ASD, this is not a universal characteristic. There is currently no standardized assessment tool to evaluate and measure

difficulties in prosody. It may be that prosody is affected by speech fluency, word finding difficulties, or sensory system feedback. Currently, Holbrook (in preparation) has a tool in development entitled The Brief Prosody Rating Scale for ASD which may prove helpful to clinicians and researchers alike in classifying and identifying the underlying difficulties in speech-language prosody.

Specific Interventions to Support Academic Success of Students with ASD

In the next section, we describe specific interventions that have been demonstrated through research to provide positive results for students with ASD. We recommend that practitioners select research-based interventions when working with students with ASD.

Reading Interventions for Students with ASD

The current research on reading interventions is still emerging for students with ASD but several interventions have been determined to be effective. The majority of research has focused on interventions for reading comprehension skills, although some studies have explicitly addressed reading fluency skills. Several interventions and strategies are effective for reading fluency, such as listening passage preview, repeated readings, reread-adapt and answer-comprehend (RAAC), error correction, fluency training, discrete trial instruction, and Reading Mastery curriculum (Guthrie, 2017; Hua et al., 2012; Kamps et al., 2016; Nopprapun & Holloway, 2014; Reisener, Lancaster, McMullin, & Ho, 2014). Specific to reading comprehension, the use of several techniques, such as peer-based strategies, cooperative learning groups, reading aloud, direct instruction, video modeling, priming, self-management, graphic organizers, computer-assisted technology, story mapping, and reciprocal questioning, have been shown to be effective (Chiang & Lin, 2007; El Zein, Solis, Vaughn, & McCulley, 2014; Fleury et al., 2014; Finnegan & Mazin, 2016; Randi, Newman, & Grigorenko, 2010; Schatz, 2017; Senokossoff, 2016). Determining the effectiveness of reading interventions for students with ASD who have cognitive delays is also warranted as most of the aforementioned studies focus on students with ASD who have at least average cognitive abilities.

Mathematics Interventions for Students with ASD

A primary recommendation from recent research reviews on mathematics interventions for students with ASD is the use of explicit instruction with prompts and consequences incorporated, both for teaching mathematics topics, as well as for teaching content-vocabulary (King, Lemons, & Davidson, 2016; Spooner, Root, Saunders, & Browder, 2019). Explicit instruction (with connected prompting strategies and positive reinforcement) should form the foundation of mathematics instruction and intervention for students with ASD.

Spooner et al. (2019) recommend using systematic and explicit instruction, as well as task analysis to isolate the steps involved in solving many mathematics problems. Three evidence-based instructional supports should be used with students with ASD: graphic organizers, manipulatives, and technology aided instruction. Graphic organizers can help students understand and make connections between related mathematics concepts, and guide them through problem-solving processes when working with word problems. Manipulatives can be used in conjunction with graphic organizers and explicit and systematic instruction to help students visualize and make sense of the mathematics concepts and tasks. Technology aided instruction (i.e., the use of calculators, video modeling, or computers) is also recommended to help students compensate for difficulties they may have with computation, and to help students connect mathematics topics to real-world applications.

Communication Interventions for Students with ASD

The National Autism Center's (NAC) National Standards Project (NSP; National Autism Center, 2015) has identified several language interventions that have an established level of evidence in treating students with ASD. Three intervention approaches have an established level of evidence for students with ASD in preschool and beyond: modeling, story-based interventions, and language training. In modeling, the communication partner, which could be an adult or a peer, demonstrates the desired behaviors. Video modeling has also been shown to have established efficacy, and story-based interventions been shown to be effective. In preschool populations, stories may be entirely visually based, and as a student begins to master literacy skills, words and sentences are added to the stories. For adolescents, this intervention may be a comic strip (Hutchins & Prelock, 2006) where they are also engaged in drawing the comic and adding the "thought" or "word" bubbles above the character's head. Story-based interventions help a student with ASD begin to take on the perspective taking as they engage with "others" in their stories. Language training may help improve communication, interpersonal skills, and interactive play skills. Strategies can include modeling, prompting (either verbally, visually, or gesturally, or a combination thereof) and the use of positive reinforcement to shape the language behavior.

Much of the research regarding communication in school-age children with ASD has focused on discrete rather than global or holistic social skills. Volkmar et al. (2014) also found that many of the social communication strategies were completed at the individual level, with few interventions completed at the small group or classroom levels. Some interventions were conducted on a playground as a way to encourage more natural communication. However, the authors of this review also found limited evidence for social-pragmatic interventions. The comprehensive review completed by The National Autism Center (2015) also designated social skills programs as having emerging evidence.

Providing direct instruction on written language skills has been shown to have some efficacy as an academic intervention for students with ASD. A literature review of 15 writing instruction studies indicated that direct instruction in the written use of story elements, narration, and spelling resulted in student improvements in these skills, which were maintained over time (Pennington & Delano, 2012).

Multicomponent Interventions to Address a Variety of Needs

Instructional strategies and interventions should match the individual student's needs and support access to the core curriculum (Spooner et al., 2019). As such, multicomponent interventions are often an appropriate way to meet students' needs, especially since there is a strong connection between social skills and academic performance (Fleury et al., 2014). Students with ASD may be receiving a variety of different support services, so it is essential that all relevant professionals be included when determining instructional or intervention plans for students with ASD (Leach & Duffy, 2009). Related professionals, including special education teachers, SLPs, occupational therapists, psychologists, behavior analysts, and parents (Leach & Duffy, 2009) should work together to identify the student's needs, strengths, and goals and to determine an appropriate multicomponent intervention. To help support students' long-term success, interventions should prioritize conversation ability and communication skills, which are associated with increased odds of pursuing college and declaring a science, technology, engineering, or mathematics major (Wei et al., 2017).

Factors Influencing Interdisciplinary Collaboration in Schools

Interdisciplinary collaboration relies on an understanding of the variety of school systems and structures that may influence the needs and services of students with ASD. Although the descriptions below are typical, school structures, personnel roles, and resources can vary. We recommend that practitioners consult with administrators

and other key stakeholders in their settings to better understand the variables relevant to meeting the needs of students with ASD.

School Type

Public schools serve 90% of students in the US (National Center for Education Statistics [NCES], 2017). Public schools, including magnet and charter schools, are responsible per IDEA (2004) for identifying and serving students with disabilities under their jurisdiction. For public schools, this includes all students within their boundaries, and for charter schools, all enrolled students. Property taxes serve as the primary funding source for public schools (Hoffman, Anderson-Butcher, Fuller, & Bates, 2017), which may limit available resources to serve students with ASD in low-income urban and rural areas. Charter schools rely on state or federal government budgets to receive needed funds (Waitoller, Maggin, & Trzaska, 2017).

Private schools differ from public and charter schools. Since they charge tuition, private schools are more likely to have the necessary funds to serve students. Private schools are only required to provide accommodations to students with disabilities (Americans with Disabilities Act, 1990), not interventions since IDEA excludes private institutions. As a private institution, these schools have more flexibility to provide specialized curricula and services for students with ASD or other disorders. In the event a public school is unable to reasonably meet the needs of a student, they may refer parents to a private school with specialized services and pay the students' tuition (IDEA, 2004). A thorough understanding of students' educational needs and the resources of their public, charter, or private school is necessary for effective interdisciplinary care.

School Level

School level also influences the available resources of schools and the needs of students. At the primary level, students with ASD may still be unidentified or in the process of receiving individualized education plans (IEP) if needed (IDEA, 2004). With assessment and identification being the primary concern, school psychologists, SLPs, and other trained professionals are more heavily involved at this stage. School-based autism services most often focus on accessibility (e.g., transportation, adapting activities) and speech, physical, and behavioral interventions (Wei, Wagner, Christiano, Shattuck, & Yu, 2014).

At the secondary level, schools serve more students (NCES, 2017). Students are expected to be more independent, face more transitions within the school day and between days, and navigate a more complex social landscape (Rispoli, Lee, Nathanson, & Malcolm, 2019). ASD services include more social and emotional counseling than speech, physical, or behavioral interventions (Wei et al., 2014), as

well as an increased focus on post-secondary transition (Rispoli et al., 2019). It also becomes increasingly difficult to coordinate services within the school compared to the elementary school where often only one general education teacher is serving a student at a time (Hedges et al., 2014). By middle and high school, a student may see upwards of four teachers a day, while only one is required to participate in the development of their IEP (IDEA, 2004), which may result in inconsistent implementation across teachers.

School Setting

The U.S. Census Bureau (2010) outlines two types of urban areas: urbanized areas, populated by over 50,000 people, and urban clusters, with between 2,500 and 50,000 inhabitants. These two definitions account for major cities, metropolitan areas, and suburbs. Together, in 2010, over 249 million people or 80.7% of the US population lived in these settings, including the majority of the nation's students. Urban schools are more likely to have greater ethnic and linguistic diversity and high dropout rates (Vaughn et al., 2019), and are more prone to racial segregation (Chapman, 2018). Urban schools also tend to be close to medical centers, universities, and clinics, which may help facilitate collaboration (Iadarola et al., 2015). Urban schools may face a variety of challenges: high rates of teacher burnout and relocation (Ouellette et al., 2018), lack of funding in poverty centers, and large student populations per school (Merillat, Corrigan, & Harper, 2018).

Though serving a very different demographic, rural schools face many of the same challenges. The U.S. Census Bureau (2010) defines a rural area as any region with a population of less than 2,500 people. An estimated 59.5 million people in the US, or 19.3% of the population, live in rural areas. Despite the smaller proportion of the population, rural land makes up the majority of the US, meaning greater distances between students and schools. Rural schools, like urban schools, may face financial constraints, high dropout rates, and poverty (Hoffman, Anderson-Butcher, Fuller, & Bates, 2017). Rural schools have less access to trained professionals due to distance, transportation constraints, and stigma toward help-seeking. Because of this, rural schools may be understaffed and struggle to implement multi-tiered systems or programs (Oyen & Wollersheim-Shervey, 2018), relying more heavily on parents and community members to meet student needs (Hoffman et al., 2017).

Though suburbs are not distinguished from urban areas by the U.S. Census Bureau (2010), research indicates they are distinct. Suburban schools have higher mathematics and reading performance scores, as well as greater rates of college attendance (Goforth, Yosai, Brown, & Shindorf, 2017). However, suburban schools carry a mix of the advantages and disadvantages of rural and urban areas. Namely, distances between trained professionals are greater compared to urban centers, but parental involvement and funding are more common than in other areas. Suburban schools traditionally share similar racial and ethnic compositions as rural schools but have larger student populations than they do.

How Interdisciplinary Collaboration Can Address Students' Needs

Because ASD is a complex and multi-faceted disorder, students with ASD may require intervention from those with expertise in a number of different areas. Effective collaboration among personnel and families working with students with ASD improves student outcomes, facilitates transitions and strengthens working relationships (Emmons & Zager, 2018). The following elements are essential for collaboration: commitment, communication, strong leadership from decision makers, understanding the culture of the collaborator, adequate resources, minimizing turf issues, and engaging in preplanning (Johnson, Zorn, Yung Tam, Lamontagne, & Johnson, 2003). Effective collaboration also relies on establishing shared priorities. Parents, educators, and specialists working with students with ASD identify students' academic learning and social–emotional needs as high priorities, and parents rank students' academic learning as a higher priority than educators. Each of these groups also note the need for transparency in translating research into practice, as well as the need for continuing education/training (Saggers et al., 2019).

Collaboration can be strengthened through the involvement of knowledgeable administrators, the use of family-centered care, and by increasing the self-efficacy of service providers. Administrators with an understanding of ASD and evidence-based treatments are more likely to foster collaboration, provide appropriate services, and ensure that all personnel have the necessary skills and training (Pazey, Gevarter, Hamrick & Rojeski, 2014). Family-centered care, specifically a medical home model, is associated with positive student outcomes, including reductions in negative behaviors, increased social responsiveness, and overall improvements in quality of life (Carbone, Behl, Azor, & Murphy, 2010; Dang et al., 2017). Increasing service providers' self-efficacy also results in more ease in collaborating with parents, as well as improved performance and reductions in problem behaviors (Emmons & Zager, 2018).

Applied Case Example—Interdisciplinary Supports Implemented Through MTSS

In the following section, we will illustrate how professionals and relevant stakeholders can work together to meet the academic needs of students with ASD, using a fictional applied case example. Throughout this example, we focus on how a structure of MTSS (see chapter 'Supporting Students with Autism Spectrum Disorder in Schools Through Multi-Tiered Systems of Support' for more information), which includes School-Wide Positive Behavior Interventions and Supports (SWPBIS) and Response to Intervention (RtI), can be utilized to facilitate interdisciplinary collaboration to meet the needs of students with ASD. Students with ASD, regardless of whether they are receiving special education services or not, may have needs that

correspond with any tier within MTSS, and their needs may be fluid (i.e., in some areas they may require Tier 2 supports, while in others they may not require any; as students respond to interventions, they may not require additional supports beyond Tier 1).

Proactive and responsive approaches to promote academic success (Tier 1). Sierra Middle School (SMS) is an urban school that enrolls approximately 700 students. Sierra Middle School has been implementing MTSS for the last 7 years and places a high value on interdisciplinary collaboration to meet the needs of all students. At Sierra, Tier 1 implementation efforts are facilitated and monitored through a Leadership Team, which includes an administrator, department heads for each subject area and special education, a school counselor, a school psychologist, a social worker, and a representative from the parental advisory board. After reviewing school and student-level data, this team decided on several research-based Tier 1 approaches to implement school-wide (see list of Tier 1 approaches in Table 1).

During a data review at one of their regular meetings, the School Leadership Team noticed that several students with ASD had lower grades in several classes, and a higher rate of office discipline referrals due to inappropriate behavior. The Leadership Team invited an ASD expert to their meetings to assist in re-examining their Tier 1 supports. The ASD expert recommended that the school incorporate Universal Design for Learning (UDL) as a framework to organize proactive supports not only for students with ASD, but all students. Universal Design for Learning (UDL) involves intentionally incorporating a variety of instructional supports from the outset, as opposed to individualized supports for particular students (Ok, Rao, Bryant, & McDougall, 2017). The Center for Applied Special Technology (CAST), a leader in research, development, and implementation related to UDL, provides three guiding principles for UDL: (1) provide multiple means of engagement, (2) provide multiple means of representation, and (3) provide multiple means of action and expression (CAST, 2018).

Sierra Middle School utilized the resources on the CAST website (http://www.cast.org/) to enhance their existing Tier 1 supports. They provided professional development for their teachers to ensure that they had the knowledge and resources to effectively implement UDL in their classrooms, and established interdisciplinary professional learning communities that provided teachers, related school personnel, and administrators opportunities to share knowledge and resources to enhance the quality of UDL implementation. The School Leadership Team reviewed data after the school implemented UDL for several weeks, and found that the grades and behaviors of most students with and without ASD had improved since implementing UDL.

Targeted and individualized supports and interventions (Tier 2). Students with ASD may need additional targeted supports and interventions in addition to Tier 1. The specific form of these interventions can vary based on individual student factors, such as age, level of functional and academic performance, and the student's particular needs and preferences. For many students in preschool and early elementary grades, interventions are individualized and intensive, and are gradually faded or adjusted as students' skills develop. When faded or adjusted, such interventions

Table 1 Tier 1, 2, and 3 Academic Strategies and Interventions for Students with ASD

Tier 1	Tier 2	Tier 3
Estimated that 80% responsive to Tier 1 supports alone	*Estimated that 15–20% will need Tier 2 supports in addition to Tier 1*	*Estimated that 5% will need Tier 3 supports in addition to Tiers 1 and 2*
Engagement: • Group opportunities to respond • Physical opportunities to respond • Variety of response opportunities • Incorporate student interests in academic tasks • Incorporate a variety of instructional tasks and activities **Academic Instruction**: • Explicit and systematic instruction • Graphic organizers • Visual cues • Mnemonic devices **Self-management**: • Explicit strategy instruction • Goal setting • Self-monitoring	**Teach new (or adjust existing) social, communicative, or academic behaviors**: • Discrete trials • Massed trials • Naturalistic behavior • Peer mediation • Video modeling • Self-modeling (video recorded) • Differentiated assessments and class activities • Differential reinforcement of other behaviors • Extinction • Antecedent manipulation **Build communication skills**: • Assistive devices • Picture Exchange System • Use scripts to help students engage with peers and/or academic content • Role plays • Social stories	**Individualized interventions, determined based on students' needs and strengths. Approaches that may be incorporated include**: • Task analysis • System of least to most prompts, or most to least prompts • Use a model-teach-lead format of instruction and support • Time delay prompting • Adapt curricula or assessments • Conduct functional-behavioral analysis and develop individualized behavior support plan **Team responsible for developing and monitoring individualized intervention should meet regularly to review data related to fidelity of intervention implementation, social validity of the intervention, and the student's response to intervention**

Note: Content in this table relates primarily to academic supports and interventions. See chapter 'Supporting Students with Autism Spectrum Disorder in Schools Through Multi-Tiered Systems of Support' for behavior strategies. Citations for content in this table: Archer & Hughes (2011), Fleury et al., (2014), Hart and Whalon (2008), Lane, Menzies, Ennis, and Bezdek (2013); Leach and Duffy (2009), National Research Council (2001)

can be delivered in a group format or supported in inclusive instructional settings (National Research Council, 2001).

Sierra Middle School organizes Tier 2 and 3 implementation efforts using a Student Support Team. The Student Support Team includes an administrator, school psychologist, counselor, special educator, SLP, a teacher representing each grade level, and a member of the parental advisory board. The team meets bi-weekly to identify students who may need additional supports and determine which of their existing supports and interventions are appropriate for each student. Whenever possible, the team focuses on providing students with access to group-based interventions

to facilitate transfer to inclusive settings. Based on recommendations from reviews of research on students with ASD, Sierra Middle School ensures that for Tier 2 and 3 interventions they have: (1) a continuum of supports that are readily implemented, and located within inclusive, as well as specialized instructional environments; (2) interventions focused on the needs of particular students, and reflective of the family's goals and wishes; (3) interventions with students with ASD that support the development of language, communication, social understanding, and peer interaction; (4) high-quality training for practitioners and caregivers to allow them to implement and/or support interventions implemented with students with ASD; (5) a formal protocol establishing and coordinating the responsibilities of the various professionals involved in providing interventions to students with ASD; and (6) a structured consultation process to recruit student input and involvement (Guldberg et al., 2011). Table 1 provides a list of common Tier 2 supports and interventions.

At the first student support team meeting following the implementation of UDL at Tier 1, the team identified five students who needed additional support. These students had failing grades in their content area classes (English Language Arts and Mathematics). Based on data collected by the students' teachers, all five students tended to be withdrawn and not participate during class activities, which was directly affecting their academic performance in class. The student support team identified a social skills group, facilitated by a school psychologist and SLP, that might help support these students in developing communication skills useful for engaging in classroom activities.

Intensive and individualized supports for students with ASD (Tier 3). A small percentage of students with ASD will need intensive, individualized supports to reach their academic goals. Most students will have their needs effectively met through Tier 1 and 2 supports. The Student Support Team at Sierra Middle School identifies students in need of Tier 3 supports by evaluating students' response to Tier 2 interventions and supports. If a student has not made enough improvement after receiving a Tier 2 intervention for a specified amount of time, the Student Support Team initiates a process for the student to access Tier 3 supports.

Because Tier 3 supports are individualized and intensive, they are typically determined by a team of professionals who focus on the particular student's strengths and needs. This team could be a student's Individualized Education Plan (IEP) team, which includes an administrator, the student's parents or guardians, the student, the student's special education case manager, each of the student's general and special education teachers, and any relevant service providers (e.g., SLP, school psychologist, social worker, occupational therapist, audiologist, behavior specialist, mathematics or reading specialist). This team meets to review the data, determine goals for the student, and to develop an individualized intervention plan. It is recommended that intensive interventions for students with ASD incorporate behavioral principles. At this level of support, interventions tend to include multiple components and may target several different areas of need (i.e., behavior as well as communication and academic skills; Fleury et al., 2014). Table 1 provides some common Tier 3 intervention approaches.

It is important to use research-validated interventions for students in need of individualized supports because of the time-intensive nature of interventions required at this level (Lane et al., 2013). Additionally, for some students with ASD, Tier 3 interventions may focus on priority areas of behavior and communication, but not specifically academic skills. In these cases, teachers can still include students with ASD who have more individualized needs in resource or core instruction by adapting curricula or materials. For example, teachers may adapt the reading material students are presented with to provide the student with more intensive needs with a shorter text at an easier reading level (Fleury et al., 2014). Another example is that teachers may adapt an academic task that involves students writing their responses to have the student provide responses orally (or through pictures or text to speech communication device), which may also help support the student's communication skills. The goal of adjusting academic tasks should primarily be to provide the student with the greatest access to grade level core content and their general education peers.

The Student Support Team at Sierra Middle School met to review the data two weeks following the start of the Tier 2 intervention for the five students who were identified as in need of additional support. While four of the students demonstrated excellent progress, one student, Steven, continued to have failing grades and be disengaged during class activities. The team decides that Steven needs Tier 3 supports and begins the process of scheduling a meeting with his parents, teachers, and related service personnel. This team, based on a review of Steven's data, develop an individualized intervention that involves the collaboration of Steven's special education case manager, teachers, a behavior specialist, an SLP, and a school psychologist. The team implements the intervention and meets regularly to review Steven's progress. Steven's grades improve, thanks to the interdisciplinary collaboration of his team.

Conclusion

Students with ASD can be effectively supported in reaching their academic goals when included in general education classrooms, especially when instructional planning occurs within a framework of UDL, and additional supports and interventions are delivered within a system of MTSS. To efficiently and effectively assist students with ASD in achieving academically, a team of educators and care providers must communicate effectively and collaborate closely.

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