Innovation Configuration

Evidence-Based Practices for Students With Severe Disabilities

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Innovation Configuration for Evidence-Based Practices for Students With Severe Disabilities

This paper features an innovation configuration (IC) matrix that can guide teacher preparation professionals in the development of appropriate evidence-based practices (EBPs) for students with severe disabilities. This matrix appears in the Appendix.

An IC is a tool that identifies and describes the major components of a practice or innovation. With the implementation of any innovation comes a continuum of configurations of implementation from non-use to the ideal. ICs are organized around two dimensions: essential components and degree of implementation (G. E. Hall & Hord, 1987; Roy & Hord, 2004). Essential components of the IC—along with descriptors and examples to guide application of the criteria to course work, standards, and classroom practices—are listed in the rows of the far left column of the matrix. Several levels of implementation are defined in the top row of the matrix. For example, no mention of the essential component is the lowest level of implementation and would receive a score of zero. Increasing levels of implementation receive progressively higher scores.

ICs have been used in the development and implementation of educational innovations for at least 30 years (G. E. Hall & Hord, 2001; G. E. Hall, Loucks, Rutherford, & Newton, 1975; Hord, Rutherford, Huling-Austin, & Hall, 1987; Roy & Hord, 2004). Experts studying educational change in a national research center originally developed these tools, which are used for professional development (PD) in the Concerns-Based Adoption Model (CBAM). The tools have also been used for program evaluation (G. E. Hall & Hord, 2001; Roy & Hord, 2004).

Use of this tool to evaluate course syllabi can help teacher preparation leaders ensure that they emphasize proactive, preventative approaches instead of exclusive reliance on behavior reduction strategies. The IC included in the Appendix of this paper is designed for teacher preparation programs, although it can be modified as an observation tool for PD purposes.

The Collaboration for Effective Educator, Development, Accountability, and Reform (CEEDAR) Center ICs are extensions of the seven ICs originally created by the National Comprehensive Center for Teacher Quality (NCCTQ). NCCTQ professionals wrote the above description.

Individuals with moderate and severe developmental disabilities have been offered some of the most rapidly evolving educational services since students with disabilities were first guaranteed a free appropriate public education in 1975 (under PL 94-142). Although schools were not required to provide services prior to the 1970s, schools now must be accountable for ensuring that all students, including those with severe disabilities, make adequate yearly progress. For students to make adequate progress, teachers need access to the most effective instructional procedures available. Fortunately, research on how to teach students with severe disabilities has also rapidly evolved in the past 40 years. Our purpose for this IC was to summarize current, high-quality research on teaching students with severe disabilities.

Methodology

Terminology

Before describing these practices, it is important to clarify the population of focus. The term *significant cognitive disabilities* was introduced with the 1997 Amendments to the Individuals with Disabilities Education Act (IDEA, 2004) to refer to the disabilities of students who needed an alternate assessment to participate in the states' assessment systems. The term was retained in the No Child Left Behind Act (NCLB, 2008) and the reauthorization of IDEA (2004) to refer to this assessment group. In contrast, the term is not categorized as a disability category in IDEA. The term *intellectual disability* has now replaced *mental retardation* in IDEA. Handleman (1986) proposed the term *severe developmental disabilities* as an umbrella term to refer to the disabilities of individuals with autism, severe intellectual disabilities, and multiple disabilities. A *developmental disability* is one that (a) is manifested before the age of 22, (b) is chronic and severe, (c) can be attributed to a mental or physical impairment or both, (d) results in substantial functional limitations in major life activities, and (e) requires a lifelong

need for special services that are individually planned and coordinated (Handleman, 1986). With appropriate supports over time, the life functioning of the person will improve (American Association on Intellectual and Developmental Disabilities [AAIDD], 2010). In this research summary, we have used the shorthand *severe disabilities* to refer to severe developmental disabilities. While describing individual studies, we were as specific as possible about the participants' disabilities (e.g., intellectual disabilities).

Identifying the Practices

To identify practices for review, we used textbooks and articles on personnel preparation in severe disabilities and then cross-referenced these recommendations with the research literature. In this section, we have identified the practices using these resources. We also reviewed research on each practice to consider whether there is an evidence-base. As shown in the appendix, these practices can be grouped into the categories of (a) how to teach, (b) what to teach, and (c) how to support. In a survey of experts, Meyer, Eichinger, and Park-Lee (1987) identified five best practices for educating students with severe disabilities, including

- Inclusion,
- home-school collaboration,
- staff development,
- data-based instruction, and
- the criterion of ultimate functioning (i.e., preparing students for their current and future environments).

Although much has changed since 1987, the quality indicators still hold true.

Instruction. Most textbooks on the topic of severe disabilities give strong coverage to using principles of applied behavior analysis to design effective, systematic instruction (Browder

& Spooner, 2011; Collins, 2007; Kennedy & Horn, 2004; Snell & Brown, 2011; Westling & Fox, 2004). Meyer and colleagues (1987) referred to this as *data-based instruction* to connote the need for using ongoing progress monitoring, which the major textbooks have also emphasized. Recently, teacher educators have reaffirmed the importance of systematic instruction (Delano, Keefe, & Perner, 2008-2009) and have noted the need for special educators to know how to include students with severe disabilities in general educational instructional contexts. The current thinking about how to teach also includes strategies for promoting peer-delivered instruction (e.g., Jameson, McDonnell, Polychronis, & Riesen, 2008). Snell and Brown (2011) considered this topic so important that they included a chapter devoted to this methodology. An area of rapidly growing research on how to teach involves the use of technology (Ayres, Mechling, & Sansosti, 2013). Perhaps most important, through strategies such as setting goals, students can learn to direct their learning (Agran, Cavin, Wehmeyer, & Palmer, 2006).

Skills and academics. Dating back to some of the earliest planning for students with severe disabilities, educators have stressed teaching students the skills that will help them meet a criterion of ultimate functioning as productively and independently as possible in inclusive adult environments (Brown, Nietupski, & Hamre-Nietupski, 1976). Nearly all textbooks in the field of severe disabilities include chapters on daily living, job, and community skills (e.g., Browder & Spooner, 2011; Snell & Brown, 2011; Westling & Fox, 2004). Increasingly, educators have realized that inclusive opportunities include access to general curriculum content (Jackson, Ryndak, & Wehmeyer, 2008-2009). This realization can be seen in the additional coverage on academic instruction (Browder & Spooner, 2011; Ryndak & Alper, 2003; Snell & Brown, 2011).

Recent legislation like NCLB (2008) and IDEA (2004) has required schools to use alternate assessments for students who cannot participate in general assessments of state academic content standards. To prepare students to show progress on state standards, even with alternate achievement expectations, teachers need an understanding of academic interventions. Most experts have also emphasized the importance of communication and social skills and have extensively addressed the topic (Browder & Spooner, 2011; Kennedy & Horn, 2004; Snell & Brown, 2011; Westling & Fox, 2004). The criterion of ultimate functioning also includes teaching students to direct their lives. Experts also emphasize the importance of teaching students skills like self-management, goal setting, and choice making (i.e., Collins, 2007; Ryndak & Alper, 2003).

Instructional supports. Many experts consider team planning and home-school collaboration highly important (Collins, 2007; Kennedy & Horn, 2004; Westling & Fox, 2004). Most emphasize planning supports for inclusive contexts, again devoting much attention to this topic (Collins, 2007; Snell & Brown, 2011; Westling & Fox, 2004). Some have made *inclusion* the focus of entire books, including this term in their titles (Kennedy & Horn, 2004; Ryndak & Alper, 2003). Every textbook about students with severe disabilities that we reviewed included at least one chapter on positive behavior support. Assistive technology (AT), another important form of support, was usually woven into the literature on communication or instructional strategies in general.

Other practices. Using the overlap among experts to frame our review of EBPs, we noted that each textbook had chapters not covered by this review. Some described sensory, motor, and health-care needs of students (Browder & Spooner, 2011; Collins, 2007; Kennedy & Horn, 2004; Ryndak & Alper, 2003; Snell & Brown, 2011; Westling & Fox, 2004).

We omitted these topics because most literature in these areas has focused on practical guidelines rather than on EBPs for teachers. Others devoted chapters to special age groups (Kennedy & Horn, 2004; Westling & Fox, 2004), but we found that many practices in the research literature spanned age groups.

Review Criteria

Once we gleaned the practices from the recommendations of experts in severe disabilities from textbooks and other published literature, we searched the literature for guidance on each category. Given the brevity of this review, we relied heavily on existing reviews of the literature and a few current studies to illustrate these practices. It was beyond the scope of this review, given its breadth, to make judgments about each study's design as reviewers sometimes do to identify the evidence base for a practice. Instead, we considered any review or individual study published in a peer-reviewed journal. The evidence offered here also varied in quantity. Some practices (e.g., systematic instruction) have vast stores of literature while others have fewer studies (e.g., use of technology).

In general, we followed the Horner and colleagues (2005) criteria for EBPs using a single-case design to include five studies with 20 participants across three independent research teams. The Council for Exceptional Children (CEC; 2008) further defined these criteria as follows: (a) strong evidence in five studies, 20 participants, three research teams, and no negative effects; (b) moderate evidence in three studies, 20 participants, two research teams, and no negative effects; and (c) limited evidence base in at least one well-implemented study (CEC, 2008). If a literature review applied Horner and colleagues' (2005) criteria or similar criteria, we relied on the authors' conclusions about the strength of the evidence. In synthesizing this

literature, our goal was to help educators to know what the research supports for effective instruction of students with severe disabilities.

How to Teach

Systematic Instruction

Systematic instruction, which originates from the principles of applied behavior analysis, has a strong evidence base spanning more than 60 years supporting the teaching of community and daily living skills (Spooner, Browder, & Mims, 2011a). For example, Miller and Test (1989) compared the effects of constant time delay and most-to-least intrusive prompts on the acquisition of laundry skills for students with moderate intellectual disabilities. Recent literature reviews documented a strong evidence base for using systematic instruction to teach academic skills to this population (Browder, Ahlgrim-Delzell, Spooner, Mims, & Baker, 2009; Morse & Schuster, 2004). Jameson, McDonnell, Johnson, Riesen, and Polychronis (2007) illustrated this practice by teaching symbol and word recognition to students with moderate intellectual disabilities using constant time delay and differential reinforcement.

Defining the skill. The first step in using systematic instruction is to define an observable, measurable skill to be taught. Behaviors can be categorized as *discrete*—one step—or *chained*—a series of discrete behaviors that equate to a complex behavior (Alberto & Troutman, 2009). Chained tasks can be taught by breaking components of the task into the discrete steps of a *task analysis* (Spooner, 1984). A strong evidence base exists for using task-analytic instruction to teach daily living and community skills. Mechling, Gast, and Langone (2002) effectively used video simulations to teach students with moderate intellectual disabilities the steps of a task analysis for locating items in a grocery store.

Academic skills. This method can also be applied to academic skills. Courtade, Browder, Spooner, and DiBiase (2010) taught teachers to follow steps of a task analysis to teach science concepts to students using inquiry-based science instruction. Sometimes, teachers may choose to focus on a set of discrete responses like a list of sight words or math facts.

Data collection. Once the target skill has been defined as a discrete response, set of responses, or task analysis, these responses can be entered on a data sheet for ongoing progress monitoring. Some research suggests that teachers can use the pattern of their data to make instructional decisions (e.g., Belfiore & Browder, 1992; Browder, Liberty, Heller, & D'Huyvetters, 1986). For example, if progress is too slow, teachers may want to refine their prompting system or increase opportunities to respond. *Data-based decision making* is the term used when teachers use their data to plan instructional changes.

Prompting. Once the target behavior is defined and the data sheet is created, the teacher must plan the response prompting and fading systems to use for instructing target skills (Wolery, Ault, & Doyle, 1992). These systems include simultaneous prompting, time delay, system of least prompts, most-to-least intrusive prompts, and graduated guidance.

Simultaneous prompting. This method consists of one response prompt (e.g., verbal, model) concurrently presented with the target stimulus, which is eliminated after several instructional trials. A strong evidence base suggests that this prompting system is an effective strategy for teaching discrete or chained tasks and can be simpler than other prompting strategies (Morse & Schuster, 2004). For example, Smith, Schuster, Collins, and Kleinert (2011) used simultaneous prompting to teach restaurant sight words and food classification information to secondary students with moderate and severe intellectual disabilities. To teach chained

academic skills, Waugh, Fredrick, and Alberto (2009) used simultaneous prompting to teach sounds and blending skills to students with moderate and severe disabilities.

Time delay. There is also a strong evidence base for using time delay, a system in which the prompt is concurrently presented with the target stimulus and then faded with small increments of time over successive trials. Time delay has strong research support for teaching picture and word recognition skills to students with severe disabilities (Browder et al., 2009; Walker, 2008). Riesen, McDonnell, Johnson, Polychronis, and Jameson (2003) compared the effects of time delay and simultaneous prompting on the academic skills of students with moderate and severe disabilities. Both prompting systems were effective in teaching vocabulary for words and definitions across content areas (i.e., science, German, and United States history). In a recent study, Zisimopoulos, Sigafoos, and Koutromanos (2011) successfully used constant time delay and video prompting to teach students with moderate intellectual disabilities the steps of conducting an Internet search.

Least intrusive prompts. Another prompting alternative with a strong evidence base is the system of least intrusive prompts—an instructional strategy that delivers prompts only as needed to teach discrete or chained tasks. Doyle, Wolery, Ault, and Gast (1988) reviewed 90 articles that document the use of a system of least prompts to teach students with severe disabilities. In a system of least prompts, the instructor may begin with a verbal direction, followed by a model and then physical guidance, only providing as many of these prompts as the student needs to produce the response. Emerging evidence suggests that this strategy can be used to teach academic skills, including early literacy skills (e.g., Browder, Mims, Spooner, Ahlgrim-Delzell, & Lee, 2008; Browder, Trela, & Jimenez, 2007); listening comprehension

(e.g., Mims, Hudson, & Browder, 2012); and reading comprehension (e.g., Browder, Hudson, & Wood, 2013).

Most-to-least intrusive prompts. Sometimes the safety or motoric demands of a task suggest the need to begin with a more intrusive prompt such as physical guidance. A strong body of evidence supports the use of most-to-least prompting to teach vocational and daily living skills, such as cooking and sewing (e.g., Aykut, 2012). MacDuff, Krantz, and McClannahan (1993) employed this procedure to teach the use of picture schedules to promote on-task behaviors for students with autism. Instructors initially used physical guidance in training and then faded physical prompts over time.

Reinforcement. Whatever prompting is used, instructional planning must also include plans for reinforcing correct responses. Reinforcement should always include praise and, depending on the motivational needs of the student, tangibles (e.g., stickers, extra computer time). In addition, teachers must decide on a schedule of reinforcement for teaching a skill. Initially, teachers should reinforce every correct response with descriptive praise, like, "Good job saying *m*!" (Cooper, Heron, & Heward, 2007). Eventually, all forms of reinforcement should be faded so the student is able to consistently perform the skill without attention from the teacher. For example, the teacher may fade to reinforcing only unprompted correct responses and then about every third response. All studies that used systematic prompting also included reinforcement systems, making this an essential component of a systematic instruction-intervention plan.

Generalization. With systematic instruction, it is important to train for generalization (Stokes & Baer, 1977). One way to promote generalization is to teach in contexts in which skills are most likely to occur naturally (e.g., general education classrooms, cafeteria, and community

settings). Teaching in naturalistic environments can be in simulated or authentic community settings (e.g., Colyer & Collins, 1996; Mechling et al., 2002). For example, Mechling and colleagues (2002) taught students to read grocery aisle signs using simulated computer-based programs. All generalization probes occurred in real grocery stores. To teach generalization of academic content, Riesen and colleagues (2003) taught students to identify grade-aligned vocabulary in both special education and general education classrooms. Test probes in general education classrooms were embedded during naturalistic opportunities (e.g., transitions, breaks).

Another strategy for promoting generalization is teaching with multiple exemplars (i.e., teaching more than one type of target item; Collins, 2007; Collins, Karl, Riggs, Galloway, & Hager, 2010). The use of multiple exemplars encourages students to recognize relevant features of target stimuli. For example, Smith and colleagues (2011) promoted generalization by varying the materials (e.g., sight-word flash cards, real restaurant menus) used to train recognition of restaurant words. Browder, Ahlgrim-Delzell, Courtade, Gibbs, and Flowers (2008) incorporated multiple exemplars in an early literacy intervention by including multiple visual representations of single concepts or objects (e.g., students identify *dog* by identifying several different types of dogs throughout the training sessions). Additionally, Mims and colleagues (2012) promoted generalization of comprehension across different grade-aligned biographies. Finally, general-case programming—teaching skills across all types of relevant materials (Alberto & Troutman, 2009)—is an effective strategy for increasing the likelihood that students will generalize skills to multiple naturalistic settings. To promote generalization to community settings, Colyer and Collins (1996) surveyed 12 local stores to determine the range of stimulus variation. For example, they noted whether the final price of a purchase was

presented with verbal or visual cues. The teacher then used a store sample that reflected this variation.

Summary. A large body of research for teaching a wide range of discrete and chained skills to students with moderate and severe disabilities supports systematic instruction. Teachers should select prompting systems that match the complexity and nature of the target skill. Although there is a long history of effective systematic instruction for teaching daily living and community skills (Bambara, Koger, & Bartholomew, 2011), the past decade offered evidence that it is also effective for academic instruction (e.g., Browder et al., 2009).

Self-Directed Learning

Although teacher-delivered systematic instruction is highly effective, students with severe disabilities should also be provided with opportunities for self-directed learning so that they gain greater autonomy. Two strategies with strong research evidence for promoting self-directed learning are pictorial self-instruction and the Self-Determined Learning Model of Instruction (SDLMI). Directed inquiry, which has a moderate evidence base, is a recent strategy used to promote academic learning.

Pictorial self-instruction. In one study using pictorial self-instruction (Mithaug & Mithaug, 2003), students with autism learned to complete academic assignments using a picture-based graphic organizer planner. Students planned, completed, and evaluated their work by circling pictures according to the following categories: (a) Subjects to Work, (b) What I Will Do, and (c) What I Did. Several studies have taught students with severe disabilities to independently use picture activity schedules to complete tasks (e.g., Hume, Plavnick, & Odom, 2012; MacDuff et al., 1993). Students have also used pictorial self-instruction to engage in

socially appropriate behavior (e.g., Schneider & Goldstein, 2010); prepare food (e.g., Lancioni & O'Reilly, 2002); and complete vocational tasks (e.g., Steed & Lutzker, 1997).

Self-Determined Learning Model of Instruction. The SDLMI teaches self-directed learning to students in three units: (a) setting a goal, (b) taking action, and (c) adjusting the total or plan (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000). Students are taught to solve problems using four steps: (a) identify the problem, (b) identify possible solutions, (c) identify possible barriers, and (d) identify consequences of each solution. Agran and colleagues (2006) investigated the effects of SDLMI on the academic performances of three middle school students with severe disabilities. Results indicated a functional relationship between SDLMI and academic performance. Each student made immediate and rapid increases in identified academic goals. Shogren, Palmer, Wehmeyer, Williams-Diehm, and Little (2012) studied the influence of SDLMI on academic and transition goals and access to the general education curriculum for students with intellectual disabilities. Results indicated significant improvements in goal attainment and general curriculum access. The SDLMI model can also be used to improve self-determination. Wehmeyer and colleagues (2012) analyzed the effects of SDLMI on self-determination behaviors of students with intellectual disabilities. Using a randomized modified-equivalent-control-group time-series design for 2 years, students in the SDLMI group showed a significant positive difference on self-determination compared to the control group.

Directed inquiry. Directed inquiry has been used more recently to engage students with severe disabilities in academic learning. Students have been taught to use a directed-inquiry chart to answer questions about science and social studies topics (Agran et al., 2006; Browder, Trela, et al., 2012; Courtade et al., 2010; Jimenez, Browder, & Courtade, 2009). For example, with a KWHL chart, as used by Jimenez, Browder, Spooner, and DiBiase (2012), the teacher

guided the students to identify (a) what they know [K], (b) what they want to know [W], (c) how to find out [H], and (d) what they learned [L]. Similarly, Bethune and Wood (2013) taught students to use a graphic organizer to identify question types and to independently answer *wh* questions (e.g., *where* asks for a place) about a text selection.

Summary. Studies have shown that students with severe disabilities have demonstrated the ability to engage in self-directed learning to complete functional, employment, and academic tasks. Research supports the benefits of teachers' efforts to instruct these students in the use of pictorial self-instruction, directed inquiry, and SDLMI.

Peer Tutors

Peer tutoring as an instructional strategy has a strong body of evidence suggesting academic and social benefits for both the tutor and the tutee (e.g., McDonnell, Mathot-Buckner, Thorson, & Fister, 2001; Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003). In this practice, a peer tutor—typically a same-age student from a general education classroom—delivers instruction to a student with disabilities—the tutee. Peer tutors are trained to incorporate active student responding, opportunities to respond, feedback, and reinforcement in instructional sessions (Heron, Villareal, Yao, Christianson, & Heron, 2006). Class-wide peer tutoring, which involves training peers to deliver instruction to designated tutees for all students in a class (Greenwood, Maheady, & Delquardi, 2002), has been implemented to teach students with severe disabilities across various settings and content areas.

Skills. Several studies illustrate the strong evidence base that supports peer tutoring for teaching skills to students with moderate and severe disabilities. Kamps, Locke, Delquardi, and Hall (1989) extensively trained two students from a general education fifth-grade classroom to deliver instruction in money skills, expressive language, oral reading, and comprehension skills

to two students with severe disabilities. After tutors completed twelve 30-minute training sessions, they were able to (a) plan lists of target items; (b) decide when to provide models; and (c) deliver prompts, feedback, and consequences. Miracle, Collins, Schuster, and Grisham-Brown (2001) trained peers in high school to effectively deliver sight-word instruction using constant time delay. Similarly, Godsey, Schuster, Lingo, Collins, and Kleinert (2008) trained peers to deliver instruction on the chained tasks of food preparation to students with severe disabilities using constant time delay. Peers learned, with explicit training, to deliver systematic instruction, including praise and error correction.

Academics and social interaction. There is also a strong evidence base for using peer tutoring to promote social interactions and academic engagement (e.g., Carter, Cushing, Clark, & Kennedy, 2005; Carter, Sisco, Melekoglu, & Kurkowski, 2007). For example, McDonnell and colleagues (2001) used peer tutoring to increase academic engagement and skills in pre-algebra, physical education, and history. Collins, Branson, Hall, and Rankin (2001) examined the effects of peer tutoring on a chained task in an inclusive setting. Peer tutors were trained to deliver a system of least prompts to teach the steps of a task analysis for writing a letter. Jameson and colleagues (2008) trained peers to teach key concepts from health and art classes using constant time delay. Finally, Hudson, Browder, and Jimenez (in press) trained peers in elementary school to deliver read-alouds and a system of least prompts to teach listening comprehension to students with severe disabilities.

Summary. Peer tutoring has a strong body of research supporting the practice of training peers to teach both discrete and chained skills across a variety of content areas and settings and to promote social interactions. Additionally, peers are able to deliver systematic instruction

(e.g., constant time delay, system of least prompts, task-analytic instruction) with fidelity to promote academic and functional outcomes for students with severe disabilities.

Technology

Recent advances in technology have resulted in increased use of technological interventions for students with severe disabilities. The use of technology to teach skills to students with severe disabilities has a moderate to strong evidence base depending on the type of technology. Video prompting and modeling and computer-assisted instruction are two primary modes of technology interventions.

Video. Bellini and Akullian (2007) identified video modeling as a strong EBP for teaching social communication as well as functional and behavioral skills to students with autism spectrum disorders. Cannella-Malone and colleagues (2011) differentiated between video modeling and video prompting. Video modeling employs a video that includes the entire target behavior in one viewing whereas video prompting shows clips of each component of a target behavior. Using an alternating treatment design, Bellini and Akullian (2007) found that students with severe disabilities were more successful while viewing video prompts than while viewing video models. An additional study demonstrated that video prompting with error correction was more efficient than video prompting alone in teaching targeted skills to students with severe disabilities (Cannella-Malone, Wheaton, Wu, Tullis, & Park, 2012).

Other studies have investigated hardware devices (e.g., iPods, iPads) as tools for implementing video modeling and video prompting with individuals with severe disabilities (Kagohara et al., 2011; Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, & Grider, 2009). Results demonstrated that students with severe disabilities were able to use the devices

and achieve positive outcomes on targeted skills (i.e., listening to music and completing job-related tasks).

Computer-assisted instruction. In addition to video prompting and modeling, computer-assisted instruction (CAI) is associated with a moderate level of evidence in teaching skills to students with severe disabilities (e.g., Ayres et al., 2013; Coyne, Pisha, Dalton, Zeph, & Smith, 2012; Knight, McKissick, & Saunders, 2013; Pennington, 2010; Ramdoss et al., 2012). Ramdoss and colleagues (2012) identified CAI as a promising practice for teaching social and emotional skills to students with autism spectrum disorders. Pennington (2010) and Knight and colleagues (2013) investigated the use of CAI to teach academic skills to students with autism spectrum disorders. Both literature reviews determined that the majority of studies used CAI to teach English language arts (ELA).

Although nearly all studies included in this review employed single-case design, Coyne and colleagues (2012) used a group design with teachers purposefully (not randomly) assigned to either Universal Design for Learning (UDL) or traditional literacy intervention. The UDL intervention included the use of e-books for students with severe disabilities. UDL involves planning an intervention for engagement, responses, and representation of materials that will be inclusive of all students. Student results indicated statistically significant increases in passage comprehension with UDL intervention.

Mechling (2011) reviewed studies using portable electronic devices (PDA) to teach students with moderate intellectual disabilities and autism spectrum disorders. PDAs showed promise for teaching the multistep skills needed for daily living, transitioning between tasks, and time/task management.

Ayres and colleagues (2013) proposed the following recommendations for using mobile technologies to assist with independence and life skills for students with moderate to severe disabilities:

- use systematic instruction to teach use of technology,
- regularly investigate and use technology to remain fluent and up to date with technological innovations,
- record and assess data on students' use of technology,
- remain knowledgeable about how and why traditional effective interventions for teaching skills to students with severe disabilities work and assess whether the use of technology may be more efficient in teaching skills, and
- pursue ongoing opportunities for PD on current technological advances for teaching students with severe disabilities.

Summary. Technology can be an effective way to deliver instruction for students with severe disabilities. Video modeling and video prompting are effective for students learning how to perform new daily living or social skills. CAI, including tablets and other mobile devices, can also be effective but require systematic instruction in the use of the technology.

What to Teach

Academics

In three comprehensive reviews, Browder and colleagues (Browder, Spooner, Ahlgrim-Delzell, Harris, & Wakeman, 2008; Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006; Spooner, Knight, Browder, Jimenez, & DiBiase, 2011) identified the strong evidence base for teaching academic skills to students with severe disabilities. More studies were available in literacy/reading (i.e., 128 experiments; Browder et al., 2006) than in

mathematics (i.e., 68 experiments; Browder, Spooner et al., 2008), with the fewest in science (i.e., 17 experiments; Spooner, Knight, et al., 2011). These literature reviews supported using systematic instruction—including task analysis or massed trials, systematic prompting, and feedback—to teach academic content. Two additional reviews found evidence for using time delay as an instructional procedure to teach literacy to students with severe disabilities (Browder et al., 2009) and for academics in general (Spooner, Knight, Browder, & Smith, 2012).

Literacy/reading. In the past two decades, researchers have sought ways to extend these intervention strategies to grade-aligned state content standards. In language arts, a strong evidence base has emerged for the use of read-alouds to promote understanding of text (Hudson & Test, 2011). Browder and colleagues (2007) demonstrated how teachers could learn to use a read-aloud of an adapted novel with middle school students. In Shurr and Taber-Doughty (2012), students with moderate intellectual disabilities conversed about pictures related to the passages prior to the reading and then demonstrated increased comprehension of the read-aloud using a picture array. Mims, Browder, Baker, Lee, and Spooner (2009) found that students with visual impairments and severe intellectual disabilities increased their number of correct answers to comprehension questions during a read-aloud using objects to answer questions. Browder, Mims, and colleagues (2008) showed that students with multiple disabilities increased their engagement with book read-alouds and also demonstrated comprehension with objects. In Mims and colleagues (2012), four middle school students with autism spectrum disorders who were non-readers increased their correct answers to comprehension questions with read-alouds of biographies. The interventionist used a system of least-intrusive prompting with re-reads of key portions of text combined with a rule for answering *wh* questions (e.g., *who* asks for a person). A dissertation study by Hudson (2012) demonstrated that

students with moderate intellectual disabilities could also increase correct responses to comprehension questions in a read-aloud conducted by peers who were non-disabled in a general education class.

Although read-alouds have provided an important method of engaging students with grade-level text, research has also yielded emerging evidence that some students with moderate and severe disabilities can gain independent reading skills (Allor, Mathes, Roberts, Jones, & Champlin, 2010; Browder, Ahlgrim-Delzell, Flowers, & Baker, 2012). Once students gain entry-level skills for reading connected text, they can begin to answer comprehension questions about what they learn (Browder et al., 2013). Language arts lessons may include additional targets, such as the development of vocabulary (Polychronis, McDonnell, Johnson, Riesen, & Jameson, 2004) and simplified ways to write text (Pennington & Delano, 2012). The lesson may also be implemented in a group context (Carnahan, Musti-Rao, & Bailey, 2009; Kamps, Barbetta, Leonard, & Delquardi, 1994). While using informational text, like social studies, students may use graphic organizers to summarize key details (Zakas, Browder, Ahlgrim-Delzell, & Heafner, in press).

Mathematics. Emerging research shows that students can learn to solve problems in line with grade-aligned standards. In Browder, Trela, and colleagues (2012), students with moderate and severe intellectual disabilities and some with autism spectrum disorders, learned to solve problems in algebra, data analysis, geometry, and computation using familiar stories, graphic organizers, and manipulatives. Similarly, Browder, Jimenez, and Trela (2012) taught students with moderate and severe disabilities to solve mathematical problems using task-analytic instruction with stories, graphic organizers, and manipulatives. Students have also progressed to learn operations such as multiplication (Zisimopoulos, 2010).

Science. Grade-aligned interventions have focused on teaching students science concepts using a process of inquiry. There is emerging evidence that students with autism spectrum disorder can acquire concepts with the use of a graphic organizer (Knight, Spooner, Browder, & Smith, 2012). There is moderate evidence that students can also learn concepts through directed inquiry combined with training in vocabulary. In a study by Smith, Spooner, Jimenez, and Browder (2013), students with multiple severe disabilities learned science concepts through hands-on experiments and time delay to train vocabulary. Courtade and colleagues (2010) demonstrated how teachers of students with severe disabilities could learn to teach an inquiry-based science lesson with concomitant learning by the participating students. Jimenez and colleagues (2012) trained peers who were non-disabled to support the learning of science concepts for students with moderate intellectual disabilities during an inquiry-based middle school lesson in general education.

Academic vocabulary. Overall, there is strong evidence for teaching academic vocabulary using time delay to students with severe disabilities (Browder et al., 2009). With academic vocabulary, like science terms, students can learn to communicate what they know. What is emerging are ways to teach students with severe disabilities prioritized concepts (e.g., Smith et al., 2013) and comprehension (e.g., Mims et al., 2012) that more closely align to the academic content acquired by their same-age peers who are non-disabled.

Daily Living Skills

Daily living involves a broad category of skills that encompass the aptitudes needed for home and community living. The extent to which a person lives independently depends on the acquisition of these skills and the availability of supports and resources in the community (Wehman & Targett, 2004).

Person-centered planning. A person-centered approach should drive the planning process as the teacher determines the skills most applicable to a particular student (Bambara et al., 2011). In person-centered planning, the teacher considers the student's preferences, goals, and future needs. Daily living skills vary across cultures, families, contexts, and personal preferences (e.g., some individuals like doing yard work), so it is important to begin planning with students and their families to be sure goals are culturally relevant (Cartledge, Gardner, & Ford, 2009). Self-care skills (e.g., toileting, eating, dressing) should be emphasized with younger students, and adaptations should be incorporated for maximum independence. As students become older, daily living skills like food preparation, housekeeping, home safety, use of the telephone, and sexuality education gain a higher priority. To prepare for adult living, students also need community skills like safety skills, purchasing skills, leisure skills, banking skills, and mobility skills for getting around the community.

Task analysis. A strong evidence base has established that students with severe disabilities can learn a wide variety of daily living skills (Bouck, 2010) and self-care skills (Cobb & Alwell, 2009). In many studies, an interventionist (e.g., teacher) used systematic prompting and feedback to teach students to perform each step in a task analysis. For example, using a system of least prompts delivered via PDA, Mechling, Gast, and Seid (2009) taught students with autism to follow the steps in a task analysis to prepare food. A similar procedure can be used to teach students personal care or community access. For example, Keen, Brannigan, and Cuskelly (2007) used graduated guidance with decreased assistance and an animated training video to teach toilet training to students with autism.

Self-management. Although many researchers have used a teacher-directed model for acquisition of new skills, a strong body of evidence suggests that students can learn to

self-manage their daily living skills. A self-management-skills approach has been an effective strategy for students with developmental disabilities like autism to learn a variety of skills (e.g., Coyle & Coyle, 2004; Kern, Marder, Boyajian, Elliot, & McElhattan, 1997; Stahmer & Schreibman, 1992). With self-management, students can learn to discriminate between appropriate and inappropriate behaviors, monitor their behaviors, and reward themselves for appropriate behaviors. For example, Riffel and colleagues (2005) taught students task completion and productivity skills using digital pictures and auditory directions in order to increase the number of steps completed for setting the table, rolling silverware, and folding laundry.

Social narratives. Besides self-management, there is a moderate evidence base for the use of social narratives for teaching students with autism about daily living skills such as choice making (Test, Richter, Knight, & Spooner, 2011). For example, Ivey, Heflin, and Alberto (2004) trained parents to read social stories to students with pervasive developmental disorder to teach participation in novel activities (e.g., setting changes, interacting with novel people, purchasing).

Technology. Although students need opportunities to learn daily living and community skills in natural environments, due to the logistics of the overall school experience, finding alternatives to community-based experiences is also critical (Test, Aspel, & Everson, 2006). Some skill instruction can be embedded into typical daily routines in the school. For example, Smith and colleagues (2011) embedded simultaneous prompting into daily routines to teach restaurant words to students with moderate and severe disabilities. Simulations of home and community activities can also promote generalization. For teaching skills to students with severe disabilities, a strong evidence base exists for the use of video modeling and CAI, both of which can be used to simulate a variety of target skills. Van Laarhoven and Van Laarhoven-Myers

(2006) taught daily living skills to students with developmental disabilities using systematic instruction and video modeling. In this study, students had picture cues to accompany the video and received in vivo video prompting.

Summary. Students with severe disabilities need opportunities to learn to manage personal care and acquire skills for their home and community. Effective strategies to promote these skills include (a) task-analytic instruction, (b) self-management, (c) social narratives, and (d) video and computer-based models. Although students need opportunities to practice skills in real environments, many skills can be embedded in typical school routines and simulated with technology and other materials.

Job and Community Skills

Transition. Students with severe disabilities need extensive preparation and supports to prepare for life after school (Test & Mazzotti, 2011). Legislation mandates transition training for all students with disabilities (IDEA, 2004). Quality of transition programs is a predictor of positive postschool outcomes (Carter, Brock, et al., 2013; Newman et al., 2011; Wehman, 2013; Wehmeyer, 1992). While planning for life after school for students with severe disabilities, teachers must use EBPs to teach community participation and job skills. Recent literature reviews on teaching transition to students with disabilities have identified several EBPs related to student-focused planning and student development in job and community skills (Cobb & Alwell, 2009; Landmark, Ju, & Zhang, 2010; Test et al., 2009).

The first step for developing an individualized transition plan for a student with severe disabilities is to conduct a valid, age-appropriate transition assessment (Mazzotti et al., 2009). For students with severe disabilities, this may include (a) student, peer, parent, and/or teacher interviews; (b) preference assessments; (c) situational assessments; and (d) observations (Test

et al., 2006). On a protocol used to determine the work-task preferences of adults with severe disabilities, Reid and colleagues (2007) investigated the time efficiency, usefulness of various procedures to determine preferences, and accuracy of staff opinion in identifying preferences. They employed a multitask assessment. In a multitask assessment, an individual selects a preference from four tasks, then the three remaining tasks, and then the two remaining tasks in order to rank task preferences. Results indicated that a multitask assessment was more efficient and effective in determining work-task preferences than a paired-task assessment. In a paired task assessment, an individual selects a preference from two choices; this is repeated with variations of pairs for a total of four tasks. Results were mixed on staff ability to identify preferred tasks using rank ordering. Behavior of the adults with severe disabilities was most positive when the adults were engaged in activities they had preferred during the multitask preference assessments.

Students with severe disabilities should also participate in transition planning during individualized education program (IEP) meetings (Madaus, Banerjee, & Merchant, 2011). Test and colleagues (2004) identified student involvement in IEP meetings as an EBP. Reviewed studies that included students with severe disabilities used either a self-directed IEP (Martin, Marshall, Maxon, & Jerman, 1996) or whole-life planning (Butterworth et al., 1993).

Job and community. Once transition plans have been developed, teachers must use EBPs to teach job and community skills. Two recent literature reviews identified evidence-based interventions for teaching job and community skills to individuals with disabilities (Landmark et al., 2010; Test et al., 2009). Many employed systematic instruction strategies, including (a) teaching job-related communication skills using a system of least prompts (Heller, Allgood, Ware, & Castelle, 1996) and (b) teaching leisure skills using positive reinforcement with

prompting (Nietupski, Hamre-Nietupski, Green, & Varnum-Teeter, 1986) or constant time delay (Wall, Gast, & Royston, 1999). Similarly, research demonstrates positive outcomes for students with severe disabilities who are taught transportation skills using most-to-least prompting (Batu, Ergenekon, Erbals, & Akmanoglu, 2004) and work skills using task analysis with prompting (e.g., Bates, Cuvo, Miner, & Korabek, 2001; Mechling & Ortega-Hurndon, 2007).

An important consideration in teaching community and job skills is to determine whether students generalize their skills to actual contexts. One method researchers have used is to train in the community using community-based instruction (Collins, 2007; Test & Mazzotti, 2011). In this approach, the interventionist uses strategies like task analysis and systematic prompting while the individual engages in the activity. Because community-based instruction may be expensive, researchers have sought alternative ways to teach community skills that will generalize. There is a strong evidence base for the use of simulated, community-referenced instruction (Bambara et al., 2011), including the use of simulations of the activity (Lattimore, Parsons, & Reid, 2006); video demonstrations (Van Laarhoven et al., 2009); and social stories (Wissick & Schweder, 2007). Social stories, which provide simple, age-appropriate descriptions written from the student's point of view, are used to teach a skill like a job-related task.

Summary. To prepare students with severe disabilities for job and community skills, teachers must

- conduct individualized transitions assessments,
- develop plans based on the assessments,
- use EBPs to teach and promote job and community skills, and
- promote generalization of these skills to the natural community and/or employment environment.

Self-Determination Skills

Individuals with severe disabilities should be provided opportunities to make choices that impact their daily and future lives (Wehmeyer, Agran, & Hughes, 1998). These opportunities should be substantive and should be taught systematically (Agran, Storey, & Krupp, 2010; Wood, Fowler, Uphold, & Test, 2005). Choice making is one component of a broader set of skills known as self-determination skills. Research indicates that self-determination has a positive effect on postschool outcomes for individuals with intellectual disabilities (Wehmeyer & Schwartz, 1998; Wehmeyer et al., 2012).

Components of self-determination. Wehmeyer (2005) defined self-determination as intentional behaviors or choices that allow an individual to be the "primary causal agent in one's life and to maintain or improve one's quality of life" (p. 117). Key component skills to self-determination include

- decision making,
- choice making,
- self-management,
- self-advocacy,
- self-awareness,
- goal setting, and
- problem solving.

In research, self-determination can be either the dependent variable (i.e., target outcome) or the independent variable (i.e., intervention). Wood and colleagues (2005) reviewed 21 intervention studies conducted over 20 years that examined the effects of a variety of interventions on self-determination outcomes. Participants learned choice making in 10 studies, self-management in

five studies, and problem solving in one study; in the remaining studies, participants focused on multiple skills. Especially pertinent to the current review is that all studies included at least one participant with severe disabilities who acquired the self-determination target skills. The interventions in the majority of the studies applied systematic instructional approaches, such as a system of least prompting, time delay, modeling, massed trials, and model-lead-test strategy.

Although Wood and colleagues (2005) considered the studies they found to constitute a small number, these studies have provided ample research support for the feasibility of teaching students with severe disabilities the components of self-determination. Once students begin to acquire self-determination skills, they can learn to apply these components to promote other positive outcomes. Numerous studies have shown that the application of components of self-determination (e.g., self-management, choice making) positively impacts outcomes like social behavior and academic learning (Fowler, Konrad, Walker, Test, & Wood, 2007; Wood et al., 2005).

Summary. The strong evidence base on self-determination demonstrates the feasibility of teaching component skills like choice making, self-management, and problem solving to students with severe disabilities. Although these skills have inherent value, the application of self-determination can also promote the attainment of academic and transition goals.

Social and Communication Skills

Social skill needs. Social skills are typically forged over time and through positive relationships with others (Spooner, Browder, & Knight, 2011). McGinnis and Goldstein (2003) described six broad categories for social skills content: (a) beginning social skills, (b) skills related to school, (c) skills for developing friendships, (d) skills for coping with feelings, (e) skills for coping with aggression, and (f) skills for dealing with stress. Students with severe

disabilities typically struggle to develop these skills, often due to communication challenges (Benner, Rogers-Adkinson, Mooney, & Abbott, 2007). Teachers can perform ecological assessments to determine exactly which skills are most important for an individual student (Westling & Fox, 2000). These assessments consider the student's larger domain (e.g., school); specific environment (e.g., math class); activities or actions within the environment (e.g., asking for materials); and performance of the skill by the student.

Evidence. Researchers have developed a strong evidence base for increasing social skills through the use of systematic instruction strategies, including systems of least prompts and stimulus fading (Spooner, Knight, et al., 2011). For example, Barry and Burlew (2004) used a system of least prompts to teach social stories about choice making and play skills to students with autism.

The National Autism Center (Howard, Ladew, & Pollack, 2009) recommended several social skills interventions. For example, there is strong evidence for the use of pivotal-response treatment, which targets critical behavioral areas (e.g., social communication) by teaching related skills that will have widespread effects (e.g., Harper, Symon, & Frea, 2008). The National Autism Center (Howard et al., 2009) also recommends the use of schedules as a strategy with a strong evidence base. Students receive a list of activities or steps and are required to complete an activity, typically illustrated by symbols or pictures (e.g., Dettmer, Simpson, Myles, & Ganz, 2000). Another strategy with a strong evidence base is self-management in which students learn to regulate their behavior by recording when target behaviors occur or do not occur (e.g., Apple, Billingsley, & Schwartz, 2005).

Communication skill needs. Addressing students' communication needs can promote the acquisition of positive social skills. Students need a purpose to communicate and a means

for doing so. Students who can understand and use symbolic communication have an increased range of communicative functions. Nevertheless, teachers should encourage a broad range of communicative skills, including non-symbolic communication (e.g., facial expression, eye gaze). A primary goal for all students is to learn to make a request or a refusal. To further improve social interactions, students should learn to gain attention, initiate interactions, develop social closeness, request or share information, and engage in typical social exchanges.

Evidence. Snell and colleagues (2010) reviewed 116 articles to determine the quality of evidence for teaching communication skills to individuals with severe disabilities. In general, Snell and colleagues found strong evidence that students with severe disabilities can gain through systematic interventions the communication skills necessary to interact with others. Social skills were also supported by several interventions to teach communication. For example, Preis (2006) used visual supports (e.g., picture symbols) to promote conversation initiations with peers. Similarly, Hughes and colleagues (2011) increased conversational initiations and responses using communication books and conversational peer partners.

In another literature review, Arthur-Kelly, Sigafoos, Green, Mathisen, and Arthur-Kelly (2009) described the strong body of evidence supporting the use of visual supports to enhance the communication and social skills of students with severe disabilities. Visual supports are pictorial or graphic cues that aid student learning. Examples include picture symbols or physical objects used in activity schedules. Arthur-Kelley and colleagues urged practitioners to also consider cultural and communicative contexts while planning supports for individual students. For example, pictures should be culturally relevant to the student's background and context.

Summary. To develop positive social relationships, students need a means of communication. This can include speech, sign language, facial expressions, body language, eye

gaze, or expression through AT (e.g., picture symbols, voice output device; Snell, 2002). Students who have a means to effectively communicate can gain the skills needed to interact socially with others.

How to Support

Team Planning

Collaborative teaming. In contrast to multidisciplinary teaming in which individuals typically work independently of each other providing fragmented services, students with severe disabilities often have multifaceted needs that require collaborative teaming to develop and implement effective educational supports. Ryndak and Alper (1996) described collaborative teaming as professionals working together toward the mutual goal of meeting the needs of students in a manner of openness to others' ideas, flexibility, shared decision making, and commitment to consensus. With collaborative teaming, consensus is important to maintain the investment of team members in implementing the individualized plan (Snell & Brown, 2011). Shared expectations for the target student should include student goals, schedule for implementation of goals throughout the school day, necessary supports and accommodations, instructional strategies and adaptations, and process for progress monitoring. Team members should address educational, social, and functional supports needed for the student to achieve the targeted goals (Collins, 2007; Snell & Brown, 2011). Team members typically include the case-managing special educator, parent, general educators, paraprofessionals, and related service providers (Collins, 2007; Snell & Brown, 2011).

Studies. Hunt, Doering, Hirose-Hatae, Maier, and Goetz (2001) investigated the effects of collaborative team development of unified plans of support (UPS) on academic engagement and social interaction of three students, including one student with a severe disability. Hunt and

colleagues defined UPS as "listing of educational supports (e.g., adaptations, curricula modifications, instructional modifications, peer supports, tutoring, after-school programs) and social supports (e.g., partner systems, social facilitation, interactive activities) for each focal student" (p. 242). Using a multiple-probe-across-participants design, the study results showed increased academic engagement and reciprocal interactions for all students. The authors noted that regular monthly team meetings with a reflective component may have strengthened the positive outcomes. Two replication studies demonstrated similar positive outcomes for students with severe disabilities who were culturally and linguistically diverse (CLD) and in inclusive settings (Hunt, Soto, Maier, & Doering, 2003; Hunt, Soto, Maier, Liboiron, & Bae, 2004).

Evidence. Collaborative teaming is a promising approach for developing a comprehensive plan to support students with severe disabilities, but there are only a few experimental studies to date. As a result, this practice has a limited evidence base. Future research with additional participants is needed to establish collaborative teaming as an EBP.

Assistive Technology

AT has the potential to improve the quality of life for individuals with severe disabilities (Reichle, 2011). IDEA (2004) defines AT as the devices (i.e., products or product systems) that improve the functional abilities of individuals with disabilities.

Low tech and high tech. These products or supports can be low tech (e.g., slant board, pencil grips) or high tech (e.g., laptop, iPad, voice-output devices). For students with severe disabilities, AT can support mobility, positioning, daily living, hearing, vision, and instruction (Spooner, Browder, & Mims, 2011b).

Augmentative and alternative communication. Augmentative and alternative communication (AAC) is the use of devices or strategies that support or replace verbal

communication (Mustonen, Locke, Reichle, Solbrack, & Lindgren, 1991). AAC assessments should be used to identify discrepancies between an individual's communication needs and current capabilities (Fossett & Mirenda, 2007). Several literature reviews have suggested strong evidence for the use of AAC for students with severe disabilities (e.g., Calculator & Black, 2009; Johnston, Reichle, & Evans, 2004; Reichle, 2011; Snell, Chen, & Hoover, 2006; Snell et al., 2010). Calculator and Black (2009) reviewed 102 journal articles and identified effective practices for teaching AAC to students with severe disabilities, including

- using naturalistic teaching,
- using a system of least prompts,
- training peers and teachers to use the devices,
- teaching multiple modes of AAC,
- teaching a single symbol for a variety of purposes, and
- introducing the use of communication devices early in a child's life.

For example, Drager and colleagues (2006) used naturalistic teaching opportunities to embed instruction in symbol use to promote the communication skills of students with autism. Millar, Light, and Schlosser (2006) conducted a meta-analysis of the literature to determine the impact of AAC use on speech production for students with developmental disabilities. An analysis of the studies meeting search criteria indicated an increase in speech production in 89% of the students.

In another review of AAC, Snell and colleagues (2006) identified strong evidence for response, antecedent, and problem-behavior strategies for teaching using AAC to support the needs of students with severe disabilities. Examples of response strategies were response prompting, proximity of partners and materials, teaching across stimuli, and embedding

instruction in naturalistic routines. Examples of antecedent strategies were reinforcers, non-punitive error correction, and contingent reinforcement. Examples of instructional strategies to reduce problem behaviors with AT included functional communication training (FCT; Carr & Durand, 1985) and the picture exchange communication system (PECS; Bondy & Frost, 1994). To illustrate, Markel, Neef, and Ferrari (2006) used PECS to teach students to use picture symbols to request items that were not available. Through systematic prompting and fading, students learned to use descriptive symbols to request items for which a symbol was not available. Mirenda (2001) also described the positive support for both support systems (i.e., FCT and PECS) in a literature review of AAC.

Summary. AT has broad applications for students with severe disabilities. The largest body of research is on the application of AAC to quality-of-life improvements for this population. Research supports teaching both low- and high-tech AAC through the use of response prompting during naturalistic opportunities (e.g., system of least prompts); antecedent strategies (e.g., error correction, reinforcers); and strategies such as FCT and PECS.

Peer Supports

Peers without disabilities can not only provide effective tutoring, but can also be an important form of support (Carter & Kennedy, 2006). Research indicates that individuals with severe disabilities demonstrate markedly increased numbers of social interactions with peer supports (Carter, Sisco, Chung, & Stanton-Chapman, 2010). Additionally, peers without disabilities have improved or maintained their academic performance while providing supports to peers with severe disabilities (Carter, Moss, Hoffman, Chung, & Sisco, 2011; McDonnell et al., 2001).

Carter, Asmus, and colleagues (2013) identified strategies for developing an enduring peer-support network for students with severe disabilities. Strategies included (a) eliciting support from school personnel (e.g., administrators, teachers, paraprofessionals); (b) selecting students with disabilities who would find participation in peer networks beneficial; (c) identifying a school staff member who is committed to facilitating peer supports and is familiar with a large number of students in the school; (d) enlisting support from peers who are known to the individual with a severe disability, share common interests, and are enrolled in the same classes; (e) planning the logistics of how and when peer support will occur; (f) training non-disabled peers about disabilities; (g) encouraging peers and students to interact with each other outside of the structured peer-support activities; (h) continually assessing the peer supports and determining if improvements are needed; and (i) identifying ways to prolong the relationships between peers across semesters or school years if mutually desirable.

Summary. Recruiting peers to form a social network for individuals with severe disabilities can be an important way to build social interactions and improve or maintain academic performance. Strategies have been identified to develop an enduring peer-support network for students with severe disabilities.

Inclusive Settings

IDEA (2004) mandates that students with severe disabilities have access to general education classrooms, and there is a strong body of evidence supporting the idea that students with severe disabilities can be successfully included as members in that setting (e.g., Agran et al., 2006; Giangreco, Dennis, Cloninger, Edelman, & Schattman, 1993; McDonnell et al., 2001). For example, McDonnell and colleagues (2001) used peer-delivered instructional cues, social reinforcement, and error-correction models in peer triads to teach seventh-grade physical

education, seventh-grade history, and ninth-grade algebra skills to students with severe disabilities. Findings were not merely a function of the location where students were educated; Turnbull, Turnbull, and Wehmeyer (2006) urged others in the field to recognize the importance of the content taught to students with severe disabilities in general education classrooms. These students need access to general curriculum content, but they also require supports and instruction in non-academic skills, such as initiating interactions with others.

Hudson, Browder, and Wood (in press) conducted a literature review of studies in which students with moderate and severe disabilities learned academic content in a general education setting. From 17 studies meeting search criteria, they found a strong evidence base for the method of embedded trial instruction with constant time delay to fade instructional prompts for teaching academic skills to students with severe disabilities in a general education setting. For example, Jameson and colleagues (2008) used peer tutors to deliver embedded trials with constant time delay to teach definitions of key vocabulary in health and art classes to students with moderate intellectual disabilities. Jimenez and colleagues (2012) used embedded constant time delay to teach vocabulary words and definitions in a general curriculum science class to students with moderate intellectual disabilities. Other studies from the Hudson, Browder, and Wood (in press) review suggested systematic instruction has many applications in the general curriculum classroom. For example, Collins, Evans, Creech-Galloway, Karl, and Miller (2007) used embedded trials with simultaneous prompting to teach core vocabulary definitions and sight words in science, mathematics, and United States history classes to students with moderate intellectual disabilities. Finally, an emerging body of research suggests the use of the system of least prompts to teach academic skills. For example, Hudson, Browder, and Jimenez (in press)

taught listening comprehension using a system of least prompts to students with moderate intellectual disabilities in science and social studies classes.

***Peer support in general education*.** A strong body of evidence recommends the use of peer supports to increase both academic learning and social gains in general education settings. Chung, Carter, and Sisco (2012) reviewed the literature to identify strategies for promoting peer interactions and relationships for students with severe disabilities as well as complex augmentative and alternative communication needs. Findings from the 31 studies meeting search criteria indicated that students increased positive interactions when peers and students were trained in the use of communication books to promote social interactions. For example, Hughes and colleagues (2004) trained students with severe disabilities to use communication books to invite peers to participate in school activities.

In another review, Carter and colleagues (2010) examined the literature on peer interactions with students with intellectual disabilities or autism. In the 85 experiments meeting search criteria, they found a strong evidence base for peer interaction training, social skills instruction, and peer awareness activities. For example, Loftin, Odom, and Lantz (2008) used a combined package of peer training, social initiation instruction, and self-management strategies to promote the initiation of social interactions by students with autism in a general education setting.

Summary. Supporting students with severe disabilities in inclusive settings is often a multifaceted endeavor. The use of strategies including systematic instruction and peer supports can improve both academic and social skills in a general education environment.

Paraprofessionals

Paraprofessionals have also provided a key support to students with severe disabilities.

McDonnell, Johnson, Polychronis, and Risen (2002) demonstrated the effectiveness of embedded instruction delivered by paraprofessionals. Paraprofessionals taught vocabulary word and definition identification in a general education setting to four middle school students with moderate intellectual disabilities. As a result of instruction, the students were able to acquire and maintain literacy skills.

Similarly, Martella, Marchand-Martella, Miller, Young, and Macfarlane (1995) described the use of paraprofessionals as an important factor for promoting inclusion of students with severe disabilities in general education settings.

Effectiveness. In a literature review, Giangreco, Suter, and Doyle (2010) analyzed 32 studies to evaluate the effectiveness of paraprofessionals and to identify strategies for maximizing the effectiveness of paraprofessional support. These researchers urged special education teachers to explicitly foster communication and collaboration with paraprofessionals, noting that many paraprofessionals do not receive explicit instruction about disabilities or effective practices for teaching. Giangreco, Backus, CichoskiKelly, Sherman, and Mavropoulos (2003) effectively trained paraprofessionals by teaching content knowledge, student perspectives, and instructional skills. Additionally, Causton-Theoharis and Malmgren (2005) trained paraprofessionals to facilitate peer interactions in inclusive settings by (a) enhancing paraprofessionals' perspective of social relationships, (b) teaching the importance of social relationships, (c) specifying the roles of paraprofessionals, and (d) modeling strategies for promoting peer interactions. Using a multiple-baseline-across-participants design, this study found increased rates of facilitative behaviors for promoting peer interactions for students with severe disabilities.

Summary. Research shows that paraprofessionals can provide support for students with severe disabilities that promotes inclusion and improves academic skill development. Furthermore, explicit training of paraprofessionals related to disabilities, teaching strategies, content knowledge, and the importance of social interactions can increase the effectiveness of their involvement in the academic and social growth of students with severe disabilities.

Positive Behavior Support

Many students with severe disabilities exhibit challenging behaviors. IDEA (2004) requires that behavior supports be provided to children with severe disabilities and that these children be supported in the least restrictive environment. While developing behavior supports for students with severe disabilities, teachers must maintain the personal dignity of their students and avoid the use of seclusion and restraint whenever possible (Horner, Dunlap, Koegel, & Carr, 1990).

Non-aversive techniques. Positive behavior supports involve the use of non-aversive techniques to decrease problem behavior and increase appropriate behavior (Horner et al., 1990). Qualified professionals conduct a functional behavioral assessment to determine the function of the problem behavior and consult with teachers to select appropriate alternative behaviors that elicit the same function. Potential functions of behavior (Cooper et al., 2007) include obtaining something (e.g., attention, tangible item, access to sensory experience) or escaping something (e.g., attention, undesired activity, sensory experience).

Differential reinforcement of alternative behavior. Differential reinforcement of alternative behavior (DRA) is an established evidence-based positive behavior support practice for students with severe disabilities (Petscher, Rey, & Bailey, 2009). DRA involves reinforcing occurrences of the desired alternative behavior and withholding reinforcements for the problem

behavior (Cooper et al., 2007). West and Patton (2010) used DRA for adults with severe disabilities during supported employment. Desirable alternative work behaviors increased when DRA was implemented. Petscher and colleagues (2009) indicated that DRA is a well-established treatment for disruptive behavior. The authors highlighted that 70% of the 116 identified articles noted FCT as the intervention.

Functional communication training. Many students with severe disabilities have deficits in communication (Bruce, 2011). The inability to communicate wants and needs may lead to frustration, which is expressed in problem behaviors, such as aggression and self-injurious behaviors. FCT has been identified as a strong evidenced-based strategy for decreasing problem behaviors of students with severe disabilities (Davis, Fredrick, Alberto, & Gama, 2012; Kurtz, Boelter, Jarmolowicz, Chin, & Hagopian, 2011; Petscher et al., 2009). FCT involves determining the function of the problem behavior and explicitly teaching appropriate communication techniques to obtain the desired function. Alternative communication responses can include vocalizations, sign language, communication boards, words or picture cards, vocal output systems, or gestures (Cooper et al., 2007). An example of FCT is the use of PECS training for students with severe disabilities (Frea, Arnold, & Vittimberga, 2001).

Davis and colleagues (2012) investigated the use of escape for decreasing problem behaviors and increasing positive alternative behaviors. Students were given a brief 30-s escape each time they exhibited a problem behavior and a brief 30-s escape plus a preferred activity each time they exhibited the alternative behavior. Results indicated decreased problem behaviors and increased time on task. The authors explained that by providing FCT without extinction (i.e., withholding reinforcement of problem behavior), students did not exhibit

potential negative effects of extinction, which include extinction burst (i.e., dramatic increase before reduction of problem behavior) or re-emergence of problem behavior.

Antecedent strategies. Brosnan and Healy (2011) identified other positive behavior-support interventions that have demonstrated positive outcomes for students with severe disabilities including (a) choice making (Dyer, Dunlap, & Wintering, 1990); (b) non-contingent reinforcement (O'Reilly, 1999; Ringdahl, Christensen, & Boelter, 2009); (c) visual cues (Carr & Durand, 1985; Massey & Wheeler, 2000); and (d) non-contingent escape (Borrero, Vollmer, & Borrero, 2004). Antecedent strategies involve arranging the environment or schedule to elicit desired behaviors (Cooper et al., 2007). Another promising antecedent approach for improving behaviors of students with severe disabilities is the use of social stories and visual schedules (Schneider & Goldstein, 2010). There is strong evidence for use of antecedent strategies, but more research is needed on each practice.

Summary. Students with severe disabilities may demonstrate problem behaviors that require positive behavior supports. Developing effective positive behavior supports requires conducting a functional assessment, identifying the function of the behavior, and developing behavior supports that enable students to elicit appropriate functionally equivalent behaviors. DRA, FCT, and antecedent strategies are effective practices to implement with this population.

Home-School Collaboration

Various organizations (e.g., AAIDD, 2010; The Association for the Severely Handicapped [TASH], 2000) have stressed the importance of environmental supports for improving outcomes for individuals with severe disabilities. One such support—the family—is considered so crucial that involvement is required in federal legislation (i.e., IDEA) for program decision making and educational planning for students with disabilities.

General population studies. Students with severe disabilities typically rely on their families for physical, adaptive, and communication needs; their families typically rely on the school to access information and services for their children (Westling & Fox, 2009). Unfortunately, little research has been conducted to investigate parental involvement for students with disabilities. Instead, the general population of students has received the attention (McDonnall, Cavenaugh, & Giesen, 2012).

Systematic reviews of parental involvement at school (Nye, Turner, & Schwartz, 2006) and correlational studies of involvement at home for the general population (Henderson & Berla, 1994; Hill & Tyson, 2009; Pomerantz, Moorman, & Litwack, 2007) have been conducted. Studies have revealed positive relationships with achievement; improved attendance; social competence (Webster-Stratton, Reid, & Hammond, 2001); and long-term aspirations (Caplan, Hall, Lubin, & Fleming, 1997). In addition, these benefits remain if the analysis controls for students' different abilities and economic levels (Domina, 2005). A recent study by McDonnall and colleagues (2012) showed a strong positive relationship between home parental involvement and mathematics achievement for students with visual impairments and cognitive disabilities. Home-school collaboration moves beyond traditional family involvement activities and requires the development of partnerships between families and educators to work together toward common goals (Christenson, Rounds, & Franklin, 1992; Kennedy & Horn, 2004).

Effective collaboration. Blue-Banning, Summers, Frankland, Nelson, and Beegle (2004) described the following six essential components of effective home-school collaboration based on focus groups and/or personal interviews across a diverse sample of 137 families:

- positive, understandable, and respectful communication;
- commitment to the child and family;

- equal power in decision making and service implementation;
- competence with decision making and service implementation;
- mutual trust; and
- mutual respect.

Successful interactions with families are more likely to occur if educators focus on assets over deficits and regard families as willing and capable partners (Amatea, Smith-Adcock, & Villares, 2006). Trust leads to effective communication, which requires "letting go of preset expectations" (Kennedy & Horn, 2004, p. 88). Home-school collaboration is also crucial for problem solving (Kennedy & Horn, 2004). T. E. Hall, Wolfe, and Bollig (2003) proposed that home-school notebooks for students with severe disabilities represent an effective communication strategy that can facilitate collaborative problem solving, assist with information analysis, and serve as a continued documentation form of program implementation and student progress.

Individualized behavior support plans. Home-school collaboration has also been seen as essential for the development and implementation of individualized behavior support plans for children with severe disabilities. Cho-Blair, Lee, Cho, & Dunlap (2011) conducted a multiple baseline design study of three young children with autism to evaluate the impact of implementing home-school collaboration for individualized behavior support. The study involved the following components for each child: (a) collaborative team building, (b) person-centered planning, (c) functional behavior assessment, (d) hypothesis development, (e) intervention trials, and (f) behavior support plan development and implementation. Results showed improvements in child behavior, which generalized to non-targeted contexts and improved teacher and maternal interactions with the children.

Barriers to collaboration. Unfortunately, various barriers exist for the development of effective home-school collaboration; they include (a) cultural misunderstandings; (b) negative assumptions (Defur, Todd-Allen, & Getzel, 2001); and (c) communication-style differences (Westling & Fox, 2009). Home-school collaboration may also be more difficult when families have unmet needs (Kennedy & Horn, 2004). Kyzar, Turnbull, Summers, and Gomez (2012) reviewed 14 studies that examined the relationships between family supports (i.e., emotional, physical, material, and informational) and family outcomes for families of children with moderate to severe disabilities. Kyzar and colleagues found that support was positively related to family outcomes, such as family functioning, family satisfaction, family quality of life, and family stress. Providing support or connections to support, especially during transitions or major life events, can increase the ability of some families to become partners (Westling & Fox, 2009).

Summary. Although there has not been extensive research on the impact of home-school collaboration on educational outcomes for students with severe disabilities, existing research supports positive benefits for both the student and family. Furthermore, home-school collaboration is crucial for problem solving and the development and implementation of individualized behavior support plans.

Summary: What We Know and Need to Know

Overall, this review of the literature described research support for the recommended educational programs provided by most leading textbook writers (Browder & Spooner, 2011; Kennedy & Horn, 2004; Snell & Brown, 2011; Westling & Fox, 2004) and prior surveys of experts (Meyer et al., 1987). The research offers strong support for teaching students with severe disabilities both academic content and functional life skills using systematic instruction. This systematic instruction can be delivered by peers, in general education settings, and with

grade-aligned academic content. In addition, strong evidence exists for teaching social and communication skills and providing positive behavioral support. Students with severe disabilities can also learn self-determination skills like choice making, direct their IEP meetings, and direct their learning.

Some areas had moderate rather than strong evidence. Although teaming and home-school collaboration are strong values in planning programs for this population, more research is needed to demonstrate the impacts of these forms of support. Research addressing the acquisition of grade-aligned academic skills versus functional academics is also emerging. Evidence exists for how to promote transition skills for students with severe disabilities, but postschool outcomes suggest that the widespread implementation of these strategies must be fostered. One limitation of the research literature is that students with the most severe disabilities—those who need the most intensive supports—are not well represented in the research literature. More research is needed on students who have emerging systems of communication, sensory, and physical impairments combined with severe intellectual disabilities and severe behavior disorders.

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Appendix

Innovation Configuration for Evidence-Based Practices for Students With Severe Disabilities

Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	**Level 0**	**Level 1**	**Level 2**	**Level 3**	**Rating**
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/ demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
1.0 How to Teach - Systematic Instruction					
1.1 - Prompting and fading. 1.2 - Reinforcement. 1.3 - Task analysis; discrete trial. 1.4 - Generalization.					
2.0 How to Teach - Self-Directed Instruction					
2.1 - SDLMI. 2.2 - Pictorial self-instruction. 2.3 - Directed inquiry.					

Essential Components	Implementation Levels				
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	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/ demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
3.0 How to Teach - Peer Tutors					
4.0 How to Teach - Technology					
4.1 - Video modeling. 4.2 - Computer-based instruction.					
5.0 What to Teach - Academics					
5.1 - Language arts. 5.2 - Mathematics. 5.3 - Science. 5.4 - Social Studies.					

Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	**Level 0**	**Level 1**	**Level 2**	**Level 3**	**Rating**
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/ demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
6.0 What to Teach - Daily Living (can embed in school routines)					
6.1 - Home skills. 6.2 - Self-care.					
7.0 What to Teach - Job and Community (increase in importance for older students)					
8.0 What to Teach - Self-Determination (can embed with academic instruction)					
8.1 - Choice making. 8.2 - Self-management. 8.3 - Problem solving.					
9.0 What to Teach - Communication and Social Skills					

Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	**Level 0**	**Level 1**	**Level 2**	**Level 3**	**Rating**
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/ demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
10.0 How to Support - Team Planning					
11.0 How to Support - Assistive Technology					
12.0 How to Support - Peer Supports					
13.0 How to Support - Paraprofessionals					
14.0 How to Support - Inclusive Setting					

Essential Components	Implementation Levels				
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria level from 0 to 3. Score and rate each item separately.	**Level 0**	**Level 1**	**Level 2**	**Level 3**	**Rating**
	There is no evidence that the component is included in the syllabus, or the syllabus only mentions the component.	Must contain at least one of the following: reading, test, lecture/presentation, discussion, modeling/ demonstration, or quiz.	Must contain at least one item from Level 1, plus at least one of the following: observation, project/activity, case study, or lesson plan study.	Must contain at least one item from Level 1 as well as at least one item from Level 2, plus at least one of the following: tutoring, small group student teaching, or whole group internship.	Rate each item as the number of the highest variation receiving an X under it.
15.0 How to Support - Positive Behavior Support					
16.0 How to Support - Home-School Collaboration					