

Individualizing Interventions for Young Children with Autism in Preschool

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Abstract Increasing numbers of children with autism receive education services in settings with their typically developing peers. In response to this shift in the location of services, there is a growing body of research identifying evidence-based practices for young children with autism in inclusive early childhood classrooms. The purpose of this paper is to organize and translate this research for application by early childhood practitioners in inclusive settings.

Keywords Preschool · Research to practice · Early intervention

Autism is characterized by qualitative impairments in communication, social skills, and restricted and repetitive behaviors, which, without individualized interventions, can impede academic success and independent functioning. The increased prevalence of children with autism (Centers for Disease Control and Prevention 2007) has had a dramatic effect on schools and educational policy. An increasing number of children with autism are receiving services in inclusive settings alongside their typical peers (e.g., McDonnell et al. 1997; Strain et al. 2002). In fact, the Individuals with Disabilities Education Act (IDEA) mandates children receive services in inclusive settings with

peers with typical development to the extent possible. As a result, early childhood educators (e.g., child care providers, preschool teachers, early childhood program directors) and other professionals (e.g., speech therapists, physical therapist, occupational therapists) working with young children need to learn to implement strategies that address the complex strengths and needs of children with autism.

Current research supports the inclusion of young children with autism. Inclusive preschools provide more opportunities for teachers to implement evidence-based practices to teach social and communication skills, and more opportunities for positive social interactions with peers (Strain et al. 2002). Also, inclusive classrooms provide opportunities for generalization and maintenance of social and communication skills. However, placement alone is not sufficient. Children with autism benefit from inclusive classrooms when instruction is individualized and focused on teaching functional skills in meaningful contexts by responsive adults (McBride and Schwartz 2003).

Recent advances in intervention and diagnostic research provide guidelines for professionals working with children with autism. Over the last decade autism experts have published numerous literature analyses (e.g., Simpson 2005), special journal issues (see *Journal of Autism and Developmental Disorders*, Volume 32, Issue 5, 2002), and technical reports (National Autism Center 2009b; National Research Council 2001) focused on evidence-based practices for young children with autism (McIntyre and Barton in press). However, the gap between research and classroom practices is considerable for children with autism (e.g., Stahmer 2007). As education science has demonstrated time and time again, the translation of research into classroom practice requires more than demonstrating interventions are effective in clinics or controlled classrooms (Dunst and Trivette 2009; Odom 2009). Evidence-based practice in a

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real, applied sense, requires the integration of research, professional and clinical judgment, data-based decisions, family preferences, social and cultural considerations, and interventions that work in real life settings (National Autism Center 2009a; Strain and Dunlap, n.d.). Additionally, because every child with autism has unique strengths and needs, guidelines for selecting, designing, and delivering evidence-based instruction in classroom settings must emphasize individual adaptations.

The purpose of this paper is to translate and organize a portion of the established evidence-based practices for young children with any of the Autism Spectrum Disorders (i.e., representing the full ranging of functioning) for direct application in preschool and early childhood classrooms. The focus of this paper is on the individualization of evidence-based practices for the full spectrum of autism (i.e., from children who might have advanced language skills but struggle with social skills to children who are non-verbal or with severely delayed functional repertoires). Strategies for developing goals, designing the classroom environment, and implementing *individualized* instruction in inclusive classrooms will be described. Although this paper will focus on young children with autism in inclusive settings, we describe several strategies to assist practitioners (e.g., early childhood educators, early childhood special educators, speech language therapists, physical therapists) working with children with special needs in a variety of settings. We elected to describe evidence-based strategies that might be particularly effective with young children with autism in inclusive settings. We selected strategies based on the findings of the National Autism Center (2009b) and the National Research Council (2001) on the education of young children with autism. For a comprehensive overview of evidence-based practices in autism see the National Autism Center's Educator's Manual (<http://www.nationalautismcenter.org/learning/practitioner.php>). Table 1 provides a list of the resources and websites referenced in this manuscript.

Goal Development

The first step in designing an educational program for young children with autism is gathering information from a variety of formal and informal assessments to develop individualized goals (e.g., standardized, caregiver-interviews, curriculum-based). Diagnostic or norm-referenced assessments provide information about the child's strengths and weaknesses in comparison to a population of typically developing children; curriculum-based assessments provide information about the child's current level of functioning to guide goal development. Goals for young children with autism should include addressing their core

Table 1 Resources and websites for teaching children with autism

Name of Resource	Website	Description	Cost
1. Autism Internet Modules	http://www.autisminternetmodules.org/	The Autism Internet Modules were created by autism experts to disseminate information on autism to families and practitioners.	Free
2. Embedded Instruction for Early Learning	http://www.embeddedinstruction.net/node/16	This website was created as part of a collaborative research project funded by the Institute of Education Sciences. The research project examines various approaches to professional development in early childhood.	Free
3. Indiana Resource Center for Autism	http://www.iidc.indiana.edu/?pageId=416	This website was created by the Indiana Resource Center on Autism to disseminate information about Autism Spectrum Disorders to families and practitioners.	Free
4. Mrs. Riley	www.mrsriley.com	Mrs. Riley was created to help practitioners, families, and students make educational materials, including picture cards.	1 day trial is free; \$5,000 per month or \$45,000 per year.
5. National Autism Center Educator's Manual	http://www.nationalautismcenter.org/learning/practitioner.php	This manual was developed by the National Autism Center to outline and disseminate information on evidence-based practices for students with autism.	Download for free; \$24.95 for paper copy

Table 1 continued

Name of Resource	Website	Description	Cost
6. Professional Development Center on Autism at the University of Washington	http://www.haringcenter.washington.edu/resources	This website was created by the Professional Development Center on Autism and includes tip sheets and research briefs on evidence-based practices for use with children with autism.	Free
7. Treatment and Education of Autistic and Communication Related Handicapped Children (TEACCH)	http://teacch.com/educational-approaches	The TEACCH website provides information on the TEACCH educational approach for children with autism.	Free
8. University of California at Santa Barbara Koegel Autism Center	http://education.ucsb.edu/autism/behaviormanuals.html	The website allows practitioners and family members to order a variety of manuals related to working with children and adults with autism and severe disabilities. The manuals were created by experts at the Koegel Autism Center.	Order paper copies of manual for \$5.00–7.00

deficits or symptomology of autism (i.e., communication, social skills, and restricted and repetitive behaviors). Dawson and Osterling (1997) indicated that goals for young children with autism should focus on: (a) the ability to attend to relevant cues in the environment, (b) imitation of adults and peers, (c) the ability to understand language and communicate, (d) functional and pretend play with toys, and (e) social interactions with peers and adults. However, given the range of characteristics and symptomology of young children with autism as a group, individualized goals are necessary. As children near the transition to kindergarten, teachers also should consider what skills or educational content the child with autism will need to be ready to learn in kindergarten and the general education classroom. School readiness skills, such as sitting in a chair, attending to a teacher at the front of the room, and following verbal directions, are core skills for ensuring the child is successful in kindergarten.

Collaboration with the family is essential for selecting individual goals. Goals for each child should be based on information gathered from the family about the child’s daily routines, strengths, and needs. Goals should be functional (i.e., to promote independent functioning across daily routines and activities in natural settings), measurable (i.e., the skill can be seen or heard, performance criteria are clear), and generative (i.e., teach flexible and varied responses that are useful across settings and people) and based on formal and informal assessment results (Notari-Syverson and Shuster 1995). Teachers might ask the following questions of goals: Does the child need these skills to participate in or complete most daily routines? Does the child use these skills with a variety of people or across a variety of settings or materials? Does the child have several opportunities each day to practice these skills in real life contexts?

A case study (i.e., Sami, a young child with autism) is embedded throughout this manuscript to illustrate the implementation of evidence-based practices with a young child with autism. The following vignette introduces Sami and describes her individualized goals and parents’ concerns.

Sami is a 3-year-old girl with autism. She attends an inclusive childcare center with 12 children, one lead teacher, May, and two assistant teachers, Tasha and Lupe. Sami and 2 other children in the classroom receive special education services. The remainder of the children are typically developing. Sami’s parents, teachers, and early childhood special education (ECSE) consultant were quite pleased with the progress she was making in this classroom and recently met to discuss her transition to a kindergarten classroom at their community elementary school. Before the meeting, they visited the new school several times

and were concerned about Sami's ability to attend to a teacher at the front of the classroom and interact with her peers. Sami had been inconsistently participating in small group, teacher-directed activities, rarely interacted with peers, and often avoided playing near peers. She preferred to play in the book area, where she frequently lined up books or repetitively turned the pages of books.

The Classroom Environment

Children with autism often experience delays in understanding verbal language and identifying and attending to information in the environment (e.g., Dawson and Osterling 1997; National Research Council 2001). Many children with autism are most successful in highly structured and organized environments. Structure and organization helps children with autism identify relevant cues, predict activities and routines, and understand behavioral expectations. For more information on classroom structure for children with autism see the Treatment and Education of Autistic and Communication related Handicapped Children (TEACCH) website: <http://teacch.com/educational-approaches> or the Autism Intervention Modules at (<http://www.autisminternetmodules.org>) developed by the Ohio Center for Autism and Low Incidence.

Visual Cues or Schedules

Visual supports, such as visual cues and picture schedules, are commonly used in preschools to organize and structure the environment to help children with autism focus on relevant cues and understand classroom expectations. Also, visual cues and picture schedules can be used to decrease the child's dependence on adult prompting to follow daily routines (Hall 2009; McClannahan and Krantz 1999). Schedules allow children more independence in following directions, daily routines, and managing transitions, and have been shown to be effective for increasing task completion and reducing challenging behaviors (e.g., Hall et al. 1995; Odom et al. 2003; Pierce and Schreibman 1994). Adult or peer modeling can be used to teach children to use a picture schedule. However, if the child does not attend to or imitate adult or peer modeling, the teacher might use hand over hand prompting. The teacher should begin phasing out or "fading" prompts (e.g., move from hand over hand prompts, to verbal cues such as, "check your schedule," or gentle physical guidance toward the child's schedule) over time, until the child independently uses the visual schedule to transition between activities across the day. The following vignette describes how Sami's teachers planned to teach her to use a picture schedule.

When Sami first started in the classroom a year ago, the teachers realized that she would need a lot of one-on-one teacher attention during transitions between classroom activities because she did not yet have the skills to observe and imitate other children or follow teachers' verbal directions. They decided to work toward making Sami more independent in following the classroom routines and transitions by teaching her to use a picture schedule. The teachers began by selecting the three or four transitions with which Sami had the most difficulty. These included transitioning from outside play to circle time, circle time to washing hands for snack, and then to sitting at the table. The teachers decided to use a high five, and "good job!" as reinforcement to help Sami to learn the picture schedule. The reinforcement would be thinned as she became familiar with the routine. After the initial training with a few pictures was successful, they made a set of pictures of each activity that Sami would go through during the day, and also included an icon of a bus as the last picture for transition to home. They put the picture schedule at Sami's height on the side of a bookshelf so that she could reach the icons to take them off as the activities were finished. They decided to use a poker chip as a cue to her that it was time to check her schedule. Once Sami understood how to use the schedule, the poker chip could be given to Sami by any teacher each time there was a transition, and they would say, "Sami, check your schedule."

Picture schedules are common in preschool classrooms. For example, preschool classrooms often have a classroom schedule with large pictures of daily routines or activities (e.g., snack, outside time, circle time), which teachers refer to throughout the day to help children transition from one activity to the next. Children with autism might need their own individual schedules to help them understand what happens next and when the activity will be finished (Mesibov and Howley 2003). These might be small pictures that the child removes from the wall, carries to each activity, and places in a container or envelop when finished. Some children will need larger pictures or photographs of activities or materials, or a combination of pictures and words. Over time, teachers can replace the pictures with words. There are several websites (e.g., www.mrsriley.com) and software programs (e.g., Boardmaker™ and Writing with Symbols™) available for creating visuals and picture cards. For more research and information on activity schedules see the tipsheets and research briefs produced and disseminated by the Professional Development Center on Autism at the University of Washington (see:

<http://www.haringcenter.washington.edu/resources>). The following vignette describes how Sami's teachers taught her to use a picture schedule to independently transition between daily activities and routines. The vignette describes how Sami's teachers were able to fade prompts over time to promote Sami's independent use of the picture schedule.

Lupe was assigned to help Sami learn to use the picture schedule. Everyday when Sami arrived, Lupe handed her a poker chip and walked with her to the picture schedule. She taught Sami to place the chip in a cup sitting on the shelf above the schedule. Then she pointed to the current activity that was ending and showed her how to take it off and place it in an envelope. Lupe then pointed to and named the picture of the next activity and walked Sami to the next activity (e.g., “snack is all done,” while putting the snack icon in the envelope, then pointing to the next icon and saying, “Let's read books,” and walking Sami to the book area). Lupe slowly decreased the verbal and visual cues, and after a couple weeks could just hand her the poker chip and walk with her to the schedule, while Sami did the rest. After a couple months, Sami was able to use her picture schedule by herself!

Independent Work Systems

Visual schedules can be embedded across the day to help children learn to self-manage and independently complete individual tasks. Many classrooms for children with autism also include independent work systems to teach self-management. These are visually structured tasks, arranged so that the child knows exactly what is expected of him, when he is finished with the task, the reinforcement, and what activity is next (Mesibov and Howley 2003). Work system can be particularly effective for children with autism because they are designed to limit distractions, include clear, visual directions, use predictable sequences, and minimize the need for verbal or adult prompting (Carnahan et al. 2009). Tasks are often set up using boxes or shelves and arranged left to right in a sheltered work area that has few distractions. Only tasks the child has already mastered are used, because the goal of the work system is to teach children to independently complete any task (i.e., without adult prompting). Work system activities should be individually selected based on the child's current repertoire. The activities or “work” can include any activities with a clear beginning and end (e.g., dump and fill, puzzles, writing, sorting by color or function, answering math problems, money sorting, following simple recipes, cutting and pasting, filing by letter, following written directions to

complete an art activity, etc.). Work systems can also be used to give children opportunities to practice adaptive skills (e.g., hanging up coat and book bag, tying shoes, sorting utensils). Directions for completing the task can take the form of picture schedules showing each step, with a picture of the reinforcement as the last step. Over time the pictures can be replaced with symbols (e.g., consecutive numbers, letters, or colors). Teachers might start with task with one or two steps, and over time increase the complexity of the task (for example, moving from a 2-piece to a 5-piece puzzle) and the number of steps. The final step should include placing a picture card of the activity in an “all done” container, which might be part of the child's individual activity schedule. Once a child learns how to do work systems, he will be able to use it in many other environments. A clear explanation of Structured Work Systems appears on the Autism Intervention Modules at (<http://www.autisminternetmodules.org>) and the Indiana Resource Center for Autism (<http://www.iidc.indiana.edu/?pageId=416>).

Reinforcement

Reinforcement also is part of high quality intervention programs for children with autism. Reinforcement is a consequence for a behavior that increases the probability that the behavior will continue (Alberto and Troutman 2008). Reinforcement is crucial to the effectiveness of treatment and allows practitioners to deliver positive consequences for desired behaviors. Reinforcement can take many forms, including tangible reinforcers such as a favorite object, activity, or food; natural reinforcers such as receiving something one asks for; and social reinforcers such as a smile or praise. Natural reinforcers are directly related to the target behavior and used across daily routines and activities in preschool classrooms (e.g., giving a child a toy when she asks for it, or giving the child a turn during circle time when he raises his hand). Likewise, if the goal is verbal requesting during snack, the natural consequence is getting the snack she asked for; if a child is working on learning play behaviors with an adult, the natural consequence is the adult's responsive play. Social praise also is a commonly used type of reinforcement in preschool settings that functions to increase and maintain appropriate behaviors. However, some children with autism will not find social praise rewarding. Some children with autism will need other types of reinforcement to increase appropriate behaviors (e.g., activities, toys, edibles). By observing and using what naturally motivates the child, the teacher can help the child learn and practice new skills. Tangible reinforcers such as toys, popcorn, or access to computer time, can be available or represented on picture schedules in the areas of the classroom that are being used for instruction.

When a child performs a target behavior, he is immediately reinforced. For example, during circle time, a child working on sitting quietly in a chair could be reinforced on a set schedule by periodically receiving a piece of popcorn and specific praise, “You are sitting so quietly!” Over time the child should receive fewer pieces of popcorn with more time in between each piece, so that eventually the child independently sits for the duration of circle time.

Identifying and using individualized reinforcers are useful for maintaining motivation and can be essential to the effectiveness of interventions. There are a variety of strategies for identifying reinforcers for children (e.g., paired-stimulus preference assessments, multiple stimuli without replacement). The multiple stimuli without replacement method has been shown to be effective with young children with autism (Carr et al. 2000). Using this method, the adult presents an array of items (up to 7 at a time) and has the child pick one item at a time without replacing the chosen item. In this manner, the adult gathers

information about several different potential reinforcers. Parents and caregivers also provide valuable information about reinforcement and preferences. It is important to re-assess preferences regularly and change out the reinforcers so that they do not lose their novelty. Figure 1 provides an example of a tool for gathering reinforcement information from parents or caregivers. Parents can fill this out directly or practitioners can fill it out with parents during an informal interview. Reinforcement lists should be updated frequently by adding reinforcers and crossing off items that are no longer reinforcers.

The schedule of reinforcement also is crucial to consider and plan when designing an intervention. The schedule of reinforcement refers to how often and when the reinforcement is delivered. When teaching new behaviors, the schedule of reinforcement might be as high as one to one. This means the child is reinforced for every appropriate response. However, as the child begins to use the target response more often, the schedule of reinforcement should

Fig. 1 Tool for gathering information from parents and caregivers about child preferences

Child’s Name: _____
 Person Completing Form: _____
 Original Date: _____ Date Updated: _____ Date Updated: _____

Reinforcer List

<u>Toys / Objects</u>	<u>Auditory Stimuli</u>	<u>Visual Stimuli</u>	<u>Physical Stimuli</u> (swinging, massage, vibrating)
<u>Tactile Stimuli</u> (soft things, koosk balls, tickling, sandpaper)	<u>Other sensory stimulation</u> (smells, tastes, sounds)	<u>Activities, games, songs</u>	<u>Food</u>

be thinned (i.e., delivered for every other appropriate behavior, then every third appropriate behavior, etc.) until it is not necessary or rarely necessary. Eventually, if possible, the natural reinforcement should replace the artificial reinforcement. For more research and information on identifying and using reinforcement see the Autism Internet Modules (<http://www.autisminternetmodules.org>).

Individualized Instruction

Antecedent-Based Interventions

Antecedents are activities or routines that come before the expected behavior or response being taught, and often occur as a natural part of the classroom routine. For example, the end of circle time could be the natural antecedent to washing hands for snack; turning the lights off might be a natural antecedent for laying down on a cot for naptime. Antecedents in the form of verbal prompts, visual cues, or physical modeling are used when teaching new skills. The goal of any antecedent-based intervention is to ensure that children demonstrate the target skills after a naturally occurring cue (i.e., antecedent). Thus, when designing an antecedent-based intervention, a plan for fading (gradually removing) prompts is essential.

System of Least Prompts

The system of least prompts is one type of antecedent-based intervention. The system of least prompts has been effective for teaching new skills *and* fading adult prompts (Doyle et al. 1988). The teacher plans and delivers a series of prompts starting with least intrusive amount of adult control over the child’s response and, if necessary, using the most intrusive prompt to ensure the child performs the behavior. For example, the system of least prompts has

been effective for teaching pretend play to young children with autism (Barton and Wolery 2010; Lifter et al. 2005). In these studies, prior to implementation, teachers carefully selected a variety of preferred toys and objects that are likely to elicit pretend play behaviors (e.g., dolls, cups, cars, blocks, etc.), types of prompts (i.e., based on the child’s learning history), and reinforcement. Natural reinforcement for play behaviors might be a similar play response by the teacher. For example, if the child takes a block and pretends it is a car, the teacher might do the same thing with a different block. When necessary, tangible reinforcers (e.g., stickers, snacks) also were used. The reinforcement should be delivered immediately after play behaviors at first and gradually thinned over time. In these studies (i.e., Barton and Wolery 2010; Lifter et al. 2005), the first level of prompt, or the natural environmental cue, was the presentation of the toys. The teacher said, “Let’s play,” and waited, giving the child 10–20 s to respond. If the child did not engage in pretend play, the teacher delivered the next level of prompt by modeling play or giving a visual or verbal prompt, and again gave the child time to respond. If at any point the child engaged in pretend play, the teacher delivered the planned reinforcement. If the child did not respond, the teacher used a “controlling prompt” which ensured that the child performed a pretend play behavior and received the reinforcement. The controlling prompts were hand over hand prompting, or a verbal prompt, depending on how much support the child needed. If the child engaged in the pretend play at any time (prompted or unprompted), he was reinforced. The ultimate goal was for the child to engage in pretend play with the first level prompt (i.e., natural cues from the environment). This body of research suggests prompts that use modeling, visual pictures of play, and choices are appropriate (Barton and Wolery 2010). Table 2 provides examples of how the system of least prompts can be individualized for young children with autism.

Table 2 Three examples of a system of least prompts to teach play with toys

Prompt Level		Example 1 (4 prompt levels)	Example 2 (4 prompt levels)	Example 3 (3 prompt levels)
Least intrusive prompt	1 (naturally occurring antecedent)	Presentation of toys and “Let’s play”	Presentation of toys and “Let’s play” paired with picture card for ‘free play’ time	Presentation of toys and “Let’s play”
	2	Picture of child playing with one or two toys	Choice of two toys	Model and verbal description of pretend play
	3	Model and verbal description of pretend play	Model and visual cue	Hand-over-hand prompting
Most intrusive prompt	4	Hand-over-hand prompting	Putting the toy in or near the child’s hand	

High Probability Procedures

In high probability procedures, the teacher delivers a series of prompts for a skill the child has mastered and is likely to perform (high-p: high probability) followed by a prompt for a new skill or one the child is less likely to perform (low-p: low probability). It is accompanied by reinforcement for all accurate responses (e.g., sticker, token towards time on the computer). When the teacher delivers a series of high-p prompts, the child responds faster and is reinforced more often (Santos 2001). This creates a momentum that increases the likelihood that the child will respond to a low-p request. For example, children can be taught to share preferred materials by delivering a series of prompts asking them to respond to questions about the toys they are playing with (high-p: “What color is your train?” “Is that Thomas or Henry?” “Is your train going fast or slow?”). The teacher reinforces each response by the child (e.g., “Your train is blue and mine is green!” “Yes! Your train is moving fast!”). After the child has responded and the teacher has reinforced at least three times, she delivers a prompt to share with peers (i.e., “Give that train to your friend Jose!”). High probability procedures can be easily embedded into classroom routines without many extra resources (e.g., Jung et al. 2008), and they have been used to increase social interactions (Davis et al. 1994) and social responses (Jung et al. 2008).

Priming

With priming, a child is given a preview of a behavior or activity immediately before it happens, so that he can practice it before it occurs in the classroom or other setting. Priming has been used to reduce problem behaviors in children with autism during transitions (Schreibman et al. 2000) and to increase social skills (Zanolli et al. 1996). A priming session is usually brief. For example, when a child is learning one social initiation skill, a teacher models the skill, prompts the child to do it, and then rewards the child when she does it successfully. Then the child is immediately taken to the setting where the activity will occur. When the child does the behavior, she is rewarded, but not otherwise prompted (Zanolli et al. 1996). Priming can be used to teach a variety of discrete skills (e.g., greeting peers, sharing toys, taking turns). For more research and information on priming see the priming manual published by the University of California at Santa Barbara (<http://education.ucsb.edu/autism/behaviormanuals.html>).

Modeling

There are a variety of modeling strategies, and many can be embedded across daily routines. For example, adult and

peer modeling can be used to teach independent use of a picture schedule, participation during circle time, toileting, and appropriate social interactions. There are several things to consider when using modeling with children with autism. First, children with autism may have difficulty attending to important or relevant cues in the environment. In this case, video or peer modeling might be more effective (if they are motivated to attend to a video or peer); modeling is only effective if the child attends to the model. Second, children with autism may not be motivated to imitate the model, so reinforcement should be carefully planned and paired with modeling. Third, modeling is only effective if the child has the ability to demonstrate the modeled behavior (e.g., peer modeling of verbal requesting during snack will only be effective for children with autism who are verbal). In some cases, a more structured teaching strategy (e.g., least to most prompting) might be used to teach the child *how* to demonstrate a skill, and modeling can be used to teach the child *when* to demonstrate the skill. For more research and information on modeling see the tipsheets and research briefs produced and disseminated by the Professional Development Center on Autism at the University of Washington (see: <http://www.haringcenter.washington.edu/resources>) and the Autism Internet Modules (<http://www.autisminternetmodules.org>).

Video Modeling

Video modeling focuses the child’s attention on specific relevant behavior, and has been effective in teaching a variety of skills to children with autism (Charlop-Christy et al. 2000). A brief video is made of a child performing the target behavior (it can be a typically developing peer, an adult, or the child with autism) with targeted materials. The length of the video will vary according to the complexity and number of target behaviors. A video teaching one social interaction, such as, “Let’s play,” can be as brief as 30 s; a complex play sequence might be 5 min. The video is shown to the child several times in a quiet area free from distractions, and the child is immediately given time to practice the target behavior with the target materials (MacDonald et al. 2009). Video modeling has been particularly useful for teaching social (e.g., Nikopoulous and Keenan 2004), play skills (e.g., MacDonald et al. 2009) and conversational skills (e.g., Thiemann and Goldstein 2001). For more research and information on video modeling see the tipsheets and research briefs produced and disseminated by the Professional Development Center on Autism at the University of Washington (see: <http://www.haringcenter.washington.edu/resources>) and the Autism Internet Modules (<http://www.autisminternetmodules.org>).

Table 3 Examples of strategies for promoting incidental teaching

Strategy	Definition	Example	Aim
Visible but out of reach	Placing toys, art materials, food, or other objects out of reach but visible to the child. The teacher waits for the child to initiate interest or attempt to obtain or request the object then prompts target.	Each night Cara’s mom places her favorite book on a high shelf in her room. In the morning, Cara always reads the book with her mom. Her mom waits for Cara to notice the book, and look at her. Her mom models, “Book, please” and waits for Cara to respond. If Cara imitates the model, her mom gives her the book and provides social praise. If she does not imitate the model or just says, “Baa” her mom repeats the phrase, “Book, please.” If Cara does not repeat the target phrase, her mom repeats it, and gives her the book.	Teaching requesting using words, sounds, or gestures
Novelty	Introducing new toys, materials, objects, or people to the environment.	Bart really enjoys playing with toys with wheels (e.g., cars, trains, trucks). His caregivers rotate the toys around so that each day there is at least one new train or car. As soon as Bart attends to the new car, the caregiver models a sentence, “This car is blue” and waits for Bart to imitate. If Bart imitates the phrase, they give him the car or let him keep playing with it. If he does not imitate the model they repeat the phrase.	One or two word utterances using descriptive words
Violate expectations	Do something unexpected during play or daily routines	Devonte’s mom helps him put his clothes on each morning. Occasionally his mom takes his socks or shirt and puts them on herself. She waits for Devonte to notice. Devonte usually will smile and say, “My shirt!” If he does not comment, his mom might prompt, “My shirt?” and wait.	One or two word utterances
Inadequate portions	Providing small or inadequate amount of objects, toys, materials, or foods	Toma liked to make a big circle with his train tracks. His mom kept two of the pieces of tracks so Toma would have to ask for them. As soon as Toma noticed his mom had the two missing pieces, she would wait and make the sign for “more” or “help” while saying the words. If Toma responded she would give him a piece. If he did not, she might provide the model again or use hand over hand prompting to teach him to use the correct sign to request “more” or “help.”	Teaching requesting using signs

(Pretti-Frontczak and Bricker 2004; Sandall and Schwartz 2008)

Naturalistic Teaching Strategies

There are many kinds of naturalistic teaching strategies, including incidental teaching, Enhanced Milieu Teaching (EMT; Hancock and Kaiser 2002), Pivotal Response Training (PRT; Koegel and Koegel 2006), embedded instruction, focused stimulation (e.g., Grela and McLaughlin 2006), and Prelinguistic Milieu Teaching (PMT; Yoder and Stone 2006). These interventions have several elements in common: (a) the use of naturally occurring antecedents and consequences; (b) following the child’s interest; (c) embedding instruction into daily routines, activities, and play; and (d) structured teaching across a variety of routines, materials, and people (Hancock and Kaiser 2002). Naturalistic teaching strategies are effective for teaching expressive communication (Hancock and Kaiser 2002); joint attention (Kasari et al. 2006); imitation (Ingersoll and Schreibman 2006); pretend play (Barton and Wolery 2008, 2010); self-management

(Koegel and Koegel 2006); and peer interactions (Pierce and Schreibman 1995). They are most effective when teachers arrange the environment to set up natural opportunities for the child to use new skills throughout the day, and require careful curricular planning and assessment of the child’s needs, strengths, and preferences. For more research and information on naturalistic teaching strategies see the tip-sheets and research briefs produced and disseminated by the Professional Development Center on Autism at the University of Washington (see: <http://www.haringcenter.washington.edu/resources>) and the Autism Internet Modules (<http://www.autisminternetmodules.org>).

Incidental Teaching

Incidental teaching is a type of naturalistic teaching strategy that focuses on following the child’s lead and waiting for the child to request or indicate interest in something

(McGee et al. 1999). Arranging the learning environment with preferred materials is essential to ensure the child initiates interest in something. For example, teachers might keep new toys or high preference materials on a top shelf so they are visible but out of reach. When the child indicates interest in something (e.g., looks and reaches, points, attempted to climb towards it), but needs teacher assistance to get the item, the teacher models the target behavior (e.g., one word label, point and look, verbal request) and waits for the child to respond. If the child imitates the target, the child gets the item. If the child does not imitate the target, the teacher repeats the model once and then gives the child the item. Incidental teaching can be used across a variety of daily routines and activities to teach communication (e.g., use of two word request during snack, use of signs during circle time) and other skills. Table 3 describes how teachers might arrange the environment to implement incidental teaching strategies. The following vignette describes how Sami's teachers used incidental teaching strategies to teach her to attend to relevant cues.

One of Sami's goals has been to increase her attention to relevant cues in the environment. Her teachers have been working on this goal with the picture schedules that help her transition through predictable classroom routines. They also are working on this goal during circle time by teaching her how and when to ask for songs. May employs strategies of incidental teaching by arranging the environment to increase motivation and interest in the materials. May prepared colorful props for each of the songs. When it is time for singing, she holds up a clear container with the props for one of the songs inside, and asks, "What song?" When she first began using the props, Sami consistently looked at

the container and pointed and said, "Sami!" May would immediately model the name of the song, "Old MacDonald," while looking at Sami. When Sami attempted an approximation of the name, May praised her and repeated it, "Yes we are going to sing Old MacDonald." She then let Sami come forward and carry the container around the circle to each child to reach in and take a prop, as part of her role as song helper. Now, Sami knows the names of 4–5 songs, and when May holds up the container, she responds with the name of the song along with the other children.

Embedded Learning Opportunities

Oftentimes children with autism will need specific, systematic instruction beyond the general curriculum to meet their goals and objectives (Horn et al. 2000). All strategies discussed previously can be systematically embedded in daily routines and throughout a school day to create learning opportunities focused on specific goals. Embedded instruction provides children with multiple and varied opportunities to practice goals and objectives within meaningful routines and high-interest activities (Pretti-Frontczak and Bricker 2004; Sandall and Schwartz 2008). With careful planning and preparation, individualized instruction is systematically embedded across daily routines and activities (Sandall and Schwartz 2008). These embedded learning opportunities are an essential component to any individual instructional plan because they provide multiple and varied opportunities to practice skills. Embedding instruction provides contextually relevant opportunities for learning with natural antecedents and consequences. Effective embedded instructional trials have an antecedent, target behavior, and consequence

Table 4 Examples of embedded instruction

Activity/ routines	Antecedent	Target behavior	Consequence
Snack	Preferred foods on the counter, wait, verbal model ("more apple")	2 word requests ("more apple," "apple juice," "cookie please")	Obtaining food items, descriptive talk ("You want more apple!")
Dramatic play	Child is playing with preferred trucks, stuffed animals, blocks; Wait, Physical Model	Pretend Play (having stuffed animal drive the truck, pretending the blocks are trucks or cars)	Descriptive talk and play response ("Your truck is fast!" "This is my car")
Dressing for outside time	Putting on coat, shoes, boots, hat, mittens, Verbal Prompt, "Touch your nose, head. Show me your hands, feet.")	Identification of body parts	Help with getting dressed to go outside, and specific praise and descriptive talk ("Yes! Those are your hands, feet!")
Clean up time	Child is playing with blocks, dolls, books. Verbal prompt and model, ("Time to clean up. Lets count. One, Two, Three...")	Counting objects	Specific praise and descriptive talk ("You put away five books today!")
Circle time	Child is engaged in circle time and it's time to pass out props, instruments, etc., for a song. ("Give your friends one rain-stick!")	Peer social interactions	One prop, specific praise, and descriptive talk ("You gave all your friends a rain-stick...")

(Sandall and Schwartz 2008). With intentional and systematic planning and environmental arrangement complete embedded instructional trials can be embedded across the day for most goals and objective. For more information on embedded instruction see the Embedded Instruction for Early Learning website: <http://www.embeddedinstruction.net/node/16>. Examples of embedded instruction are described in Table 4. The following vignette describes how Sami's teachers systematically and intentionally embedded instruction into daily activities and routines to teach her to use more complex language.

Sami's ECSE consultant observed her at least once a month in the classroom, and trained the teachers to support Sami in generalizing her new skills. During Sami's team meetings, time was devoted to identifying multiple places and times that Sami could practice specific skills. One of Sami's goals was to increase the complexity of her language. Sami's teachers set up the environment to provide several opportunities to teach her to use three words to request items. They kept the paint out of reach during art activity, waited for her to ask for it (i.e., "paint"), and modeled, "I want paint." They did the same thing with juice and cookies during snack, her favorite books during naptime, and her favorite balls during outside time. Thus, they intentionally and systematically arranged the environment to provide many opportunities to practice this goal across people, materials, settings, and routines. The skill was generalized when she started using three-word requests for new items during other activities, for example, during art telling May the color of paint she wanted: "I want red."

Peer-Mediated Strategies

Another evidence-based strategy for increasing social skills is to provide opportunities to interact with socially competent peers. Peers can be taught strategies to help children with autism acquire new social skills (Sperry et al. 2010; Strain et al. 2002). Typically developing children who are compliant with adult direction are good candidates for peer-mediated instruction. An adult might teach the peers specific strategies for initiating social interactions, organizing play, and assisting another child when he needs help. They first practice with the adult, and then interact with the children with autism, usually with adult prompting. Peer-mediated instruction is most effective when teachers plan and embed opportunities for social interactions across daily routines and activities. For more detailed information on implementing peer-mediated instruction with young children with autism see the Autism Internet Modules (<http://www.autisminternetmodules.org>).

Generalization

Programming for generalization also is an essential component of high quality intervention programs for children with autism (Dawson and Osterling 1997). Generalization occurs when the child demonstrates a skill across settings, materials, people, peers, or routines. Generalization of new skills can be difficult for children with autism (National Research Council 2001); children with autism might resist changes to their routine and insist on following the same structure or steps, especially when learning new skills. Thus, focusing on generalization might be particularly important for children with autism.

Planning for generalization should occur along with the development of goals and the intervention plan. In this manner, the teacher might teach a new skill in a structured, one-to-one setting *and* provide opportunities for the child to practice this new skill across the day. Effective strategies for promoting generalization for young children with autism includes providing multiple, varied learning opportunities for the child to attempt and practice the target behaviors across activities and routines (Pretti-Frontczak and Bricker 2004).

Generalizing Social Skills

Providing young children with autism with the opportunity to practice and generalize social skills is particularly important. For example, teachers might take inventory of the types of toys in the classroom and consider which toys children use together versus those that a child uses alone. Social toys encourage children to play in close proximity, and support positive interactions or cooperation with peers. These include blocks, teeter-totters, painting or coloring on large pieces of paper on the floor or table, wagons, sand or water tables. Isolate toys are ones that children use to play alone, and include computers, painting easels, listening centers, small puzzles or books (Raab 2003). Providing more social toys than isolate toys may occasion more positive social interactions. Teachers also should consider how to make the isolate toys more social (e.g., spread one large piece of paper across all the painting easels and provide plenty of brushes and paint). Also, teachers might replace some of the small books with bigger books that children can read together, and rotate some toys every week to maintain interest. Classroom learning centers can be examined in the same way. By limiting the number of centers or play areas in the classroom, children are encouraged to play near each other.

Generalizing Communication Skills

The environment also can be individualized to provide opportunities for children with autism to practice

communication skills. For example, if a child is working on increasing expressive communication, arrange the environment to provide opportunities to request or comment throughout the day. Give the child a small amount of art materials (e.g., paint, glue, crayons), small pieces of snack, or materials (e.g., water at the water table, play dough, sand), and prompt the child to request more. Create opportunities for observational learning by sitting children with autism next to peers with more advanced social or language skills (Ledford et al. 2007). Prompt the peers to model requests during snack time, art activities, and small group activities.

The following vignette illustrates how Sami's education team summarized her strengths and needs and began planning for her transition to kindergarten.

In the spring before Sami went to kindergarten in the fall, Sami's team met with her teacher from kindergarten to discuss her progress, strengths, and needs. Sami was well on her way toward her parents' goal of following routines and participating in large group activities that will support her success in kindergarten. She had developed skills in self-management through practice with visual schedules. She had made large gains in her language skills. However, she still preferred solitary play, and only interacted with peers when an adult prompted her. She would need more support in kindergarten to develop social initiation and play skills with her peers.

Conclusion

In summary, increasing numbers of children with autism are placed in early childhood settings with their typically developing peers. Likewise, there is an established and expanding body of research on evidence-based practices for young children with autism in inclusive classrooms. Given the heterogeneity of characteristics of children with autism, this evidence base should be viewed as a starting point, rather than a "one-size-fits-all" treatment approach to children with autism. Effective interventions for children with autism are evidence-based and individualized (National Research Council 2001; National Autism Center 2009a, b). This paper describes a portion of the evidence-based strategies for young children with autism and should not be viewed as a comprehensive list. Given the established research to practice gap in the field of early intervention (e.g., Dunst and Trivette 2009; McIntyre and Barton in press), this paper can be used to disseminate information and resources on effective practices. However, future research is needed to examine effective professional development strategies to ensure the implementation of

intentional, systematic, and individualized practices with children with autism and their families.

References

- Alberto, P. A., & Troutman, A. C. (2008). *Applied behavior analysis for teachers* (8th ed.). Upper Saddle River, NJ: Prentice Hall.
- Barton, E. E., & Wolery, M. (2008). Teaching pretend play to children with disabilities: A review of the literature. *Topics in Early Childhood Special Education, 28*, 109–125.
- Barton, E. E., & Wolery, M. (2010). Training teachers to promote pretend play in children with disabilities. *Exceptional Children, 77*, 85–106.
- Carnahan, C. C., Hume, K., Clarke, L., & Borders, C. (2009). Using structured work systems to promote independent and engagement in students with autism spectrum disorders. *Teaching Exceptional Children, 41*(4), 6–14.
- Carr, J., Nicholson, A., & Higbee, T. (2000). Evaluation of a brief multiple-stimulus preference assessment in a natural context. *Journal of Applied Behavior Analysis, 33*, 353–357.
- Centers for Disease Control and Prevention. (2007). Prevalence of autism spectrum disorders—autism and developmental disabilities monitoring network, six sites, United States, 2000. *Morbidity and Mortality Weekly Report Surveillance Summaries, 56*(SS-1), 1–11. Retrieved February 25, 2007, from <http://www.cdc.gov/mmwr/PDF/ss/ss5601.pdf>.
- Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A comparison of video modeling with in vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders, 30*, 537–552.
- Davis, C. A., Brady, M. P., Hamilton, R., McEvoy, M. A., & Williams, R. E. (1994). Effects of high-probability requests on the social interactions of young children with severe disabilities. *Journal of Applied Behavior Analysis, 27*, 619–637.
- Dawson, G., & Osterling, J. (1997). Early intervention in autism: Effectiveness, common elements of current approaches. In M. J. Guralnick (Ed.), *The effectiveness of early intervention: Second generation research* (pp. 307–326). Baltimore: Brookes.
- Doyle, P. M., Wolery, M., Ault, M. J., & Gast, D. (1988). System of least prompts: A review of procedural parameters. *Journal of the Association for Persons with Severe Handicaps, 13*, 28–40.
- Dunst, C. J., & Trivette, C. M. (2009). Research evidence to inform and evaluate early childhood intervention practices. *Topics in Early Childhood Special Education, 29*, 40–52.
- Grela, B. G., & McLaughlin, K. S. (2006). Focused stimulation for a child with autism spectrum disorder: A treatment study. *Journal of Autism and Developmental Disorders, 36*, 753–756.
- Hall, L. J. (2009). *Autism spectrum disorders: From theory to practice*. Upper Saddle River, NJ: Pearson.
- Hall, L. J., McClannahan, L. E., & Krantz, P. J. (1995). Promoting independence in integrated classrooms by teaching aides to use activity schedules and decreased prompts. *Education and Training in Mental Retardation and Developmental Disabilities, 30*, 208–217.
- Hancock, T. B., & Kaiser, A. P. (2002). The effects of trainer-implemented enhanced Milieu teaching on the social communication of children with autism. *Topics in Early Childhood Special Education, 22*, 39–54.
- Horn, E., Leiber, J., Li, S. M., Sandall, S., & Schwartz, I. (2000). Supporting young children's IEP goals in inclusive settings through embedded learning opportunities. *Topics in Early Childhood Special Education, 20*, 208–223.

- Ingersoll, B., & Schreibman, L. (2006). Teaching reciprocal imitation skills to young children with autism using a naturalistic behavioral approach: Effects on language pretend play, and joint attention. *Journal of Autism and Developmental Disorders*, *36*, 487–505.
- Jung, S., Sainato, D. M., & Davis, C. A. (2008). Using high-probability request sequences to increase social interactions in young children with autism. *Journal of Early Intervention*, *30*, 163–187.
- Kasari, C., Freeman, S., & Parapella, T. (2006). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. *Journal of Child Psychology and Psychiatry*, *46*, 611–620.
- Koegel, R. L., & Koegel, L. K. (2006). *Pivotal response treatments for autism: Communication, social, and academic development*. Baltimore: Brookes.
- Ledford, J. R., Gast, D. L., Luscre, D., & Ayers, K. M. (2007). Observational and incidental learning by children with autism during small group instruction. *Journal of Autism and Developmental Disorders*, *38*, 86–103.
- Lifter, K., Ellis, J., Cannon, B., & Anderson, S. R. (2005). Developmental specificity in targeting and teaching play activities to children with pervasive developmental disorders. *Journal of Early Intervention*, *27*, 247–267.
- MacDonald, R., Sacramone, S., Mansfield, R., Wiltz, K., & Ahearn, W. H. (2009). Using video modeling to teach reciprocal pretend play to children with autism. *Journal of Applied Behavior Analysis*, *42*, 43–55.
- McBride, B., & Schwartz, I. (2003). Effects of teaching early interventionists to use discrete trials during ongoing classroom activities. *Topics in Early Childhood Special Education*, *23*, 5–17.
- McClannahan, P. J., & Krantz, P. J. (1999). *Activities schedules for children with autism*. Bethesda MD: Woodbine House.
- McDonnell, A. P., Brownell, K., & Wolery, M. (1997). Teaching experience and specialist support: A survey of preschool teachers employed in programs accredited by NAEYC. *Topics in Early Childhood Special Education*, *17*, 263–285.
- McGee, G. G., Morrier, M. J., & Daly, T. (1999). An incidental teaching approach to early intervention for toddlers with autism. *Journal of the Association for the Severely Handicapped*, *24*, 133–146.
- McIntyre, L. L., & Barton, E. E. (in press). Parent reports of treatment sought for their young children with autism: Implications from an evidence based practice framework. *Journal of Behavior Assessment and Intervention in Children*.
- Mesibov, G., & Howley, M. (2003). *Accessing the curriculum for pupils with autistic spectrum disorders: Using the TEACCH programme to help inclusion*. London: Dave Fulton.
- National Autism Center. (2009a). *Evidence-based practice in the schools*. Randolph, MA: National Autism Center.
- National Autism Center. (2009b). *National standards report*. Randolph, MA: National Autism Center.
- National Research Council. (2001). Educating children with autism. Committee on educational interventions for children with autism. In C. Lord & J. P. McGee (Eds.), *Division of behavioral and social sciences and education*. Washington, DC: National Academy Press.
- Nikopoulous, C. K., & Keenan, M. (2004). Effects of video modeling on social initiations by children with autism. *Journal of Applied Behavior Analysis*, *37*, 93–96.
- Notari-Syverson, A. R., & Shuster, S. L. (1995). Putting real life skills into IEP/IFSPs for infants and young children. *Teaching Exceptional Children*, *27*(2), 29–32.
- Odom, S. L. (2009). The tie that binds: Evidence-based practice, implementation science, and outcomes for children. *Topics in Early Childhood Special Education*, *29*, 53–61.
- Odom, S. L., Brown, W. H., Frey, T., Karasu, N., Smith-Canter, L. L., & Strain, P. S. (2003). Evidence-based practices for young children with autism: Contributions for single-subject design research. *Focus on Autism and Other Developmental Disabilities*, *18*, 166–175.
- Pierce, K. L., & Schreibman, L. (1994). Teaching daily living skills to children with autism in unsupervised settings through pictorial self-management. *Journal of Applied Behavior Analysis*, *27*, 471–481.
- Pierce, K. L., & Schreibman, L. (1995). Increasing complex social behaviors in children with ASD: Effects of peer-implemented pivotal response training. *Journal of Applied Behavior Analysis*, *28*, 285–295.
- Pretti-Frontczak, K., & Bricker, D. (2004). *An activity-based approach to early intervention*. Baltimore: Brookes.
- Raab, M. (2003). Relationship between types of toys and young children's social behavior. *Bridges: Practice Based Research Syntheses*, *1*(5), 1–13.
- Sandall, S. R., & Schwartz, I. S. (2008). *Building blocks for teaching preschoolers with special needs* (2nd ed.). Baltimore: Brookes.
- Santos, R. M. (2001). Using what children know to teach them something new. In M. Ostrosky & S. Sandall (Eds.), *Teaching strategies: What to do to support young children's development* (pp. 71–80). Longmont, CO: Sopris West.
- Schreibman, L., Whalen, C., & Stahmer, A. C. (2000). The use of video priming to reduce disruptive transition behavior in children with autism. *Journal of Positive Behavior Interventions*, *2*, 3–11.
- Simpson, R. L. (2005). Evidence-based practices and students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, *20*, 140–149.
- Sperry, L., Neitzel, J., & Engelhardt-Wells, K. (2010). Peer-mediated instruction and intervention strategies for children with autism. *Preventing School Failure*, *54*, 256–264.
- Stahmer, A. C. (2007). The basic structure of community early intervention programs for children with autism: Provider descriptions. *Journal of Autism and Developmental Disorders*, *37*, 1344–1354.
- Strain, P. S., McGee, G., & Kohler, F. (2002). Inclusion of children with autism in early intervention environments. In M. J. Guralnick (Ed.), *Early childhood inclusion: Focus on change* (pp. 337–363). Baltimore: Brookes.
- Strain, P. S., & Dunlap, G. (n.d.). Recommended practices: Being an evidence-based practitioner. Center for evidence-based practice: Young children with challenging behavior. Retrieved November 1, 2010, from the Technical Assistance Center for Social Emotional Intervention Web site: http://www.challengingbehavior.org/do/resources/documents/rph_practitioner.pdf.
- Thiemann, K. S., & Goldstein, H. (2001). Social stories, written text cues, and video feedback: Effects on social communication of children with autism. *Journal of Applied Behavior Analysis*, *34*, 425–446.
- Yoder, P., & Stone, W. L. (2006). Randomized comparison of two communication interventions for preschoolers with autism spectrum disorders. *Journal of Consulting and Clinical Psychology*, *74*, 426–435.
- Zanolli, K., Daggett, J., & Adams, T. (1996). Teaching preschool age autistic children to make spontaneous initiations to peers using priming. *Journal of Autism and Developmental Disorders*, *26*, 407–422.