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Students with autism spectrum disorders (ASD) present unique challenges to educators trying to plan effective instructional programs. Although an impressive body of research identifying effective practices has emerged, there have been minimal attempts to integrate the findings into a curricular foundation to be adopted by school districts. This article provides a description of 6 core elements that have empirical support and should be included in any sound, comprehensive instructional program for students with ASD. These core elements are (a) individualized supports and services for students and families, (b) systematic instruction, (c) comprehensible/structured learning environments, (d) specialized curriculum content, (e) functional approach to problem behavior, and (f) family involvement. This article provides illustrations of the core elements in the form of specific instructional practices that have been demonstrated to be effective with students with ASD.

It has been more than half a century since Kanner (1943) first described autism after observing a group of 11 children displaying deficits in communication skills and interpersonal relationships. Today, despite the efforts of numerous researchers, autism remains a unique and perplexing disability. *The Diagnostic and Statistical Manual of Mental Disorders–Fourth Edition* (*DSM-IV*; American Psychiatric Association, 1994) defines autism as a pervasive developmental disorder marked by social and communication impairments along with a restricted repertoire of activities and interests. Autism, however, is not a single condition; rather, it is a spectrum disorder that results in individuals presenting with a wide range of abilities and disabilities (Heflin & Simpson, 1998a). Furthermore, autism spectrum disorder (ASD) is a lifelong disorder, usually diagnosed before 3 years of age and persisting through adulthood, with no identified etiology or cure. The deficits displayed by individuals having ASD affect the most vital aspects of quality of life, including interacting with other people, communicating ideas and feelings, and understanding what others feel or think (National Research Council, 2001).

Although the last decade has seen an expansion in our knowledge of effective instructional practices for students with ASD, controversy exists among researchers, program developers, educators, parents, attorneys, advocates, and the media regarding the appropriateness of specific strategies (e.g., Gresham, Beebe-Frankenberger, & MacMillan, 1999; Heflin & Simpson, 1998b; Hurth, Shaw, Izeman, Whaley, & Rogers, 1999). Multiple factors have contributed to the current contentiousness, including an increased prevalence of ASD, growth in litigation concerning appropriate interventions, a massive amount of literature regarding treatments, and a lack of guidance in determining which treatments are appropriate for individual children.

Recent epidemiological studies have reported that the prevalence of ASD has increased from 4 to 5 cases per 10,000 individuals in the 1960s (Lotter, 1966) to 5 to 31 cases per 10,000 individuals in the 1990s (Nordin & Gillberg, 1996; Webb, Lobo, Hervas, Scourfield, & Fraser, 1997). Specific geographic regions have been the focus of prevalence investigations. The Centers for Disease Control and Prevention (CDC) recently reported that in Brick Township, New Jersey, 40 out of 10,000 children ages 3 to 10 years have autism (CDC, 2000). The California Department of Developmental Services reported that the number of individuals receiving services for autism increased by 273% from 1987 to 1998 (CDC, 2001). A recent population-based study of trends in autism prevalence of successive cohorts of children born between 1987 and 1994 in California reported a prevalence rate of 11.0 per 10,000 (Croen, Grether, Hoogstrate, & Selvin, 2002). Relatedly, state educational departments have reported a rise in the numbers of students with ASD demanding autism-specific services (Hurth et al., 1999; National Research Council, 2001), with some states (e.g., California,

Florida, Illinois) reporting an epidemic growth (Feinberg & Vacca, 2000). Variability in reported prevalence rates has been explained by differences in criteria used to define autism cases, strategies to obtain data, or population demographic characteristics (Croen et al., 2002). A rate of 7.5 cases of autism per 10,000 individuals has been suggested as a summary figure representing the results of multiple studies conducted since 1987 (Fombonne, 1999).

Related to the increase in the number of students with ASD in the school systems, there has been a significant increase in the number of contested Individualized Education Programs (IEPs; Heflin & Simpson, 1998b; Hurth et al., 1999). Districts report IEP meetings that last multiple days, often ending up in due process, with parents questioning the methodology used in the school settings or requesting a specific treatment (Heflin & Simpson, 1998b; Hurth et al., 1999; Yell & Drasgow, 2000). Between the years of 1993 and 1998, there were 45 published due process hearings and court cases related to parents of children with ASD challenging school methodology (Yell & Drasgow, 2000). Baird (1999) stated that the area of contested methodology for students with ASD is the fastest growing area of litigation in special education.

The literature regarding interventions and programs for ASD has exploded in the last 10 to 20 years (Heflin & Simpson, 1998a). The literature, however, is a "mix of science, anecdotal reports, and unproven theories" (Olley, 1999, p. 595), with many reports being made public through various media, such as magazines (e.g., *Time, Newsweek*), television programs (e.g., *Dateline, 20/20*), and a huge variety of Internet sites (Dunlap & Fox, 2002; Feinberg & Vacca, 2000). Presented with an array of treatment options, parents and professionals are left with minimal guidelines to determine which approaches are "fringe therapy" and which are empirically supported and efficacious (Dunlap, 1999; Olley, 1999).

Although there has been a substantial body of sound research on educational interventions for children with ASD, there has not been an integration of the existing research to facilitate decision-making policies at the state, district, or campus levels (National Research Council, 2001). A confounding factor is the inconsistency of service delivery and intervention practices across states, school systems, and individual schools within the systems. A large part of the confusion exists because the research on interventions conducted thus far has failed to identify one practice that is equally appropriate or effective for all children with ASD (Pelios & Lurd, 2001; Prizant & Rubin, 1999). Furthermore, researchers have not identified one approach that is better than all other approaches; rather, there is documented support for a range of practices (Prizant & Rubin, 1999; Rogers, 1999). Although intervention studies present improvement in specific students, there does not yet appear to be a clear, definitive relation between particular strategies and a child's progress (National Research Council, 2001). In addition, there is no evidentiary support to indicate that interventions focusing on one aspect of autism (e.g., sensory deficits) result in concurrent improvements in other areas of deficit (e.g., social interaction; Rogers, 1999).

Fortunately, recent reports have identified essential components of effective programs for individuals with ASD. Although the primary focus of the recent reviews has been on effective practices for early intervention programs (age range 0–8 years), they originated from respected scholars and groups within the field of autism and their existence helps guide educators in making sound decisions regarding the use of educational practices for students of all age ranges. The purpose of this article is to present a set of effective core components that should be considered and included in any educational program for students of all ages with ASD. First, a review of the recent reports on the shared components of effective programs for students with ASD will be presented. Second, the core components essential for sound educational program practices for students with ASD of all ages will be suggested. In addition, examples of specific instructional strategies that have been empirically documented as being successful for individuals with ASD will be presented within the discussion of core components. As it is impossible within a single article to comprehensively review all studies of interventions for students with ASD, we are presenting a selective review of recent studies (between 1992 and 2002) whose research questions attempted to address one or more of the essential core components.

Review of Recent Reports

Several authors and expert groups have provided comprehensive reviews for the purpose of identifying effective practices for individuals with ASD. Table 1 provides a comparison of the essential components identified in the separate reports.

Powers (1992) provided one of the first sets of core components of effective instructional practices for students with autism. He based his review on examining practices of various early intervention programs, and he concluded that there were no data available to conclude that one program was effective for all. However, he did identify a set of best practices that should be included in programs for students with autism. These identified components included structured treatment using principles of applied behavior analysis (ABA); parent involvement in the school, community, and home; early intervention; intensive treatment; programming for generalization; specified curricula emphasizing social and communication skills; and integration with typical peers when possible.

Dawson and Osterling (1997) reviewed the literature on practices of nationally known, well-established, and well-respected models of early intervention programs and identified several key elements that were common to all programs reviewed. These elements included specific curriculum content focusing on core deficits of autism; highly supportive and structured teaching environment; predictability and routine; functional approach to problem behav-

TABLE 1
Comparison of Commonality Studies

Study/ component	Powers (1992)	Dawson & Osterling (1997)	Hurth et al. (1999)	National Research Council (2001)
Supportive and structured learning environments	X	X	X	
Family involvement	X	X	X	X
Early intervention	X		X	X
Specialized curricula focusing on communication and social interaction	X	X	X	X
Integration with typical peers	X			
Predictability and routine		X		
Functional approach to problem behaviors		X		X
Planned transitions between preschool and kindergarten/ first grade		X		
Individualization of supports and services			X	X
Systematic, carefully planned instruction			X	X
Intensity of engagement			X	X
Deveopmentally appropriate practices			X	

iors; planned transitions between preschool and kindergarten/first grade; and family involvement.

The National Early Childhood Technical Assistance System (NECTAS), funded through a cooperative agreement with the Office of Special Education Programs (OSEP) and the U.S. Department of Education, examined seven effective programs for young children with ASD and synthesized the information by describing the areas of agreement across the programs (Hurth et al., 1999). Six areas of agreement were identified as common to all programs reviewed: earliest possible start to intervention; individualization of services for children and families; systematic, carefully planned teaching; specialized curriculum; intensity of engagement; and family involvement. Three additional elements were presented as common to some, but not all, programs: structured environment, developmentally appropriate practices, and intervention in settings with typical children or in natural environments.

Most recently, the National Research Council (2001) formed a committee of renowned experts to examine research related to autism and present an organized and synthesized format of the multitude of scientific findings and unknowns in the field of early education of children with autism. They specifically reviewed practices and programs designed for children 8 years of age and younger and presented a framework for evaluation of programs and practices. Similar to the previous summary reports, a consensus of the characteristics of effective interventions used in programs for children with ASD was determined. These characteristics were early entry into intervention programs, active engagement in intensive instructional programming, use of planned teaching opportunities, sufficient amount of adult attention to meet individualized goals, and active family involvement. Accompanying the characteristics were the following priority areas for instructional focus: functional spontaneous communication, social instruction, cognitive development, play skills, and proactive approaches to behavior challenges.

In reviewing the four reports, we discovered the following two noteworthy issues:

1. The effective characteristics identified focused on broad practices rather than specific treatments or strategies.
2. There are definitive areas of agreement, or commonalities, among the reports.

Integration of Core Components From Published Reports

The major reviews discussed in the previous section have focused on essential features of early intervention programs. To date, there has not been a similar concerted effort by authors to identify core components shared by effective educa-

tional programs for older students (i.e., elementary through secondary) with ASD, though there have been earlier attempts to identify guidelines for educational efforts (Dunlap & Robbins, 1991; Olley & Rosenthal, 1985). More recently, Heflin and Simpson (1998a) provided a critique of several established programs (e.g., Project TEACCH, UCLA Young Autism Project) and strategies (e.g., social stories, visual schedules). In a follow-up article, the authors offered guidelines for school districts to use when choosing specific interventions for students with ASD (Heflin & Simpson, 1998b). Gresham, Beebe-Frankenberger, and MacMillan (1999), using Dawson and Osterling's (1997) common elements as an evaluative guide, conducted a comparative review of several comprehensive treatment programs for children with autism (e.g., Project TEACCH, UCLA Young Autism Project, Learning Experiences . . . An Alternative Program [LEAP]). Gresham et al. suggested that these elements were appropriate for all school systems and should be provided in educational programs for all children with autism.

Although the majority of the previous reviews focused on programs targeting young children (8 years of age and younger), we believe that the areas identified are consistent with effective practices for children of any age with ASD. Although less information is available regarding the application of these practices with school-age children, there is no reason to believe that these broad core components would not apply to an older child. Of course, implementation of any component may vary in its form or level of intensity depending on the individual student's needs and characteristics, including age. With that in mind, we will attempt to identify and describe those core components that are agreed upon by most of the summary reports and appear to be appropriate for all instructional age levels. Using Table 1 as our guide for synthesizing the core elements identified by each summary report, we have recognized six essential themes or components to be included in an effective educational program for students with ASD:

1. individualized supports and services for students and families,
2. systematic instruction,
3. comprehensible and/or structured environments,
4. specialized curriculum content,
5. a functional approach to problem behaviors, and
6. family involvement.

Embedded within our discussion of core components, we will review a number of studies that used a range of strategies with students of all ages having ASD and that documented effectiveness in providing one or more of the core components, with the understanding that specific strategies can concurrently address more than one component. Table 2 provides a list of a representative sample of studies using specific strategies. Criteria used to determine inclusion of a study in Table 2 were (a) including individuals with autism who were at least 5 years of age, (b) having been published within the last 10 years (1992–2002), and (c) the intervention having been demonstrated to be effective.

Individualized Supports and Services

There is consensus among well-respected scholars in the field of autism that there is no empirical basis for recommending one approach or endorsing a single program as being superior for all individuals with ASD (Dunlap & Fox, 2002; Heflin & Simpson, 1998a). Students with ASD are heterogeneous in their presentation of behaviors and in their unique preferences, interests, and learning styles requiring individualized instructional support needs (Dunlap & Fox, 2002; Dunlap & Robbins, 1991). Educational personnel are required, through the Individuals with Disabilities Education Act (IDEA) Amendments of 1997, to provide a continuum of individualized supports, services, and placements to students, ranging from inclusion in general education with varying levels of supports to extremely specific services and instruction in specialized settings. The determination of the appropriate levels of supports and services to be provided to each student with ASD is the foundation of the IEP. Within this framework, choices regarding curriculum emphasis will be made. For some students with ASD, the general education curriculum with minimal or moderate modifications and adaptations will be appropriate, whereas others may need major adaptations (e.g., a more functional academic approach). Therefore, no one program, support, or service (e.g., self-contained class for autism) is likely to meet the needs of the population as a whole. Instead, schools should provide flexible placement and support options to meet each student's individualized goals (Dunlap & Fox, 2002).

Although there is not one distinct approach that is effective for all students with ASD, some approaches benefit individual children and families more than others. A critical key to success is for school personnel to find ways to match specific practices, supports, and services with each student's unique profile and the individual family's characteristics (Dunlap, 1999). Individualized supports and services include the following:

1. considering family preferences when determining the goals to be taught and the methods by which instruction will be delivered,
2. incorporating the child's preferences and special interests into the instructional program (Hurth et al., 1999), and
3. focusing on the child's strengths and weaknesses to determine the most appropriate intensity and level of instruction to meet the child's individual goals (National Research Council, 2001).

Procedures used should take on the characteristic of being custom designed for each child, allowing for individual ad-

TABLE 2
Overview of Studies Using Interventions Implementing Core Components with Children with Autism

Core component	Study	*N*[a]	Age	Target behavior	Intervention
Individualized supports and services	Baker, Koegel, & Koegel (1999)	3	5–7	Increase social engagement with peers	Functional use of children's unique obsessive behaviors as play themes
	Bryan & Gast (2000)	4	7–9	Increase engagement in tasks and schedules	Picture activity schedules and graduated guidance
	Gena & Kymissis (2001)	3	5	Develop individualized plans to increase engagement and support inclusion in general education kindergarten	Individualized assessments of levels of behaviors and targeted instruction for specific needs
	Heckaman, Alber, Hooper, & Heward (1998)	4	6–9	Decreasing rates of disruptive behavior and increasing engagement in instruction	Task interspersal (difficult/easy); least-to-most prompting; progressive time delay
	L. K. Koegel, Camarata, Valdez-Menchaca, & Koegel (1998)	1	5	Self-initiation of question-asking and generalization	Motivational procedures (incorporation of preferred items, natural reinforcers)
	MacDuff, Krantz, & McClannahan (1993)	4	9–14	Increase engagement and on-schedule behaviors	Photographic activity schedules and graduated guidance
Systematic instruction	Callahan & Rademacher (1999)	1	8	Increase on-task behaviors and school performance	Self-management
	Eikeseth, Smith, Jahr, & Eldevik (2002)	25	4–7	Increase discrete behaviors (language, social behaviors, motor skills, etc.)	Intensive discrete trial training compared to eclectic treatment based on Dawson & Osterling's components
	Mancina, Tankersley, Kamps, Kravits, & Parrett (2000)	1	12	Reduction of inappropriate vocalizations and increasing engagement and independence	Self-management
	Morse & Schuster (2000)	3	6 (two) & 9 (one)	Increase acquisition, generalization, and maintenance of grocery shopping skills	Combination of in vivo training, constant time delay, and pictorial storyboard simulation
Comprehensible (structured) environment	Dettmer, Simpson, Myles, & Ganz (2000)	2	5 & 7	Facilitating transitions between activities	Visual schedules, subschedules, "finished" boxes, and timers

(table continues)

(Table 2 continued)

Core component	Study	N[a]	Age	Target behavior	Intervention
	Pierce & Schreibman (1994)	3	6–9	Increase acquisition of daily living skills	Pictorial self-management system
	Schreibman, Whalen, & Stahmer (2000)	3	3–6	Decrease disruptive behavior during transitions	Video priming
Specialized curriculum: Communication	Buffington, Krantz, McClannahan, & Poulson (1998)	4	4–6	Acquisition, generalization, and maintenance of functional communicative gestures in combination with verbal language	Modeling, prompting, reinforcement
	Dyches (1998)	4	10–12	Effects of switch training on functional communication	Least-to-most prompts
	Jahr (2001)	5	3–7	Transfer and maintenance of wh-question–answering skills	Multiple exemplar discrete trial
	Sarokoff, Taylor, & Poulson (2001)	2	8–9	Increase conversational exchanges	Script-fading with embedded textual cue as stimulus
	Scherer et al. (2001)	5	4–11	Increase responses to conversation questions	Video-modeling (others and self)
	Schwartz, Garfinkle, & Bauer (1998)	Study 1: 16 Study 2: 11	3–6	Study 1: Rate of acquisition of PECS Study 2: Increase in functional communication	PECS
	Thiemann & Goldstein (2001)	5	6–11	Acquisition and generalization of social communication skills	Social stories, pictorial cues, written social phrases
Specialized curriculum: Social skills	Kamps, Leonard, Vernon, Dugan, & Delquadri (1992)	3	7	Increase social initiations, responses, and exchanges	Peer mediation and monitoring
	Kamps et al. (2002)	5	3–9	Increase social participation with peers	Peer mediation
	Laushey & Heflin (2000)	2	5	Increase social interaction skills	Peer mediation (peer tutors)
	Morrison, Kamps, Garcia, & Parker (2001)	4	11–13	Improve social initiations and social interactions	Peer mediation and monitoring (peer and self)
	Norris & Dattilo (1999)	1	8	Increase social behaviors	Social story

(table continues)

(Table 2 continued)

Core component	Study	*N*[a]	Age	Target behavior	Intervention
	Pierce & Schreibman (1997)	2	7–8	Increase social behaviors	Peer mediation (pivotal response training)
	Stahmer & Schreibman (1992)	3	7–12	Increase appropriate play with toy skills	Self-management package
	Zercher, Hunt, Schuler, & Webster (2001)	2	6	Increase joint attention, play, and language	Peer-supported integrated play groups
Functional approach to problem behavior	Chandler, Dahlquist, Repp, & Feltz (1999)	12	3–6	Decrease challenging behaviors and increase appropriate behaviors	School team-based functional behavior assessment
	Durand (1999)	2	9–11	Decrease challenging behaviors and increase communicative behaviors	Functional behavior assessment and functional communication training
	Graff, Lineman, Libby, & Ahearn (1999)	1	6	Decrease challenging behavior	Functional analysis, differential reinforcement and consequential strategies
	Hagopian, Wilson, & Wilder (2001)	6	6	Decrease challenging behavior and increase communicative behaviors	Functional analysis, functional communication training
	Kuttler, Myles, & Carlson (1998)	1	12	Reduction in challenging behavior	Functional behavior assessment and social stories
	Mueller, Wilczynski, & Moore (2001)	1	8	Reduction in challenging behavior	Functional analysis and antecedent manipulations
	O'Neill & Sweetland-Baker (2001)	2	6 & 15	Decrease challenging behavior and increase appropriate behavior	Functional communication training
	Patel, Carr, Kim, Robles, & Eastridge (2000)	1	10	Decrease challenging behavior	Functional behavior assessment, DR0
Family involvement	Frea & Hepburn (1999)	2	4	Decrease challenging behavior and increase appropriate behavior	Parent training of functional behavior assessment
	Koegel, Bimbela, & Schreibman (1996)	17	*M* = 6	Effects of different parent training interventions on parent interaction styles	Parent training: Pivotal response training compared with discrete trial training
	Lorimer, Simpson, Myles, & Ganz (2002)	1	5	Prevention of challenging behavior	Social stories as antecedent intervention in home setting

Note. PECS = *Picture Exchange Communication System* (Frost & Bondy, 1994). DR0 = differential reinforcement of zero rates of responding.
[a]Number of children in study 5 years or older with an autism spectrum disorder.

justments within the package that meet each child's unique skills and needs (Hurth et al., 1999; National Research Council, 2001).

A key aspect of individualization for students with ASD involves approaches for supporting high rates of engagement. Engagement, the amount of time that the student is attending to and actively interacting in his or her social and nonsocial environments (Dunlap, 1999; Hurth et al., 1999), has been cited as one of the best predictors of positive student outcomes (Logan, Bakeman, & Keefe, 1997; Rogers, 1999). When a child is engaged, connections and interactions are occurring. Conversely, when the child is not engaged, he or she is not available for learning (Hurth et al., 1999). Difficulty in motivating students with ASD to engage with or respond to their environment, a key diagnostic marker, has been well documented in the literature (Dunlap & Robbins, 1991; R. L. Koegel & Mentis, 1985; Olley & Reeve, 1997; Simpson & Myles, 1998). Students with ASD have difficulty attending to and interacting during events occurring in their settings and thus lose out on crucial learning opportunities (Dunlap, 1999). Engagement of students with ASD will be unlikely unless there is some deliberate design, such as carefully planning changes to the physical environment, systematically using materials and/or activities, incorporating preferred materials and activities, and capitalizing on a student's spontaneous interests and initiations (Hurth et al., 1999). The calculated methods selected to ensure the engagement of individual students should be guided by the students' unique preferences and characteristics. Engaged time can be provided at different levels of intensity and in a wide variety of settings using a range of strategies based on students' individual needs and characteristics. For example, engagement can occur in various settings, including (a) one-to-one instruction with an adult, (b) independent work time with specific planned activities and materials, (c) group instruction spent with a peer tutor or an adult, and (d) general instruction that occurs throughout a student's day. Strategies can include one-to-one discrete trials as well as more naturalistic instructional techniques.

Pivotal response training (PRT), a naturalistic teaching approach, has received increasing attention as a method to promote motivation and engagement (L. K. Koegel, Harrower, & Koegel, 1999; R. L. Koegel, Koegel, & Carter, 1999; Pierce & Schreibman, 1997). PRT approaches include following the child's lead, using preferred items or activities, teaching within natural contexts, and using natural reinforcers rather than artificial or arbitrary reinforcers. Whereas incidental teaching and other naturalistic procedures focus on teaching specific target behaviors (McGee, Krantz, & McClannahan, 1985), PRT focuses on the acquisition of behaviors that are crucial to wide areas of functioning so that a change in the pivotal behavior will result in the acquisition of a variety of other behaviors (R. L. Koegel et al., 1999). Motivation, self-initiation, and responding to multiple cues are examples of pivotal behaviors. Providing choices, varying tasks, interspersing tasks, reinforcing all attempts (even if incorrect), and using natural reinforcers are methods used within PRT to increase students' responsiveness to social and environmental stimuli and thus increase their engagement and motivation (R. L. Koegel & Egel, 1979; R L. Koegel et al., 1999).

Several studies in Table 2 used PRT strategies to increase active engagement of children with autism. The use of preferred objects and natural reinforcers to increase the motivation of three children to (a) self-initiate questions to others and (b) generalize the use of spontaneous questions about novel objects to other people and within new environments was investigated by L. K. Koegel, Camarata, Valdez-Menchaca, and Koegel (1998). Other PRT strategies to increase motivation in children with autism include varying the presentation of tasks and interspersing maintenance tasks so that children with autism experience success in the activity. The strategy of interspersing easy and difficult tasks was used to decrease problem behaviors and increase participation in and responses to instructional activities for four elementary students with autism (Heckaman, Alber, Hooper, & Heward, 1998).

The other representative studies in Table 2 used various strategies based on individualized characteristics of the target child to increase engagement. Incorporating a child's idiosyncratic interests into instructional activities has proven to be an effective method to enhance engagement in activities. Baker, Koegel, and Koegel (1999) incorporated a child's perseverative interests in maps into socially appropriate games to increase the child's willingness to socially interact with others in the environment during social study activities. MacDuff, Krantz, and McClannahan (1993) and Bryan and Gast (2000) used picture activity schedules designed for individual students and prompting strategies to increase on-task and on-schedule behaviors. The development of specific educational plans based on the unique learning characteristics of students with autism resulted in their increased engagement in an inclusive kindergarten setting (Gena & Kymissis, 2001).

In summary, considering a child's unique preferences, needs, and learning characteristics, along with the family's preferences, is a component that has demonstrated effectiveness through numerous investigations. Optimal progress of a student with ASD is dependent on the extent to which assessments of the child's abilities and the selection of interventions are individualized.

Systematic Instruction

The second component that scholars have agreed is critical is providing systematic instruction. Systematic instruction involves carefully planning for instruction by identifying valid educational goals, carefully outlining instructional procedures for teaching, implementing the instructional procedures, evaluating the effectiveness of the teaching procedures, and adjusting instruction based on data (Hurth et al., 1999; Westling & Fox, 2000). Having systematic, meaningful data collection for making instruc-

tional decisions has been identified as a major factor in schools' winning due process cases related to disagreement about methodologies (Yell & Drasgow, 2000). Individuals with ASD have demonstrated significant progress in attainment of competencies when programs use instructional approaches that are both comprehensive and systematic (Heflin & Alberto, 2001; Simpson, 2001). Systematic instruction also provides a structured teaching plan for generalization and maintenance of learned skills. Another critical feature of systematic instruction is planning for high levels of engagement.

Strategies using applied behavior analysis (ABA) have been documented to be effective in systematically teaching target behaviors. It is important for educators and families to keep in mind that "ABA is not a specific program, procedure, or technique; it involves methods and principles" that are applied in diverse ways (Dunlap, 1999, p. 224). Within these various formats, specific instructional procedures (e.g., prompt delivery, shaping, fading) are provided at a level and intensity that fits the context and the unique characteristics of the student (Harrower & Dunlap, 2001). Strategies based on ABA principles include intense structured approaches (e.g., discrete trial training), naturalistic approaches (e.g., incidental teaching, pivotal response training), and self-management procedures. See Table 2 for a list of studies that use strategies based on ABA principles to improve the rate of acquisition of novel skills and to maintain and generalize learned skills.

The representative studies (listed under systematic instruction) in Table 2 use a variety of methods based on ABA principles (e.g., discrete trial training, in viro training, self-management) to increase acquisition, maintenance, and generalization of skills in children with ASD. An evaluation of the effect of 1 year of school-based intensive discrete trial training procedures on a group of children with autism was conducted by Eikeseth, Smith, Jahr, and Eldevik (2002). Results indicated that the children made gains on standardized measures of functioning assessing cognition, language, and adaptive skills. Morse and Schuster (2000) used a combination of in vivo training including constant time delay and visual icons to teach students to shop for groceries. Callahan and Rademacher (1999) used self-management procedures to increase the independent academic behavior of a high-functioning second-grade student with autism in a general education setting. When self-management procedures were implemented, there were significant increases in on-task behavior, as well as increases in independent academic and behavior functioning. An additional study using self-management procedures resulted in the reduction of inappropriate vocalizations and increases in the on-task behavior of a 12-year-old girl with autism and moderate mental retardation (Mancina, Tankersley, Kamps, Kravits, & Parrett, 2000). Thus, self-management procedures can be used with children with diverse functioning levels.

In summary, systematic, well-planned instruction is an essential component of all classrooms including students with ASD. By carefully targeting meaningful skills to be taught, planning specifically when and how to provide instruction based on the unique characteristics of the specified student, determining data-collection methods to gauge student progress and instructional effectiveness, and using data to make sound instructional decisions, educational personnel should have effective and defensible programs.

Comprehensible/Structured Learning Environments

Although students with ASD often need classrooms that are structured, the term *structure* is not consistently defined (Olley & Reeve, 1997). A program is considered structured when the curriculum (activities, schedule, environment) is clear (i.e., comprehensible) to both the students and the educational personnel. A good test of determining whether an environment is comprehensible is to observe the students for 10 minutes and identify what each one is supposed to be doing. If the observer is unclear about what is happening for each student, it stands to reason that the students may also be uncertain (Olley & Reeve, 1997). A comprehensible classroom for students with ASD is one that is arranged in such a way as to elicit, facilitate, enhance, or support the acquisition of specific skills such as language acquisition, appropriate behavior, social interactions, and targeted academic goals (Earles, Carlson, & Bock, 1998; Hurth et al., 1999). A comprehensible environment allows a student with ASD (and others) to (a) predict what is currently happening within the learning process and what will happen next, (b) anticipate requirements of specific settings, and (c) learn and generalize a variety of skills (Earles et al., 1998; Gresham et al., 1999; Volmer, 1997). Examples of strategies that assist in structuring the environment include visual cues or supports that

1. organize the instructional setting (Heflin & Alberto, 2001);
2. provide a schedule of activities (Rogers, 1999; Simpson & Myles, 1998);
3. carefully plan and provide choice-making opportunities (Dalrymple, 1995);
4. provide behavioral support (Earles et al., 1998);
5. define specific areas of the classroom and school settings (Heflin & Alberto, 2001; Volmer, 1997);
6. provide temporal relations, (Earles et al., 1998; Heflin & Alberto, 2001); and
7. facilitate transitions, flexibility, and change (Simpson & Myles, 1998).

Although environmental supports appear to have widespread use, research examining the effects of using specific strategies is sparse. The studies presented in Table 2 focus on using temporal supports, such as visual schedules, to organize sequences of time for students and using spatial supports, such as priming, to provide and preview specific information regarding the organization of a new environment and activities that will occur in the setting. Dettmer, Simpson, Myles,

and Ganz (2000) used both visual schedules of daily activities and subschedules (e.g., task analysis of sequential steps of broad activities) to facilitate transitions between activities by reducing latency time for two boys with autism. The authors concluded that the visual supports significantly reduced the latency time of transitioning for both boys, and concurrent increases were observed in communication and independent behaviors.

Video priming is a practice that previews information or activities that usually trigger problem behaviors with the child before he or she actually becomes involved in the activity (Harrower & Dunlap, 2001). Priming allows the child to predict what will happen during the upcoming activity. Schreibman, Whalen, and Stahmer (2002) used a video priming intervention to reduce disruptive transition behavior in three children with autism. They noted that the reduction of problem behaviors generalized to untrained transitions and were maintained after the study ended.

Comprehensible learning environments provide students with ASD with a way to make sense of what is happening in their environment, enhance instruction of their targeted skills, and build their competencies (e.g., independence, communication). Depending on the unique characteristics of individual students, environmental supports can range from minimal (e.g., written schedule in student planner, review of homework at the end of the day) to substantial (e.g., labels, boundaries defined, subschedules).

Specific Curriculum Content

The core deficits in individuals with ASD are in the areas of communication and social interaction. Children with autism display difficulties in the development of social reciprocity and communication skills. Specialized curriculum should include systematic instruction in social engagement skills, including initiating and responding to social bids, appropriate recreational or leisure skills, and language comprehension and communication (Olley, 1999). Curriculum content and the instructional methods to teach it should be based on an individualized assessment of students and should consider the family's preference for targeting goals (Olley, 1999). In addition, educators should consider the functionality of the skills targeted within the curriculum. Focus should be on those skills that (a) are most likely to be useful in the student's life to control his or her environment, (b) will increase the student's independence and quality of life, and (c) will increase the student's competent performance (Dunlap & Robbins, 1991). A good test of the functionality of a skill is to ask whether the result of not learning a specific behavior will require another person to perform the task for the student. For example, a goal for all students with ASD should be to communicate effectively, even if the form or structure of communication is nontraditional (i.e., nonverbal; Olley & Rosenthal, 1985). If a student does not learn a method of communication, another person will always need to be present to assist the student with communication efforts.

Table 2 lists several studies focusing on acquisition of either language abilities or social interaction skills. A review of the studies focusing on improving language abilities included using strategies based on ABA principles and using augmentative/assistive technology strategies (e.g., picture communication systems, switches, and voice output devices). Discrete trials were the intervention of choice for Buffington, Krantz, McClannahan, and Poulson (1998), who taught four children with autism to use gestures with oral communication. Jahr (2001) used multiple exemplars in discrete trials to train five children diagnosed with autism to answer wh-questions and to generalize across novel questions and novel people. Sarokoff, Taylor, and Poulson (2001) used fading procedures with embedded textual cues to increase the number of students' conversational exchanges.

Augmentative communication (AAC) and assistive technology (AT) have been identified as viable emerging components of an instructional program, particularly for those children who do not acquire functional speech or have difficulty comprehending language (National Research Council, 2001). There is limited research, however, providing clear guidelines for matching characteristics of children and elements of AAC and/or AT that may produce effective outcomes. The studies reviewed in Table 2 explored picture communication systems and vocal output communication devices (e.g., switches, Cheap Talk).

Schwartz, Garfinkle, and Bauer (1998) used the *Picture Exchange Communication System* (PECS; Frost & Bondy, 1994) to evaluate young children's rate of using the system and to examine the system's ability to facilitate acquisition of increased functional communication. All children participating in the study learned to use PECS within 3 to 28 months (M = 14 months). Furthermore, increases in functional communication for the purposes of commenting and responding were found across all settings. A combination of visual cues, including pictures and texts, was used to teach social communication skills (Thiemann & Goldstein, 2001). Scherer et al. (2001) used the medium of video recordings of peers and target students as a visual system to increase responses to questions. Dyches (1998) explored training upper elementary school-age students with autism to use a switch that triggered recorded requests and statements (e.g., "I want a drink," "I'm thirsty") to increase spontaneous communication interactions within a natural context. A concurrent increase in one student's use of verbalizations also resulted. Schepis, Reid, Behrmann, and Sutton (1998) taught four preschool children with autism to use voice output communication aids (VOCAs) with line-drawing graphics to make requests and social comments.

The studies that addressed social interaction vary in the specific method used. Techniques included using naturalistic teaching procedures (i.e., incidental teaching, pivotal response training), social stories, visual supports, self-management packages, and peer supports. Many of the articles in Table 2 use some form of peer-

mediated strategy involving recruiting and training peers to increase appropriate social interactions of students with ASD. It is interesting to note that studies using peer-mediated practices are becoming increasingly sophisticated, with some studies including the training of typical peers to use instructional methods such as pivotal response training (Pierce & Schreibman, 1997), incidental teaching (McGee, Almeida, Sulzer-Azaroff, & Feldman, 1992), monitoring strategies (Kamps, Leonard, Vernon, Dugan, & Delquadri, 1992; Morrison, Kamps, Garcia, & Parker, 2001), and peer tutoring (Kamps et al., 2002; Laushey & Heflin, 2000). In Pierce and Schreibman's (1997) study, eight typical peers were taught PRT strategies to increase the social interaction skills of two elementary children with autism. The investigators also noted that both boys generalized their improved social interaction behaviors to untrained peers. McGee et al. (1992) taught peer tutors incidental teaching techniques to increase peer interactions. Even after adult coaching of the typical peers was systematically faded, maintenance of increased social interactions remained. Kamps et al. (1992) formed and trained peers in social skills groups to increase initiations, responses, and exchanges of students with autism. Typical peers were also taught to self-monitor their social performance. Morrison et al. (2001) studied the effects of combining self-monitoring with peer-mediated strategies to improve the social interactions of four upper elementary students (ages 11–13 years) with autism. The combination intervention proved effective for increasing requesting, commenting, and sharing behaviors during free-play time. Kamps et al. (2002) and Laushey and Heflin (2000) trained peer tutors to increase the social participation of students with autism in cooperative learning groups.

Social Stories is an intervention developed by Carol Gray (1995) to facilitate interpretation of social situations by individuals with autism. Social Stories is, in essence, a priming strategy. It previews potentially difficult situations for a student prior to the student becoming engaged in the activity. Although widely used, most of the effectiveness of Social Stories has been anecdotal and informal in nature. Norris and Dattilo (1999) used a social story intervention to decrease the inappropriate social behaviors of an 8-year-old girl with autism during lunchtime. Inappropriate behaviors started to decrease on the 5th day of the intervention. No significant increase in appropriate social interactions, however, was noted. The authors concluded that using Social Stories with another intervention might be more effective than using Social Stories as the sole strategy.

The Integrated Play Group Model (Wolfberg, 1995) was used as the primary intervention for twin boys with autism (Zercher, Hunt, Schuler, & Webster, 2001). The Integrated Play Group Model uses peer mediation techniques and is characterized by the following features:

1. natural environments,
2. inclusive settings,
3. inviting play spaces and selection of play materials based on individual characteristics and interactive potential,
4. play groups consisting of three typical peers for every one or two peers with disabilities,
5. guided participation, and
6. full participation in play (Wolfberg & Schuler, 1993).

Zercher et al. found that the boys with autism had significant increases in play behaviors, along with increases in verbal utterances.

While peer-mediated strategies have proven to be effective, Stahmer and Schreibman (1992) explored the use of a self-management package to help students monitor and supervise their own appropriate play skills. The students used alarm wristwatches as their cue to evaluate whether they had used appropriate play skills during the interval. All children exhibited appropriate play skills using their self-management systems. Furthermore, the skills generalized to novel settings.

In summary, it would benefit educational personnel to emphasize curriculum content that targets communication and social interaction skills. A crucial guideline for determining specific curriculum content is to prioritize teaching skills within the domains of communication and social interaction that the student will use outside of the school environment and in adult life. Communication and social skills are the behaviors that provide us with the greatest quality of life, leading to more control over our environment. It is essential that an educational program provide all students with ASD with the necessary level of services and supports to attain competent skills in these areas.

A Functional Approach to Problem Behavior

Problem behaviors of students with autism present unique challenges and stressors to schools and parents. Recent research evidence has suggested that in order for educational interventions addressing problem behaviors to be successful, positive and proactive behaviors must be considered and developed (National Research Council, 2001). That is, the child's problem behavior is not merely decreased or eliminated; rather, interventions should focus on replacing the problem behavior with an appropriate alternative or replacement behavior that results in the same or similar consequence.

Until the mid-1980s, the primary approach for ameliorating problem behaviors was using operant behavior modification procedures that focused on the effects of contingencies for increasing desired behaviors and decreasing undesired behaviors (Carr et al., 2002). Interventions emphasized the use of consequences and were directed toward eliminating the behaviors of concern by reinforcing the absence of the target behavior, reinforcing other or alternative behaviors (e.g., differential reinforcement), or applying punishment (e.g., overcorrection, time-out) after problem behaviors occurred.

In the mid-1980s, researchers began to appreciate the perspective that prob-

lem behaviors occurred for a purpose and that this purpose often involved a communicative intent. This perspective led to using functional analysis and functional assessment to understand why a child's problem behaviors occurred, and this understanding led to incorporating interventions that focused on the establishment of socially valid behaviors that could serve the same purpose as the targeted problem behavior (Carr, 1977; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982). The concept of functional equivalence was the foundation of new strategies such as functional communication training, an instructional strategy that applies the concept of functional equivalence to identify communicative replacement behaviors that solicit the same reinforcement or function that the previous problem behavior achieved (Carr & Durand, 1985; Carr et al., 1994).

Positive behavior support (PBS) evolved from the roots of applied behavior analysis as a new scientific approach that has changed the way problem behavior is viewed, assessed, and addressed. PBS uses functional assessment (also referred to as functional behavioral assessment) to build individualized support plans that are derived from an understanding of the purpose and environmental determinants of a specified problem behavior. Functional behavior assessment (FBA) is a process for identifying variables that reliably predict and maintain problem behaviors (Horner & Carr, 1997), using data gathered through indirect measures (e.g., interviews) and direct measures (e.g., observations of antecedents, behaviors, and consequences). Prominent purposes of problem behaviors are escaping/avoiding tasks, people, events, objects, or sensory input and/or obtaining specific tasks, people, events, objects, or sensory input. Behavior support plans typically include multiple positive interventions that prevent problem behavior from occurring, provide appropriate replacement behaviors, and change the way others respond to problem and appropriate behaviors. The primary goal of PBS is to enhance the individual's quality of life by expanding his or her existing behaviors and adjusting the learning environment. The secondary goal is to make problem behavior ineffective, inefficient, and irrelevant (Carr et al., 1999; L. K. Koegel et al., 1996).

Although contingency management approaches are still valid and powerful procedures (with reinforcement techniques being a central element of PBS), the broader process of PBS has become the standard approach to behavior management and support (Carr et al., 2002). A great deal of research over the past 15 years has provided compelling evidence regarding the effectiveness of PBS for addressing the problem behaviors of students with ASD (Carr et al., 1999; Horner et al., 1990; L. K. Koegel et al., 1996; National Research Council, 2001).

Several studies reviewed in Table 2 used some variation of FBA and functional analysis to identify the purposes of the child's problem behavior prior to designing an intervention including functional communication training and other PBS strategies (e.g., Chandler, Dahlquist, Repp, & Feltz, 1999; Durand, 1999; Graff, Lineman, Libby, & Ahearn, 1999; Hagopian, Wilson, & Wilder, 2001; Kuttler, Myles, & Carlson, 1998; Mueller, Wilczynski, & Moore, 2001; O'Neill & Sweetland-Baker, 2001; Patel, Carr, Kim, Robles, & Eastridge, 2000). Educators should be using a process such as PBS that will help them understand the purposes of problem behavior and identify contextual factors that may be triggering behavioral episodes. Interventions (e.g., support plans) should be comprehensive and focus on performing antecedent manipulations and teaching replacement behaviors, as opposed to solely eliminating the problem behavior.

Family Involvement

Family members are the most stable, influential, and valuable people in the child's environment (Dunlap, 1999). Parents are usually the first to recognize delays and problems in their children's development. They actively seek diagnoses and interventions that will allow their children to acquire independent skills and a high quality of life. Due to the ubiquitous nature of autism and its effect on the individual's functioning in school, home, and the community, schools should include parents as active partners in developing their child's educational plan (Dunlap & Fox, 2002). Children with ASD have shown deficits in their ability to generalize behaviors learned in one setting or with one person or one exemplar to others. A collaborative partnership with the family can contribute to the effectiveness of interventions and programming, particularly when the strategies are used in multiple environments. Furthermore, schools have been mandated by IDEA to include parents in the IEP process, even more so since the 1997 reauthorization that strengthened the role of parents in the educational process (Yell & Shriner, 1997). Even with this IDEA mandate, however, many school districts have lost hearings involving children with autism because they failed to obtain parent participation (Yell & Drasgow, 2000). A challenge for educational personnel is determining how best to include families in the IEP process, given that each family presents unique circumstances in relation to their time, energy, and goals.

The studies highlighting family involvement in Table 2 include teaching parents to implement the strategies and using family characteristics and context to develop appropriate levels of support. Frea and Hepburn (1999) taught two families, each having a 4-year-old child with autism, the functional assessment process. R. L. Koegel, Bimbela, and Schreibman (1996) compared two different parent-training approaches and their effect on families' global style of interactions during the unstructured home activities of 17 families' lives. Lorimer, Simpson, Myles, and Ganz (2002) used a social story as an antecedent intervention to prevent problem behaviors in the home setting.

Families are essential partners in educational planning and delivery of supports and services. Education practices and strategies have a better chance of being effective if they are implemented across all settings, including the home

and community. Therefore, consideration of family participation should include determining the optimal level of participation based on family characteristics, stressors affecting the family, and the needs of the individual child.

Summary

Children with ASD present special challenges in the educational system. Important responsibilities are placed on schools, teachers, related school professionals, and parents to determine the unique characteristics of each child and match the appropriate educational interventions and practices that will allow the child to make progress. In this article, we attempted to identify core components that any educational system must provide in order to ensure a sound educational program for children with ASD. We also identified several methods used in published studies that attempted to provide one or more of the core components. It is evident in the literature that no one practice can be used to the exclusion of others.

As a field, we need to continue to conduct research that examines the effectiveness of approaches for specific children. We need to further explore emerging strategies, such as the use of assistive technology and augmentative communication. We need to conduct more research in use of naturalistic strategies, such as incidental teaching and pivotal response training. We also need data to guide us in choosing specific interventions for specific children. For example, does incidental teaching work best with children who have reached a specific functional level? Should augmentative communication or assistive technology be provided to all children with autism or only to children who have not acquired functional speech with other strategies? Finally, we need to conduct more studies of students with ASD in middle and high school settings.

Educators and parents should incorporate a variety of strategies that are best suited for the child's unique characteristics, and they should consistently evaluate the effectiveness of specific strategies with particular children. Finally, if an intervention is found to be ineffective, it is the responsibility of the school and the family to adjust and modify the intervention or select a new technique that has been empirically supported.

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