III. SCHOOL PROGRAMS AND SERVICES

Educational Environments for Students with Disabilities

Applying Positive Behavioral Support in Schools

Office of Special Education Programs Technology and Media Services Program: A Focus on Implementation and Utilization

Educational Environments for Students with Disabilities

"By 2000-01, 50 percent of children with disabilities ages 6 through 21 will be reported by States as being served in the regular education classroom 80 percent of the day or more" (U.S. Department of Education, 1999, p. 82). The U.S. Department of Education, Office of Special Education Programs (OSEP) set this target as one of its Government Performance and Results Act (GPRA) indicators. The U.S. Office of Management and Budget requires that each government agency submit a list of goals and objectives, indicators and targets for reaching those goals/objectives, strategies, and sources to monitor achievement toward meeting the established goals. OSEP's objective is to increase the percentage of children with disabilities served in settings with their nondisabled peers to the maximum extent appropriate by providing needed supports and accommodations.

This objective parallels the Individuals with Disabilities Education Act (IDEA), which mandates that "to the maximum extent appropriate, children with disabilities. . . are educated with children who are not disabled; and. . . removal of children with disabilities from the regular educational environment occurs only when the nature or severity of the disability of a child is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily" (§612(a)(5)(A)). In addition, the IDEA regulations require the availability of a continuum of alternative placements to meet the needs of children with disabilities for special education and related services (34 CFR 300.551).

Over the past 10 years, the percentage of students with disabilities served in schools and classes with their nondisabled peers has gradually increased. As the percentage of students served in settings with nondisabled students rises, the number of special education and regular education teachers prepared to provide inclusive services must also increase. OSEP currently funds a significant number of grants targeting placement issues, primarily inclusion. Many of these grants explore methods of training both special and regular education teachers to better serve students with disabilities in the regular classroom. For example, the University of Wisconsin System, Waisman Center on Mental Retardation and Human Development, through its ACTION Project, is developing both preservice and inservice training programs to raise the competence of regular and special education teachers and related services personnel working with students in inclusive settings. Other grants have focused on more systemic changes. The University of Massachusetts recently concluded a 5-year project, the Massachusetts Inclusion Initiative, which suggested several strategies. These strategies included training principals on inclusive values and emphasizing

collaboration among regular education, special education, and related service personnel. OSEP's support for these projects will provide future direction toward meeting the educational needs of students and serving them in inclusive settings (Council for Exceptional Children, 2000).

This module examines the environments in which students with disabilities received services during the 1997-98 school year and explores factors, such as age and type of disability, that may affect the service delivery environment. State-reported data from the past 10 years are presented to describe the extent to which students with disabilities received special education and related services in settings with their nondisabled peers.

Trends in Data on Educational Environments

During the 1997-98 school year, 46.4 percent of students ages 6 through 21 with disabilities were served outside the regular classroom for less than 21 percent of the school day, the most inclusive category in OSEP's data collection. Another 29.0 percent were served outside the regular classroom for 21 to 60 percent of the school day. Approximately 20 percent spent more than 60 percent of the school day outside the regular classroom. Of the remaining students, 3.6 percent were served in either a separate or residential facility, and 0.6 percent were served in a home or hospital environment (see table AB2 and figure III-1).

From the 1988-89 school year to the 1997-98 school year, the percentage of students ages 6 through 21 with disabilities who were served outside of the regular classroom for more than 60 percent of the day decreased 3.9 percent (from 24.3 percent to 20.4 percent), and the percentage served outside of regular school buildings declined by 2.1 percent (from 6.2. percent to 4.1 percent) (see table AB7 and figure III-1). Overall, the data show a gradual movement of students with disabilities from separate schools and classes to general education schools and classes.

Factors Associated with Educational Environments

The environments in which students receive special education and related services vary by student age and disability. In 1997-98, 97.8 percent of students ages 6 through 11 with disabilities were served in schools with their nondisabled peers, versus 94.7 percent of students ages 12 through 17 with disabilities and 87.2 percent of students ages 18 through 21 with disabilities. The pattern of serving more elementary-aged students in schools with their nondisabled peers holds for all disability categories and is most pronounced among students with other health
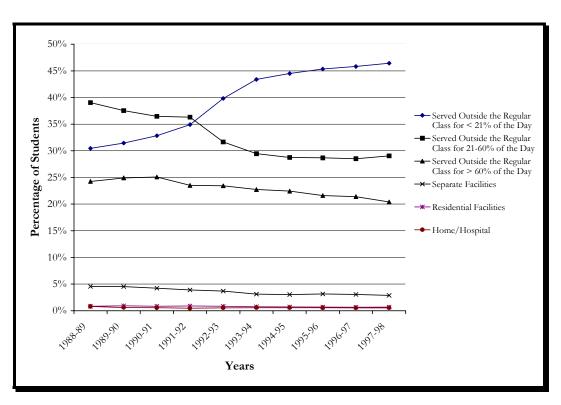
Figure III-1
Percentage of Students Ages 6 Through 21 in Different Education
Environments During 1988-89 Through 1997-98

Source: U.S. Department of Education, Office of Special Education Programs, Data Analysis
System (DANS).

impairments, visual impairments, and deaf-blindness (see tables AB4, AB5, and
AB6).

Students ages 6 through 21 with speech or language impairments (87.8 percent) were
more likely than students with other disabilities to receive services outside the regular
class less than 21 percent of the school day, while students with multiple disabilities
(10.0 percent) and students with mental retardation (12.6 percent) were the least
likely to receive services in these inclusive settings. Students with multiple disabilities
(25.2 percent) and students with deaf-blindness (34.7 percent) were more likely than
students with other disabilities to receive services in separate schools or residential
facilities, while students with speech or language impairments (0.4 percent) and
students with specific learning disabilities (0.8 percent) were the least likely to be
served in these settings (see table III-1 and table AB2).

Table III-1
Percentage of Students Ages 6 Through 21 with Disabilities Served in Different Educational Environments During the 1997-98 School Year

	Served Outside the Regular Classroom			Separate Facilities	Residential Facilities	Home/ Hospital
	0-21% of the Day	21-60% of the Day	>60% of the Day			
All Disabilities	46.4	29.0	20.4	2.9	0.7	0.6
Specific Learning Disabilities	43.8	39.3	16.0	0.6	0.2	0.2
Speech or Language Impairments	87.8	7.3	4.4	0.3	0.04	0.1
Mental Retardation	12.6	29.6	51.7	5.2	0.6	0.4
Emotional Disturbance	25.0	23.3	33.5	13.1	1.6	1.6
Multiple Disabilities	10.0	17.3	45.1	22.3	2.9	2.5
Hearing Impairments	38.8	19.1	25.4	7.4	9.2	0.2
Orthopedic Impairments	46.6	21.3	26.2	3.7	0.3	2.0
Other Health Impairments	41.4	33.8	18.3	1.7	0.3	4.7
Visual Impairments	48.1	20.1	17.3	6.7	7.1	0.7
Autism	18.3	12.7	52.1	14.6	1.8	0.5
Deaf-Blindness	13.6	11.3	39.0	19.9	14.8	1.5
Traumatic Brain Injury	29.8	26.2	30.1	9.8	1.6	2.5

Source: U.S. Department of Education, Office of Special Education Programs, Data Analysis System (DANS).

Progress in serving students in less restrictive settings has varied by disability over the past decade. From 1988-89 to 1997-98, in several disability categories, the percentage of students ages 6 through 21 with disabilities who received special education and related services outside the regular classroom for less than 60 percent of the school day has increased considerably. In other disability categories, percentages have remained relatively constant. The percentage of students with orthopedic impairments served in classrooms with their nondisabled peers for most of the school day rose 20 percent (from 47.8 percent to 67.8 percent) as did the percentage of students with mental retardation (13.7 percent; from 28.4 percent to

42.1 percent), and other health impairments (24.8 percent; from 50.3 percent to 75.1 percent). From 1988-89 to 1997-98, the majority of students with speech or language impairments received services outside the regular class less than 60 percent of the school day; this figure was relatively unchanged.

Summary

Progress continues to be made toward providing services to students with disabilities in more inclusive settings. From the 1988-89 school year to the 1997-98 school year, the number of students served outside of regular school buildings has steadily decreased. However, the percentage of students in different educational environments within regular school environments remains variable across disability and age groups, with some age and disability groups served primarily in classes with their nondisabled peers and others served largely outside those classrooms.

References

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Applying Positive Behavioral Support in Schools[1,2]

Introduction

On June 4, 1997, amendments to the Individuals with Disabilities Education Act (IDEA) became law (P.L. 105-17). These amendments introduced a number of concepts that were new to the statute, two of which are particularly important to the education of children whose behaviors violate school codes of conduct and/or are outside personal or interpersonal norms of acceptable social behavior: (a) positive behavioral support (PBS) and (b) functional behavioral assessment (FBA).

PBS and FBA are not new. However, in the context of IDEA, they represent an important effort to improve the quality of behavioral interventions and behavioral support planning. As schools organize to meet these requirements and to build their capacity to meet the behavioral needs of all students, especially students with disabilities, attention must be given to the definitions, features, and uses of PBS and FBA. The purpose of this paper is to describe what is meant by PBS and FBA.

Context

Schools are important environments in which children, families, educators, and community members have opportunities to learn, teach, and grow. For nearly 180 days each year and 6 hours each day, educators strive to provide students learning environments that are stable, positive, and predictable. These environments have the potential to provide positive adult and peer role models, multiple and regular opportunities to experience academic and social success, and social exchanges that foster enduring peer and adult relationships.

Despite these positive attributes, teachers, students, families, and community members face significant contemporary challenges in schools (e.g., acts of school violence, drug abuse, emotional and behavioral disorders, excessively high rates of rule- and code-violating behavior, expulsions, dropping out). Every year, schools are being asked to do more with fewer resources. New initiatives to improve literacy, enhance character, accommodate rapidly advancing technologies, make schools violence free, and facilitate school-to-work transitions are added to the educator's workday. Schools are being asked to achieve new and more results, yet seldom are allowed to cease work on the growing list of initiatives.

Educators also are being asked to educate an increasingly heterogeneous population of students. An increasing number of students in our schools have English as a second language, limited family supports, significant learning and/or behavioral problems, families who face major financial barriers, and a great need for mental health, social welfare, medical, and vocational assistance (Knitzer, 1993; Knitzer, Steinberg, & Fleisch, 1990; Stevens & Price, 1992). Although most attention has focused on students with externalizing problem behavior (e.g., aggressive, antisocial, destructive), students with internalizing problem behavior (e.g., social withdrawal, depression) also represent an important concern of families, schools, and communities (Kauffman, 1997).

In addition, challenges associated with educating students with severe problem behavior are increasing (Biglan, 1995; Kauffman, 1997; Sprague, Sugai, & Walker, 1998; Sugai & Horner, 1994; Walker, Colvin, & Ramsey, 1995). Although these students represent only 1 percent to 5 percent of a school's enrollment, often they can account for more than 50 percent of the behavioral incidents handled by office personnel and consume significant amounts of educator and administrator time (Sugai, Sprague, Horner, & Walker, in press; Taylor-Greene et al., 1997). Many of these students require comprehensive behavioral supports that involve family, school, and community participation (Eber, 1996; Eber & Nelson, 1997; Epstein et al., 1993; Walker et al., 1995; Walker et al., 1996).

Many schools lack the capacity to identify, adopt, and sustain policies, practices, and systems that effectively and efficiently meet the needs of all students (Mayer, 1995; Sugai & Horner, 1994; 1999; Taylor-Greene et al., 1997; Walker et al., 1996). Schools often rely on outside behavioral expertise because local personnel lack specialized skills to educate students with significant problem behaviors. School morale is often low because ongoing staff support is limited. Although many students have significant social skill needs, social skill instruction is not a conspicuous and systemic component of the school-wide curriculum. Behavioral interventions are not based on information obtained from assessments. In general, systems for the identification, adoption, and sustained use of research-validated practices are lacking (Kotter, 1995; Latham, 1988; Sugai & Horner, 1999; Todd, Horner, Sugai, & Sprague, 1999).

In sum, the challenges facing educators are significant and persistent. If not addressed, their impact on students, school personnel, families, and community members can be dramatic. However, the problem is not that schools lack procedures and practices to address these challenges. Procedures and practices have been defined and growing over the past 30 years (Mayer, 1995; Peacock Hill Working Group, 1992; Sugai, 1998; Walker et al., 1998). The greater problem has been that researchers have been unable to create and sustain the "contextual fit" between what the procedures and practices are and the features of the environments (e.g., classroom, workplace, home, neighborhood, playground) in which the student displays problem behavior (Albin, Lucyshyn, Horner, & Flannery, 1996, Walker et al., 1996). The systemic solution is to create effective "host environments" that support the use of preferred and effective practices (Sugai & Horner, 1994, 1999; Zins & Ponti, 1990). Effective host environments have policies (e.g., proactive discipline handbooks, procedural handbooks), structures (e.g., behavioral support teams), and routines (e.g., opportunities for students to learn expected behavior, staff development, data-based decision making) that promote the identification, adoption, implementation, and monitoring of research-validated practices.

As a society, we look to our schools to be or become settings where our children can learn the skills for successful adulthood (e.g., IDEA, Goals 2000, Improving America's Schools Act). This expectation occurs in the context of an increasingly heterogeneous student body and students with intense patterns of chronic problem behavior. The growing expectation is that schools will deliver socially acceptable, effective, and efficient interventions to ensure safe, productive environments where norm-violating behavior is minimized, and prosocial behavior is promoted. PBS and FBA represent important efforts toward achieving these goals.

Increasingly, efforts to establish school-linked service arrangements for children and families are appearing around the country (Sailor, 1996). These models have been tested and described in numerous schools (Adelman & Taylor, 1997; Dryfoos, 1997; Illback, Nelson, & Sanders, 1998; Kagan, Goffin, Golub, & Pritchard, 1995; Kearns, Kleinert, Farmer, & Warlick, in press; Kleinert, Kearns, & Kennedy, in press).

More recently, these school, family, and community partnerships have been described under the "community schools" rubric (Benson & Harkavy, 1997; Lawson & Briar-Lawson, 1997). These comprehensive systems-change initiatives are designed to create a seamless web of supports and services that "wrap around" children and families and to bring an end to the current fragmentation and categorical separation of school agency-directed programs. These systems-change efforts create a gateway through which to integrate PBS methods into the culture of the school and to extend effective and coordinated participation in the behavioral support plan to family members and community agency personnel (Sailor, 1996).

Positive Behavioral Support

Optimizing the capacity of schools to address school-wide, classroom, and individual problem behavior is possible in the face of current challenges but only if working policies, structures, and routines emphasize the identification, adoption, and sustained use of research-validated practices. In recent years, PBS has been emerging as an approach to enable schools to define and operationalize these structures and procedures. New journals (e.g., *Journal of Positive Behavioral Intervention*), technical assistance centers (e.g., Beach Center, Center on Positive Behavioral Interventions and Supports), and personnel preparation programs have established PBS as the focus of their purpose and activities.

Definition

PBS is a general term that refers to the culturally appropriate application of positive behavioral interventions and systems to achieve socially important behavior change. PBS was developed initially as an alternative to aversive interventions used with students with significant disabilities who engaged in extreme forms of self-injury and aggression (Durand & Carr, 1985; Meyer & Evans, 1989). More recently, the technology has been applied successfully with students both with and without disabilities, in a wide range of contexts (Carr et al., 1999; Horner, Albin, Sprague, & Todd, 1999), and extended from an intervention approach for individual students to an intervention approach for entire schools (Colvin, Kame'enui, & Sugai, 1993; Colvin, Sugai, Good, & Lee, 1997; Lewis, Sugai, & Colvin, 1998; Taylor-Greene, et al., 1997; Todd, Horner, Sugai, & Sprague, 1999).

PBS is not a new intervention package, nor a new theory of behavior but an application of a behaviorally based systems approach to enhancing the capacity of schools, families, and communities to design effective environments that improve the fit or link between research-validated practices and the environments in which teaching and learning occur. Attention is focused on creating and sustaining school environments that improve lifestyle results (personal, health, social, family, work, recreation, etc.) for all children and youth by making problem behavior less effective, efficient, and relevant and desired behavior more functional.

The use of culturally appropriate interventions also is emphasized in the PBS approach. "Culturally appropriate" describes interventions that consider the unique and individualized learning histories (social, community, historical, familial, racial, gender, etc.) of all individuals (children with problem behaviors, families, teachers, community agents, etc.) who participate in the PBS process and approach. Data-based problem solving and individualized planning processes can help to establish

culturally appropriate interventions; however, individual learning histories ultimately can affect how data are summarized, analyzed, and used.

Haring and De Vault (1996) indicate that PBS comprises (1) "interventions that consider the contexts within which the behavior occurs," (2) "interventions that address the functionality of the problem behavior," (3) "interventions that can be justified by the outcomes," and (4) "outcomes that are acceptable to the individual, the family, and the supportive community" (p. 116).

Features

At the core, PBS is the integration of behavioral science, practical interventions, social values, and a systems perspective (table III-2).

Behavioral science. An existing science of human behavior links the behavioral, cognitive, biophysical, developmental, and physical-environmental factors that influence how a person behaves (Baer, Wolf, & Risley, 1968; Bijou & Baer, 1978; Schwartz, 1989; Wolery, Bailey, & Sugai, 1988). Of particular interest are factors that affect the development and durability of disruptive and dangerous behaviors (Biglan, 1995; Kauffman, 1997; Mayer, 1995; Patterson, Reid, & Dishion, 1992; Walker et al., 1995). To a great extent, when these behaviors are observed in our schools, they can be traced to unintentional student, peer, and/or teacher behavioral exchanges (Gunter, Denny, Jack, Shores, & Nelson, 1993; Sasso, Peck, & Garrison-Harrell, 1998; Shores, Gunter, & Jack, 1993; Shores, Jack, Gunter, Ellis, DeBriere, & Wehby, 1993).

Although learning and teaching processes are complex and continuous, and some behavior initially is not learned (e.g., biobehavioral), key messages from this science are that much of human behavior is learned, comes under the control of environmental factors, and can be changed. The strength of the science is that problem behaviors become more understandable, and, as our understanding grows, so does our ability to teach more socially appropriate and functional behavior. The PBS approach is founded on this science of human behavior. Different procedures and strategies are applied at different levels, but the fundamental principles of behavior are the same.

Table III-2
Foundations and Features of Positive Behavior Support

Behavioral Science	Practical Interventions	Social Values	Systems Perspective
• Human behavior is affected by behavioral, bio-behavioral, social, and physical environmental factors. • Much of human behavior is associated with unintentional learning opportunities. • Human behavior is learned and can be changed.	• Functional behavioral assessments are used to develop behavior support plans. • Interventions emphasize environmental redesign, curriculum redesign, and removing rewards that inadvertently maintain problem behavior. • Teaching is a central behavior change tool. • Research-validated practices are emphasized. • Intervention decisions are data based.	• Behavior change must be socially significant, comprehensive, durable, and relevant. • The goal of PBS is enhancement of living and learning options. • PBS procedures are socially and culturally appropriate. Applications occur in least restrictive natural settings. • The fit between procedures and values of students, families, and educators must be contextually appropriate. • Nonaversive interventions (no pain, tissue damage, or humiliation) are used.	• The quality and durability of supports are related directly to the level of support provided by the host environment. • The implementation of practices and decisions is policy driven. • Emphasis is placed on prevention and the sustained use of effective practices. • A team-based approach to problem solving is used. • Active administrative involvement is emphasized. • Multi-systems (district, school-wide, nonclassroom, classroom, individual student, family, community) are considered. • A continuum of behavior supports is emphasized.

Practical interventions. The science of human behavior has led to the development of practical strategies for preventing and reducing problem behavior (e.g., Alberto & Troutman, 1999; Cooper, Heron, & Heward, 1987; Kerr & Nelson, 1998; Koegel, Koegel, & Dunlap, 1996; Reichle & Wacker, 1993; Wolery et al., 1988). "Practical" describes strategies that emphasize the contextual fit among problem behaviors, environments in which problem behaviors are occurring, and interventions that are developed and implemented (Albin et al., 1996). Priority is given to interventions that improve implementation efficiency, intervention effectiveness, and relevance of outcomes by (1) involving recipients of PBS in the design of behavior support plans, (2) considering the values of recipients and implementers of PBS, (3) considering the skills of implementers of PBS, (4) securing the approvals and endorsements of recipients and implementers of PBS, (5) considering the resources and administrative supports needed to implement strategies, and (6) providing the supports needed to sustain the use of effective strategies over time.

Although implementation details vary across age groups, contexts, and behavior, PBS interventions have common features. Foremost among these features is the application of FBA, but equally important are emphases on environmental redesign (changing aspects of the setting), curriculum redesign (teaching new skills), modification of behavior (teaching and changing student and adult behavior), and removing rewards that maintain problem behaviors (Carr et al., 1994; Luiselli & Cameron, 1998; O'Neill et al., 1997).

PBS procedures emphasize assessment prior to intervention, manipulation of antecedent conditions to reduce or prevent the likelihood that a problem behavior will occur, development of new social and communication skills that make problem behaviors irrelevant, and careful redesign of consequences to eliminate factors that maintain problem behaviors and to encourage more acceptable replacement social skills and behaviors. PBS is an approach that emphasizes teaching as a central behavior change tool and focuses on replacing coercion with environmental redesign to achieve durable and meaningful change in the behavior of students. As such, attention is focused on adjusting adult behavior (e.g., routines, responses, instructional routines) and improving learning environments (e.g., curricular accommodations, social networks).

Educators, parents, and community agents must "work smarter" (Kame'enui & Carnine, 1998) by using time more efficiently and strategically selecting instructional and behavioral strategies for which clear evidence of their effectiveness exists. Working smarter means using what works for all students, not just those with learning and behavioral difficulties (Delpit, 1995). The PBS approach emphasizes the identification, adoption, and sustained use of practices that have been research validated. For students with serious antisocial behaviors, a number of recent meta-analyses and descriptive literature reviews support the use of strategies that can be

applied by educators in school environments, especially, (1) contextually targeted social skills instruction, (2) academic and curricular restructuring, and (3) behaviorally based interventions (Gottfredson & Gottfredson, 1996; Lipsey, 1991, 1992; Lipsey & Wilson, 1993; Tolan & Guerra, 1994). Other more specific research-validated practices include FBAs, direct instruction, and other applied behavior analytic strategies (Carr et al., 1999).

Finally, the PBS approach emphasizes the use of data collection and analysis to inform decision making (e.g., direct behavioral observations, curriculum-based measurement). A variety of data sources (e.g., office discipline referrals, attendance and tardy reports, and academic progress) are collected through a range of methods (e.g., archival review, interviews, direct observations) and from multiple sources (i.e., students, family members, educators, community members). In addition to behavioral factors, assessments consider cognitive, biophysical, developmental, and physical-environmental factors to assist in understanding problem behavior and in guiding the development of comprehensive behavioral support plans. Collectively, these data can be used to determine the student's current level of functioning, the impact of the intervention on problem behavior, and/or improvements in other lifestyle results (e.g., family, work, recreation). With ongoing data collection, intervention and instructional modifications can be made in a timely manner.

Social values. PBS emphasizes consideration of social values in both the results expected from behavioral interventions and the strategies employed in delivering the interventions. A central PBS tenet is that behavior change needs to be socially significant. Behavior change should be (1) *comprehensive* in that all relevant parts of a student's day (before, during, and after school) and important social contexts (home, school, neighborhood, and community) are affected, (2) *durable* in that the change lasts for long time periods, and (3) *relevant* in that the reduction of problem behaviors and increases in prosocial behaviors affect living and learning opportunities (academic, family, social, work). The goal of PBS is more than the control of problem behavior; it also includes the enhancement of the living and learning options available to the student and to his or her peers and family (Risley, 1996; Turnbull & Turnbull, 1996).

Social values are also important in defining acceptable types of intervention procedures. PBS emphasizes the importance of procedures that are socially and culturally appropriate. The contextual fit between intervention strategies and the values of families, teachers, schools, support personnel, and community agency personnel may affect the quality and durability of support efforts (Sailor, 1996). No intervention should cause pain, tissue damage, or humiliation to children and their families. Finally, careful consideration is given to lifestyle outcomes that go beyond simple behavior reduction and enhancement. The development of behavioral support plans and the evaluation of their effects consider the student's current and

future quality of life in all settings and circumstances. Koegel, Koegel, and Dunlap (1996, p. xiv) add that "interventions should strive to enhance a person's competencies and access to desirable environments, social circumstances, and activities" and "all people should be treated with respect and dignity and that interventions must therefore refrain from interactions that are degrading, humiliating, or pain inducing."

Systems impact. PBS is of particular importance for schools given the emphasis on behavioral "systems" as well as individual children. A systems perspective provides support for the adoption and sustained use of effective school practices (Sugai & Horner, 1994; 1999). Without a systems approach, identification of practices is limited, adoptions are incomplete, and attention to school initiatives to address discipline is episodic and short term (e.g., 18-24 months) (Latham, 1988; Sugai & Horner, 1999; Zins & Ponti, 1990).

PBS implementations consider multiple contexts: community, family, district, school, classroom, nonclassroom (e.g., cafeteria, hallways, bus, playground, parking lot), and individual. Efforts are policy driven to ensure accountability, maximum positive results, participation in and progress through the general curriculum, and effective and efficient communications. In addition, a proactive (positive and preventative) perspective is maintained along three levels: (1) **primary**: reducing the number of new cases of problem behavior, (2) **secondary**: reducing the number of current cases of problem behavior, and (3) **tertiary**: reducing the intensity and complexity of current cases (Walker et al., 1996). A team-based approach is applied to program assessment, development, and problem solving (Adelman & Taylor, 1997; Lawson & Briar-Lawson, 1997). This approach enables input from multiple sources, broader expert knowledge base, and improved sustainability over time.

At all levels in the system, active administrator support and participation are required. Without strong leadership from school administrators, program efforts often are inefficient, incomplete, and ineffective (Colvin & Sprick, 1999). Similarly, when problem behavior is chronic and intense, comprehensive linkages with other human service agencies (e.g., juvenile justice and corrections, mental/public health, child and family services) are considered (Eber, 1996; Eber & Nelson, 1997; Epstein et al., 1993; Walker et al., 1995; Walker et al., 1996).

Taken as a whole, a systems perspective to PBS provides a continuum of behavioral support (figure III-2) in which prevention is emphasized, and intensity of problem behavior and context is considered. As a continuum, four change elements characterize PBS: (1) change of systems (policies, structures, routines), (2) change of environments, (3) change of student and adult (parent, teacher, staff) behavior, and

Figure III-2
Continuum of Positive Behavior Support

(4) change in appreciation of appropriate behavior in all involved individuals
(student, staff, family, etc.).

Functional Behavior Assessment-based Behavior Support Planning

Among the most important changes in applied behavioral analysis in the past 20
years has been the development of FBA (Special Issue, 1994). The development of
positive behavioral interventions and plans that are guided by FBA is the foundation

on which the PBS approach is delivered. A central message from this advancement is that the design of successful behavior change interventions requires identification of the events that reliably predict and maintain problem behaviors (Carr, 1994; Horner, 1994; O'Neill et al., 1997; Repp, 1994; Sugai, Lewis-Palmer, & Hagan, 1998). Historically, problem behaviors have been viewed as residing within a child, and the diagnostic emphasis has been on the type of problem behavior or the link with disability type (i.e., within the individual). Although all types of information may be useful in the design of effective support, the current emphasis is on careful documentation of the predicting and maintaining events associated with problem behaviors.

Although useful in guiding decision making at all levels, the FBA approach is the cornerstone of systems that address the educational programming of students who display the most significant and challenging problem behavior. These students require behavior support plans that are specialized, individualized, and high intensity. Such plans must be based on information about the nature of the problem behavior and the environmental context in which the problem behavior is observed. The FBA approach provides a systematic and informed means by which targeted interventions can be developed and monitored.

Functional assessment is not new, for it can be found in a variety of disciplines (e.g., vocational education, physical therapy, chemistry, physics). However, in education, in particular, special education, functional assessment had its beginning in the 1960s in applied behavior analysis (Bijou & Baer, 1961; 1978; Bijou, Peterson, & Ault, 1968; Bijou, Peterson, Harris, Allen, & Johnston, 1969). Initially, research studies and applied applications of the functional assessment technology demonstrated the value of defining variables maintaining a problem behavior prior to constructing an intervention (Carr, 1977; Carr & Durand, 1985; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982; Repp & Horner, 1999; Touchette, MacDonald, & Langer, 1985). Although most of this work has been conducted with individuals with severe developmental and intellectual disabilities (Blakeslee, Sugai, & Gruba, 1994; Lohrman-O'Rourke, Knoster, & Llewellyn, 1999), a growing body of research and applications focuses on individuals with normal intellectual functioning (e.g., emotional and behavioral disorders, learning disabilities) (e.g., Broussard & Northrup, 1995; Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Dunlap et al., 1993; Dunlap, White, Vera, Wilson, & Panacek, 1996; Kern, Childs, Dunlap, Clarke, & Falk, 1994; Lewis & Sugai, 1993, 1996a, 1996b; Umbreit, 1995; Vollmer & Northrup, 1996).

Definition

We define FBA as a systematic process of identifying problem behaviors and the events that reliably predict occurrence and nonoccurrence of those behaviors and maintain the behaviors across time. The purpose of gathering this information is to improve the effectiveness, relevance, and efficiency of behavior support plans (Carr et al., 1994; Foster-Johnson & Dunlap, 1993; Horner, 1994; O'Neill et al., 1997; Sugai, Horner, & Sprague, 1999; Sugai, Lewis-Palmer, & Hagan, 1998; Tilly et al., 1998). Specifically, if we can identify the conditions under which problem behavior is likely to occur (triggering antecedents and maintaining consequences), we can arrange environments in ways that occurrences of problem behavior can be reduced and teach and encourage behaviors that can replace problem behavior.

A number of procedures exist for conducting a FBA (Center for Effective Collaboration and Practice, 1998), but any professionally appropriate assessment should, at minimum, conclude with three main results. The first is hypothesis statements that include three key features: (1) operational definitions of the problem behavior(s), (2) descriptions of the antecedent events that reliably predict occurrence and nonoccurrence of the problem behavior, and (3) descriptions of the consequence events that maintain the problem behavior(s). The second is direct observation data supporting these hypotheses. The third FBA result is a behavior support plan. The importance of the link between hypotheses that are derived from FBAs and the development of comprehensive behavior support plans must be emphasized. Behavior support plans provide a summary of intervention manipulations in four areas: setting event strategies, antecedent strategies, behavior teaching strategies, and consequence strategies. In addition, a comprehensive behavior support plan provides implementation scripts that detail who does what strategies when, where, how often, and why; how emergency or crisis situations will be handled; and how implementation and effectiveness will be monitored.

In sum, FBA is not a set of forms or static products. It is a process of understanding behavior in the context in which it is observed and of guiding the development of positive behavioral interventions that are relevant, effective, and efficient. FBA is a best and preferred practice for all challenging behavior, not just for behavioral events that result in suspensions or other disciplinary actions.

Table III-3

Overview of Functional Behavioral Assessment and Behavior Support Planning

Step	Tools/Procedures	Outcome
1. Collect information regarding conditions under which problem behavior is and is not observed and more appropriate behavior is required.	Archival review, analysis of routines, interviews, direct observation	Descriptions of possible setting events, triggering antecedents, problem behavior response classes, maintaining consequences
2. Develop testable (manipulable) hypotheses.	Team analysis of information from Step 1	Testable hypotheses
3. Collect direct observation information.	Direct observations	Verified summary statements
4. Design behavior support plans.	Team development	Specification of (a) desired and acceptable alternative behavior, (b) antecedent strategies and manipulations, (c) consequence strategies and manipulations, (d) strategies for teaching desired and acceptable alternative behavior, and (e) setting event/establishing operation strategies and manipulations
5. Develop implementation scripts.	Team development	Scripts that specify how, when, where, etc. behavior support plan to be implemented and by whom
6. Collect information on effectiveness and efficiency of behavior support plan and redesign based on evaluation information.	Team development	Data on student progress and plan implementation, and redesign/updated plan

Steps of the Functional Behavioral Assessment and Behavior Support Planning Process

In this section, an overview of the six main steps involved in conducting an FBA and developing behavior support plans is provided (table III-3). Additional and specific guidelines for implementing the process are available in O'Neill et al. (1997); Sugai, Lewis-Palmer, and Hagan (1998); and Tilly et al. (1998).

Step One. Using archival review, analysis of routines, interviews, and/or direct observations, information is gathered regarding the conditions under which the problem behavior is and is not observed and more appropriate behavior is required. Attention is focused on four primary factors: setting events/establishing operations that make the problem behavior worse (e.g., diet, medical conditions/illness, sleep, fatigue, social conflicts), antecedent events that predictably precede and trigger or occasion problem behavior (e.g., task demands, instruction, peer/adult requests), problem behaviors that as a response class or set are maintained by a common function or outcome (e.g., attention, escape/avoidance), and consequence events that predictably follow and maintain problem behavior (positive or negative reinforcement).

Step Two. The information collected in the first step is used to develop testable hypotheses which best describe the conditions under which the problem behavior is most likely to occur. A complete testable hypothesis indicates problem behavior, triggering antecedent events, maintaining consequence events, and influential setting events/establishing operations (O'Neill et al., 1997).

Step Three. After testable hypotheses are developed, direct observation information is collected to verify the accuracy or predictability of these statements. Usually, multiple observations are conducted across multiple settings and situations to determine whether problem behavior patterns occur under hypothesized conditions and contexts. These observations involve the careful documentation of antecedent and consequence variables that are present or absent when problem behaviors are and are not observed.

In cases where hypotheses are difficult to establish or where problem behavior is particularly resistant to intervention, functional "analysis" may be recommended. A functional analysis involves a systematic manipulation (i.e., removal and addition) of factors that are hypothesized as triggering or occasioning problem behavior. These manipulations are designed to trigger problem behavior under one set of conditions and not under others. However, in educational and clinical applications, researchers do not recommend functional analysis without the direct involvement of an experienced behavior analyst, consent and collaboration by families and caregivers, and structures for maintaining appropriate accountability (e.g., data collection, monitoring of implementation fidelity).

Step Four. Based on information from verified hypotheses, behavior support plans are developed that specify possible teaching strategies or manipulations for desired and acceptable alternative behaviors, antecedent events, consequence events, and setting events/establishing operations. This plan serves as the basis for defining the actual implementation of the behavioral intervention. Unlike more typical single-

dimension interventions that focus on reactive, consequence manipulations (e.g., timeout, behavioral contracts), behavior support plans that are based on FBAs consider intervention components that are instructionally focused (i.e., teaching acceptable and desired replacement behaviors), prevention focused (e.g., neutralizing or eliminating the conditions that trigger problem behaviors or make them worse or more likely), and environmentally based (e.g., rearrangement of the problem context).

Step Five. Implementation scripts are developed to specify how, when, and where the behavior support plan will be implemented and by whom. Contingency plans for responding to emergencies, training staff, and collecting data also are indicated. If necessary, resources and assistance from other support individuals or agencies (e.g., mental health, medical, vocational) are indicated.

Step Six. Information on the effectiveness and efficiency of the behavior support plan is collected regularly, and the plan is redesigned based on an evaluation of this information. A formative (direct, frequent, regular) approach is emphasized.

Conclusion

Schools can be great places for students, teachers, related services personnel, families, human service practitioners, and community members to work collaboratively to achieve meaningful results for all children and youth. However, limited resources; diverse students, families, and neighborhoods; increases in school violence; and increased social responsibilities have decreased the efficiency and effectiveness of many schools. Although the solution is multifaceted, schools can make a significant contribution by "working smarter." This approach requires the establishment of proactive school environments (i.e., "host environments") that have the capacities to identify, adopt, and sustain the use of effective policies, systems, and practices.

PBS represents an important approach to identifying and organizing effective school practices, especially for students who present significant problem behavior. However, many systems-level challenges remain to be addressed. First, schools need guidelines for making the adoption and sustained use of PBS practices efficient and relevant. Attention must be focused on the policies, environments, structures, and practices of PBS. For example, addressing the needs of students who present significant problem behavior requires personnel with time, highly specialized skills, access to resources, and administrative supports.

Second, balancing efforts and attention between school-wide and individual student systems is a challenge for many schools. For example, a school-wide discipline system that operates efficiently and effectively for the majority of students in a school can ease the high costs associated with addressing the intense needs of the relatively small proportion of students who present the most significant problem behavior (Sugai, Sprague, Horner, & Walker, in press). However, many schools lack the capacity to maintain the efficient and ongoing operation of both school-wide and individual student systems. Increasingly, partnerships that include schools, community agencies, businesses, and family members offer new pathways for using PBS to change systems (Illback & Nelson, 1996; Sailor, 1996, in press).

Third, as the specialized nature of interventions increases with the increasing intensity of problem behavior, so does the complexity of the implementation. Schools need user-friendly ways to use PBS- and FBA-based behavior support planning. Consideration must be given to the unique features (e.g., cultural, geographical, demographic, physical) of a school and its students, families, teachers, and community members.

Finally, Carr et al. (1999) noted that lifestyle results were measured in less than 3 percent of PBS studies. Schools must develop mechanisms for determining if their efforts at the school-wide, classroom, nonclassroom, and individual student levels actually are associated with meaningful outcome improvements for students, their families, and the school. Attention to the reduction of problem behavior is understandable; however, the impact of PBS efforts on larger lifestyle results (e.g., peer relations, family functioning, community mobility) also must be considered.

The PBS approach offers students, teachers, and family and community members a process that begins to address these systems-level challenges. The process is based on an established science of human behavior, pays attention to important lifestyle results, works from a systems perspective, and gives priority to research-validated practices. The goal of PBS is to use information from FBAs to guide the design of learning and teaching environments that support and encourage adaptive behavior and lessen the usefulness of problem behavior.

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Office of Special Education Programs Technology and Media Services Program: A Focus on Implementation and Utilization

Technology applications are helpful in solving problems and improving student results in the field of special education. Technology provides a bridge linking students with special needs to the classroom curriculum and environment. While support for technology to address the needs of children with disabilities comes from many sources, including the National Institute for Disability and Rehabilitation Research, this module focuses only on technology activities of the Office of Special Education Programs (OSEP) Technology and Media Services (TMS) program.

Assistive devices have helped students with disabilities increase their independence by learning to communicate more effectively, to control their environments, and to achieve greater mobility (Burnette, 1990; Derer, Polsgrove, & Rieth, 1994; Todis, 1996; Todis & Walker, 1993). Instructional applications of technology have enhanced students' learning and meaningful participation in classroom activities by enabling teachers to tailor instruction to their individual needs and to supplement and/or enhance effective instruction (Higgins & Boone, 1993; Okolo, Bahr, & Rieth, 1993; Woodward & Carnine, 1993; Woodward & Rieth, 1997).

Technology can also support practitioners in administrative and managerial tasks related to quality programming, such as making assessment tasks more precise and manageable (Fuchs, Fuchs, & Hamett, 1993). Technology also shows promise as a vehicle for delivering and expanding professional development opportunities for practitioners and families (Blackhurst, Hales, & Lahm, 1998; Foegen & Hargrave, 1999; Gallagher & McCormick, 1999; Meyen, Tangen, & Lian, 1999; Paulsen, Higgins, Miller, Strawser, & Boone, 1998).

Congress recognized the potential of technology to enhance educational results for students with disabilities when it passed the most recent amendments to the Individuals with Disabilities Education Act (IDEA) in 1997. The amendments introduced a provision requiring teams responsible for developing an individualized education program (IEP) for a child with a disability to consider whether the child requires assistive technology devices and services. Section 602 of IDEA includes these definitions related to assistive technology:

(1) ASSISTIVE TECHNOLOGY DEVICE- The term 'assistive technology device' means any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability.

(2) ASSISTIVE TECHNOLOGY SERVICE- The term 'assistive technology service' means any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device. Such term includes --

(A) the evaluation of the needs of such child, including a functional evaluation of the child in the child's customary environment;

(B) purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices by such child;

(C) selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing of assistive technology devices;

(D) coordinating and using other therapies, interventions, or services with assistive technology devices, such as those associated with existing education and rehabilitation plans and programs;

(E) training or technical assistance for such child, or, where appropriate, the family of such child; and

(F) training or technical assistance for professionals (including individuals providing education and rehabilitation services), employers, or other individuals who provide services to, employ, or are otherwise substantially involved in the major life functions of such child.

Across the country, IEP team members are finding that consideration of technology demands more than a cursory look at the technology available in the district or at a particular technology tool for its own sake. Rather, it involves starting with what is educationally necessary for a child in order for him or her to receive an appropriate education and then determining whether technology is necessary to obtain agreed-upon educational goals (Chambers, 1997; Golden, 1998). IEP team members are not limited by what exists in the district. Indeed, if a technology tool is deemed necessary for a student to achieve his or her educational goals as set forth in the IEP, the district must ensure its availability and utilization.

To consider technology in this way assumes an understanding of a full range of technology options--from low-tech devices such as pencil grips or adaptive tools, to high-tech devices such as multimedia databases or voice recognition systems--and how they may address a student's needs. Consideration of technology also assumes an understanding of what it takes to ensure that the technology is used in the intended way, by the student and by others on behalf of the student, across educational settings.

Research has pointed to a number of challenges in implementing technology tools with students with disabilities (Hutinger, Johanson, & Stoneburner, 1996; Lesar, 1998; McGregor & Pachuski, 1996; Wehmeyer, 1999). In answering the practical questions related to implementation, technology researchers and developers have often found themselves concerned with the task of studying practice. Specifically, they must look at factors that limit the widespread use of technology (such as lack of awareness, lack of training, lack of funding, lack of administrative support, lack of time) and at strategies that may eliminate barriers. Inquiry regarding what it takes to integrate technology use into the educational setting--from making sure all parties have an awareness of effective tools, to making these tools readily available, to ensuring that all parties have sufficient training and ongoing support to utilize the tools--has been at the core of special education research in technology for nearly a quarter of a century. This line of research shows promise for ensuring that technology tools are available and are used to their full potential to enhance educational results for students with disabilities.

Prior to the 1980s, research in technology for special education was sparse. Researchers have accomplished a great deal since the middle of that decade with support from the U.S. Department of Education, OSEP. Research is informing current practices and making it possible for students with disabilities to participate and learn to their potential in classrooms across the country. To that end, this module provides a brief review of how past Federal investments and policy initiatives have been instrumental in advancing knowledge about implementation issues.

Charting a National Agenda for Making Sound Investments: A Brief History of Federal Support

Beginning in the mid-1980s, OSEP began to earmark certain competitions specifically for research and development in technology. Recognizing the need for information about the use of technology in achieving educational results for students with disabilities, OSEP focused resources on programs that would study pertinent issues.

In 1990, OSEP established a strategic agenda to guide investments in the TMS program for improving educational results that is still viable today (OSEP, 1992). After involving stakeholders from across the nation in a year-long agenda-building process, OSEP introduced the national technology program agenda. The overarching goals for technology inquiry were identified as: fostering lifelong learning; encouraging participation in diverse educational, domestic, work, and community environments; promoting equity in opportunity for individuals with disabilities; and enabling individuals with disabilities to be productive and independent. To achieve these goals, the agenda put forth four program commitments by which the use of technology would be advanced for all categories of disability. These commitments were:

- Enable the learner across environments by fostering the creation of state-of-the-art instructional environments, both in and out of school;

- Promote effective policy at all levels in government, schools, and businesses;

- Foster use through professional development by training and supporting teachers, administrators, parents, and related-service personnel; and

- Create innovative tools by encouraging the development of varied and integrated technologies, media, and materials.

For nearly a decade, the agenda has served as the cornerstone of OSEP's technology research and development. Special education researchers had long been concerned with using their findings to improve educational results for students with disabilities. Now, the agenda signaled the centrality of implementation and utilization issues to the work of technology researchers and developers. It underscored the importance of examining and improving access to information and support.

Using the agenda as a foundation, a series of research projects began exploring issues related to providing innovative technology tools that would enable students to learn across educational and classroom settings. The following examples from OSEP-funded projects exemplify the broad range of technology applications found successful in improving results for students with disabilities.

As these examples from OSEP-funded projects illustrate, technology can enhance participation in classroom environments and help students with disabilities learn challenging curricula.

Providing Access to Participation in Classrooms

Rose, a ninth grader in the Pacific Northwest, is unable to speak or walk without assistance. With the help of a motorized wheelchair and adapted devices, such as adapted pencils, eating utensils, scissors, and other tools, Rose is able to function quite independently at school. Like her classmates, Rose has been using computers for several years at school. A portable computer mounted on her wheelchair is equipped with software for completing her academic assignments. To accommodate her physical needs, her word-processing program includes a word prediction feature so Rose needs only to type the first letters of a word; she then chooses the desired word from a list. In addition, a voice-output feature, which displays messages on a screen or through voice synthesis, allows Rose to communicate her ideas.

An important goal of early childhood classrooms is developing independence. For 5-year-old Sabrina, who cannot speak or point, making choices and being able to act on them is a challenge. With the help of an eye-gaze board--a simple apparatus consisting of a Plexiglas frame with Velcro tabs--Sabrina is able to communicate with adults and other children in her classroom. For example, during free choice time, an instructional assistant places the eye-gaze board perpendicular to Sabrina's wheelchair tray and fastens six pictures of her preferred activities around its edges. The aide stands behind the board to gauge where Sabrina's eyes are pointing. By looking directly at one of the pictures, Sabrina chooses to read a book on the computer. The computer is equipped with a feature that turns the pages when Sabrina "hits" a switch, allowing for even more independence. The teacher is especially pleased, as the eye-gaze system is quickly assimilated by Sabrina's peers, who use it to interact with her during free time.

Technology can be used to enhance communication and mobility. When students have significant difficulties in communicating or in moving independently, they can be denied access to essential instruction and classroom interactions. Research and development have shown the efficacy of such applications as picture- and speech-synthesized communication boards, voice recognition systems for communication, screen readers to assist students with visual impairments in learning, and adaptive calculators. Research has considered applications of technology to different settings, such as the use of the Internet to deliver realtime captioning in remote classrooms. OSEP also has supported research in the emerging areas of computer simulation and virtual reality technology, which have shown the potential to enable students to move more quickly through complex material. One example is the use of technology to provide safe mobility training to students who are physically challenged.

Helping Students Master Basic Skills

Robert, a student in an urban first-grade classroom, is struggling to learn how to read. He has difficulty sounding out words and recognizing vocabulary. Yet providing the type of individualized instruction and practice Robert needs can prove challenging in a classroom of more than 30 students. In addition to his regular instruction, Robert's teacher supplements his educational program with software that functions as an electronic storybook. During independent reading practice time, Robert uses the software for repeated practice in reading stories at his own pace. The design features of the software directly address Robert's individual needs. By clicking on individual words or phrases with the mouse, Robert can hear them spoken by a recorded voice or can see a picture that illustrates their meaning. With another click of the mouse, Robert can highlight each word as he reads. This technology application has enabled Robert to become a more confident and skilled reader.

Developing reading and decoding skills, learning math skills, and mastering writing skills are areas of great need for students with cognitive and learning disabilities. OSEP has supported numerous projects that have enhanced our understanding of how technology can help students with disabilities master basic skills. For example, researchers have studied how computational instruction can be adapted to individual needs with the aid of technology (e.g., systematically controlling a presentation to ensure that the student is practicing appropriate skills). Researchers also have considered how technology applications such as word prediction software and speech synthesizers can help students with writing difficulties learn skills and complete written assignments in a timely fashion.

Supporting Students in Learning Complex Material

Ms. Brown believes that meeting science curriculum standards is important for all of her students. She has found that technology, media, and materials can enhance learning for her diverse group of fifth graders. For example, the class is taking a field trip to a local pond to study ecosystems. Students will observe different physical elements and collect samples for further study back in the classroom. Rather than exclude several students, who, due to their disabilities, find it difficult to participate fully, Ms. Brown incorporates the use of a digital camera. She takes photos of inaccessible areas for students to review later. She also takes photos of students engaged in observation, which she uses later to prompt recall and comprehension. Back in the classroom, students draw what they have observed. To assist students with visual and perceptual difficulties, Ms. Brown incorporates the use of a projection microscope. Students put an object under the lens of the projection microscope and trace it. To wrap up the session, Ms. Brown uses a software program that allows students to create a web, or cognitive organizer, of their observations. As

students reflect on their webs, they begin to see how their emerging ideas might be presented in an outline for a science report. These technology tools allow students to actively participate and learn in a standards-based science curriculum.

As students increasingly access the general education curriculum, they are expected to understand complex subject matter. Among other things, students are expected to comprehend written text, assemble complex information, and develop active learning skills. OSEP has funded numerous projects that have added to the knowledge base on how technology can help students with disabilities learn complex subject matter. Some examples are technology applications to enhance reading comprehension with hypertext and hypermedia software programs, improve fluency with speech recognition applications, and help engage students with limited math skills in higher order problem solving with the aid of a spreadsheet. In addition, research has looked at how technology might help engage students in instructional practices used to promote higher order thinking (e.g., project-based instruction, inquiry-based strategies, and curriculum-based units).

Over the years, the pattern of inquiry has evolved from looking at technology in isolation from the complex educational environment to exploring what it takes--with regard to curriculum, professional development, technical support, administrative support, and policy issues--to implement innovative tools and services across settings. The next section of this module reviews how early studies set the stage for current investigations into the complex nature of technology as an intervention and what that means for implementation.

Retrospective Studies

OSEP commissioned a group of researchers to review past TMS project investments in order to improve future practice (Okolo, Cavalier, Ferretti, & MacArthur, 1995). The researchers identified five broad categories of research focus:

- **Assistive technology**--projects that look at how to compensate for or otherwise address special student needs;

- **Technology and instruction**--projects related to instructional design, literacy, mathematics, social studies, science, and early childhood education;

- **Technology and assessment**--projects about assessment of academic skills, videodisc assessments, behavioral assessment, expert systems for decision support, and eco-behavioral assessment;

- **Future applications**--projects that analyze trends in hardware and software developments for individuals with disabilities; and

- **Implementation and dissemination of technology applications and services**--projects that examine how technology is used in educational and clinical settings, models of technology integration, centers to disseminate information about technology, and staff development efforts.

Within the implementation and dissemination category, which included findings from 36 projects, the researchers cited numerous research studies documenting the underutilization of assistive and instructional technology in schools, clinics, and work settings. Further, they noted a consistent finding throughout the projects: the fallacy of the belief that simply placing an innovative technology tool in the student's proximity would lead to improved educational results. The researchers reported,

> Just about all new developments in assistive and instructional technology appear to have followed this pattern--much promise, much promotion, and little attention to factors that influence how well technology is used and the range of effects it can have. . . . Adding a computer to a classroom or giving a student an assistive device does not guarantee that these tools will be used appropriately, or that they will have any effect on teaching or learning. (Okolo et al. 1995, p.54)

Okolo and colleagues synthesized several elements related to implementation that projects identified as keys to success. These were:

- Administrative leadership and the need for adequate funding;

- Technical support and collaboration; and

- Teacher preparation and released time to implement technologies.

The researchers concluded that technology was only one part of a complex microeducational environment that includes many interacting variables. Lack of attention to these variables, in deference to simple solutions, would impede the effective use of technology.

This reference to the complex nature of implementing technology became a theme throughout many subsequent OSEP technology research projects. It surfaced again in a review of five collaborative technology research projects that was initiated by

OSEP in 1995 (TAM Connector, 1999). These projects set out to study technology strategies that support access to the general education curriculum. Each project implemented technology-based strategies that helped students achieve meaningful participation and independence across various educational environments; promoted effective policy, planning, and practice to ensure accessibility, availability, and effective application for the full range of technology; and fostered the use and integration of technology through professional development.

A unifying framework emerged through cross-project analysis. Components of the framework, each of which was considered vital to effective technology utilization and integration, were:

- Technology planning;

- Professional development;

- Planning for individual students;

- Integrating technology and curriculum;

- Technical assistance to staff, students, and families;

- Student outcomes;

- Evaluating technology initiatives;

- Sustaining and institutionalizing change; and

- Integrating instruction about technology into special education teacher education programs.

It is important to point out the interrelatedness of each component. Each component is necessary to promote best practice, to support the seamless integration of technology across educational environments, and to sustain innovation and growth for the teaching and learning experience.

These projects demonstrated that technology as an educational intervention is complex. Its implementation requires more than attention to one or two elements if enduring change is to be realized. It is not enough to look only at gaining the support of the administrator, or to training a teacher. While each element is essential, each is also part of a more comprehensive framework of related elements that must be addressed in the course of implementation. In most cases, the full implementation of technology requires a comprehensive and complex look at integrating the technology

into the curriculum, into instruction, and into the educational setting with substantive policy and professional development support.

Innovative Activities

While research and development efforts have provided considerable evidence to document the positive results of technology and have suggested implementation approaches, questions remain regarding utilization of technology.

To address these issues, a number of OSEP's current investments are building upon past work in their exploration of technology as an intervention. Technology-based strategies that assist students in achieving meaningful participation and independence are being considered across various educational settings. These strategies emphasize how technology is integrated into the full range of school-related activities--its use, the effects of using assistive and instructional technology on a broad range of results, and how the environment of schools either facilitates or hinders the use of technology. This means looking at change on multiple levels--not just in the classroom, but throughout the entire educational system, including at the school, district, State, and Federal levels (Means et al., 1993). At the local level, this may include the perspectives of curriculum, professional development, and technical assistance. Systemic factors may include the extent to which policy and planning support accessibility, availability, and effective application of the technology.

The pattern of looking at technology as an intervention has emerged in current projects in a variety of ways. The following are examples of innovative OSEP-funded efforts that hold promise for shaping the future.

Stepping Stones of Technology Innovation for Students with Disabilities

A grant competition under this priority category has been conducted annually since 1998. Projects in this priority are designed to focus research on implementation as well as effectiveness and sustained use of a technology-based approach. The stepping stone framework embodies the notion of technology as a complex intervention by building into its design an understanding of implementation and the work that needs to be done to ensure utilization.

There are three phases of possible work:

- **Phase 1--Development.** Projects develop and refine a technology-based approach and test its feasibility for use with students with disabilities.

- **Phase 2--Research on Effectiveness.** Projects select a promising technology-based approach that has been developed in a manner consistent with Phase 1 and subject it to rigorous field-based research and evaluation to determine effectiveness and feasibility in educational or early intervention settings.

- **Phase 3--Research on Implementation.** Projects select a technology-based approach that has been evaluated for effectiveness and feasibility and study its implementation in multiple settings to acquire an improved understanding of the range of contexts in which the approach can be used effectively and the factors that determine the effectiveness and sustainability of the approach in that range of contexts.

Projects funded under this competition have the potential to chart a new course of inquiry as it relates to implementation issues.

The Center To Link Urban Schools with Information and Support on Special Education and Technology (LINK • US)

In previous years, the approach to dissemination and follow-up support was primarily one of supplying information, in print, media, and electronic formats, to the targeted audience. The current approach revolves around providing schools with sufficient technical assistance to support large-scale implementation efforts. The complex nature of the present activities typically includes integrating technology into the curriculum through professional development and ongoing professional support.

An example of this emerging pattern of work is the LINK•US center at the Education Development Center, Inc., a 5-year project funded by OSEP. The overall project goal is to improve outcomes for students with disabilities by having general and special education teaching personnel integrate a range of technology tools into a standards-based curriculum. LINK•US provides key school district personnel with technical assistance to design, conduct, and evaluate ongoing professional development. Technical assistance is guided by the following principles:

- All professional development activities must be aligned with key district initiatives (e.g., language and literacy improvement).

- All activities must be directed at improving results for students.

Collaboration between general and special education teaching personnel is encouraged. Such collaboration is supported by district facilitators, administrators, and related service providers. Collaborative school-based teams design, implement, and reflect on the best methods and procedures to integrate technology into ongoing instruction. Teams use an established process for looking at the work of three focal groups of students (students with IEPs, students at risk for failure, and typically developing students) over time. The process involves determining each student's abilities and needs, identifying clear goals related to standards, generating instructional strategies that meet the needs of diverse learners, determining how technology can support learning, and designing assessments. The project will determine the extent to which teachers institutionalize this process and sustain the use of technology over time.

Family Center on Technology and Disability

As technology is implemented across settings, the perspectives of multiple stakeholders regarding its usability may affect success. As researchers and developers create new technology approaches, the needs and abilities of every individual whom the child will encounter while using the technology must be addressed.

One of the most significant stakeholder groups is the child's family. The potential of technology may be hindered when families are not trained to integrate use of the assistive device in naturally occurring activities. Professionals are responsible for helping children and their families select and acquire assistive technology devices and services, as well as instructing them in their use.

The Family Center on Technology and Disability, housed at the United Cerebral Palsy Association, is an example of an OSEP center designed to support families by providing readily accessible information about technology. At the core of the center's approach is a partnership with other national organizations who serve families of children with disabilities. Rather than serving families directly, the center's emphasis is on identifying partners who, through their ongoing work with families, can serve as intermediaries in dissemination. These partners disseminate information and provide support to their constituents, thereby broadening the reach of the center.

Additional OSEP Efforts

OSEP is undertaking a variety of tasks to study how technology is being used, or might be used, for students with disabilities. Following are examples of selected initiatives.

- **Children From Birth to 3.** Technology can play a significant role in early intervention programs and services for children from birth to age 3. IDEA has promoted the use of assistive technology services to young children through the Infants and Toddlers Program (Part C). Technology enables children to engage in the same activities as their peers who do not have disabilities. As a result, technology acts as an equalizer and further enhances opportunities for children with disabilities to be educated in less restrictive settings. A major initiative being undertaken in this area is the Birth to 3 Project. In addition to looking at effective technology for this age group, researchers also will look at the feasibility of using such technologies.

- **Futures Studies.** OSEP conducted the first "futures" study in 1984 to investigate how technologies from other sectors (e.g., medical, business, military) might be adapted to benefit students with disabilities. This initiative has been revisited every 3 to 5 years in order to identify trends and plan new directions. In the current initiative, the emphasis is on the near future. Papers are being commissioned that focus on how technology may affect students with disabilities in typical settings. These papers will be given to global futurists who will be asked to draw implications for research and practice.

- **Synthesis on the Selection and Use of Assistive Technology.** To ensure that research is disseminated fully to the field, an initiative is being undertaken to synthesize information from projects that have developed and/or studied approaches to selecting and using assistive technology, training parents, and providing local programs to support the appropriate uses of assistive technology. Information from the synthesis will form the basis for a video-based package that will be disseminated to both professional and nonprofessional audiences.

Summary

The IDEA provision to consider assistive technology reflects a growing body of knowledge demonstrating the power and potential of technology to enhance the lives of children with disabilities by providing them with access to the classroom and to

learning. However, to guarantee that technology will be used consistently and effectively for its intended purposes often requires much more than simply recommending a particular tool, putting the tool into the student's or educator's hands, or providing an afterschool staff development workshop for teachers. In many cases, particularly with more high-tech applications, technology implementation takes considerable effort and knowledge. The consideration of technology assumes an understanding of how those technologies will interact with myriad contextual factors, including stakeholders, the environment, policies, curriculum, families, and the students themselves.

The TMS program has produced a strand of inquiry that has evolved from a focus on usefulness--the potential of technology to alleviate a student need--to a focus on usefulness and utilization. TMS research has followed a pattern that is illuminating many of the contextual factors that both impede and facilitate its use. The success of technology in helping students progress ultimately will be contingent on how well these contextual factors are addressed. With OSEP's support, appropriate technology and media have been and continue to be researched, developed, demonstrated, and made available in timely and accessible formats to parents, teachers, and other personnel who provide services to children with disabilities.

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