Using Assistive Technology to Enhance the Skills of Students with Learning Disabilities

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Numerous writers (e.g., D. P. Bryant, Smith, & Carter, 1997; Elkind, 1993; Higgins, Boone, & Lovitt, 1996; MacArthur, Schwartz, & Graham, 1991; Olson, Foltz, & Wise, 1986) have demonstrated the effectiveness of using assistive technology (AT) devices (e.g., word processors, "reading machines," "talking computers," speech recognition systems, electronic spell checkers, educational software) with students who have learning disabilities (LD) to foster academic success and independence (B. R. Bryant & Seay, 1998) and to compensate for reading, mathematics, writing, spelling, and other difficulties. Although AT devices may be used in remediation, such devices may also provide a compensatory alternative that circumvents or "works around" deficits while capitalizing on a student's strengths (D. P. Bryant & B. R. Bryant, 1998; Garner & Campbell, 1987; McGregor & Pachuski, 1996). Several professionals (e.g., Gray, 1981; Mangrum & Strichart, 1988; Vogel, 1987) have emphasized the importance of using compensatory approaches with students with LD; thus, AT adaptations can be effective supplements or adjunctive approaches to remediation.

There are numerous AT devices that may be helpful to students with LD, but not all devices are appropriate for everyone. Because students with LD possess individual strengths, weaknesses, interests, and experiences, a device that may be appropriate for one person may be inappropriate for another. In the same way, an AT device that is helpful for one purpose in a particular setting may be of little value in a different situation or setting. Therefore, it is important to evaluate an individual for AT devices relative to the specific student's strengths and limitations, setting(s), and task(s) to be performed.

According to the Individuals with Disabilities Education Act (IDEA) Amendments of 1997, the Individualized Education Program (IEP) team shall consider whether the child requires assistive technology devices and services (sec. 614, see Sidebar) as part of the decision-making process to identify the most appropriate, individualized intervention program for each student who qualifies for special education services. IEP team members are responsible for deciding whether or not assistive technology adaptations are educationally necessary for helping the child succeed at school-related tasks. Team members must be knowledgeable about possible assistive technology devices and services in relation to the educational needs of each child (Chambers, 1997). A multidisciplinary IEP team composed of an occupational therapist, a speech pathologist, a physical therapist, and/or an assistive technology specialist, in addition to the conventional IEP team members, may provide the most knowledgeable information about the specific needs of a child with LD that necessitate assistive technology solutions.

As part of the assessment process, each student referred for special education should be evaluated to determine the need for assistive technology devices as appropriate intervention solutions in addressing that child's educational needs and in helping her or him achieve the identified IEP goals and short-term objectives. In short, IEP team members must decide if the use of assistive technology devices will help students receive a free, appropriate public education (FAPE). Questions that IEP team members should address in reaching this decision are provided in Table 1.

In addition to the identification of assistive technology during the IEP process, continual assessment of the need for and the type of assistive technology is an ongoing process that reflects careful consideration of the student's current levels of performance, maturation process, learning disability, and changes in the educational environment (Bowser & Reed, 1995). For instance, a student with a writing learning disability will experience increased educational re-

quirements to produce written products as he or she progresses through the educational system. Thus, this student's educational difficulties and demands may necessitate the need for different assistive technology devices across the school years that foster academic success, promote access to the curriculum, and assist in circumventing the written language disability.

Raskind and Bryant (in press) and D. P. Bryant and B. R. Bryant (1998) have presented a process that technology specialists or IEP team members can use to evaluate children and the learning environment to identify assistive technology adaptations to assist students with LD in accessing their instructional settings more successfully. The purpose of this article is to describe this evaluation process, which includes considering (a) the setting demands (i.e., tasks and requisite abilities), (b) student characteristics (i.e., capabilities and disability-related limitations), (c) technology adaptations, and (d) technology/student matches.

Setting-Specific Demands

For over 10 years, researchers such as Deshler and Schumaker (1986), Riegel (1988), Rieth and Evertson (1988), and Schumaker and Deshler (1984) have documented the importance of identifying the setting demands in a variety of learning environments. *Setting demands* consist of the *tasks* students are expected to perform in the classroom and the *requisite abilities* needed to perform those tasks. As an example, consider the task of reading a chapter in a geography textbook. The requisite abilities associated with this task include visual acuity, decoding, reading comprehension, and fluency. Listening to a teacher's lecture requires the ability to hear, attend, and identify important points. Most people have the abilities necessary to perform a classroom task; however, for some students with learning disabilities, the requisite skills may be limited. Sample questions evaluators and IEP team members can consider in the assistive technology decision-making process are given in Figure 1. When setting demands have

Table 1. *Questions to Determine the Educational Necessity of Assistive Technology*

1. Is the provision of an assistive technology device or service essential for the student to receive FAPE?
2. Is an assistive technology device or service necessary for the child to be educated within the least restrictive environment?
3. Are the assistive technology devices and/or services a necessary related service?
4. Given assistive technology service and/or devices, will the person with disabilities have access to school program and activities?

Note. From *Has Technology Been Considered? A Guide for IEP Teams* (p. 5), by A. C. Chambers, 1997, Reston, VA: Council of Administrators of Special Education and the Technology and Media Division of the Council for Exceptional Children. Copyright 1997 by the Council for Exceptional Children. Reprinted with permission.

Definition of Assistive Technology Devices and Services

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.

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 services include:

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.

(Technology-Related Assistance for Individuals with Disabilities Act of 1998, 29 U.S.C. §2201)

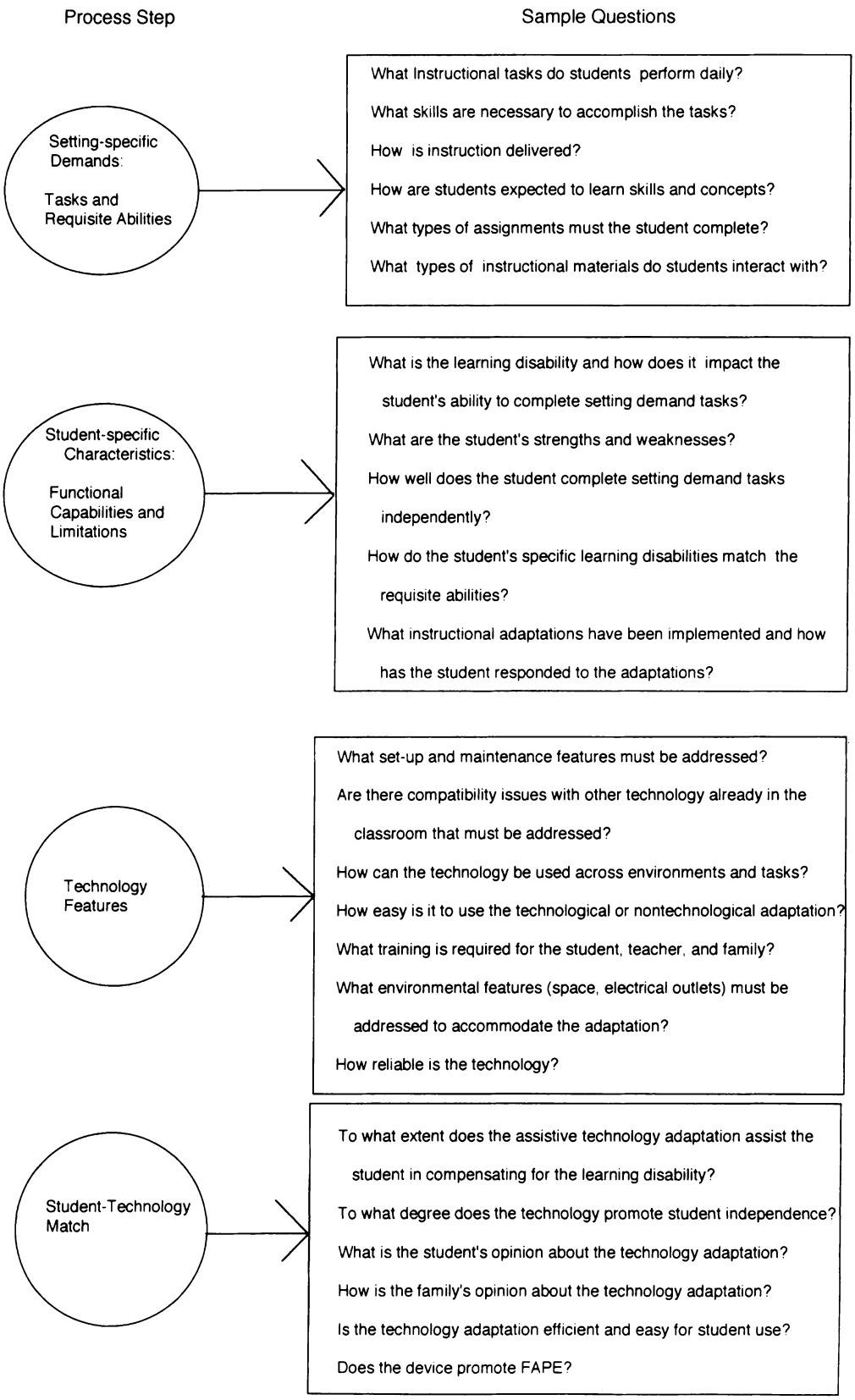

Figure 1. *Assistive technology evaluation considerations.* Note. *Adapted from "Using Assistive Technology Adaptations to Include Students with Learning Disabilities in Cooperative Learning Activities," by D. P. Bryant and B. R. Bryant, 1998,* Journal of Learning Disabilities, 31, *p. 45. Copyright 1998 by PRO-ED. Adapted with permission.*

been noted and their requisite abilities identified, attention moves from the task to the student who is trying to accomplish the demands of the setting.

Student-Specific Characteristics

The student's functional capabilities and functional limitations (i.e., factors that enhance and inhibit task performance) must be considered in making decisions about matching the student's needs with an appropriate assistive technology adaptation (see Figure 1 for sample evaluation questions).

Functional capabilities refer to abilities in the areas of sensory, motor, cognition, language, and memory. Raskind and Bryant (1996) have identified a number of behaviors (i.e., listening, speaking, reading, writing, mathematics, memory, organization, physical/motor, and behavior) of students with learning disabilities to be considered across contexts.

Functional limitations are disability-related weaknesses that inhibit a person's performance and impede the ability to meet the demands of the setting (D. P. Bryant & B. R Bryant, 1998). Like functional strengths, functional limitations can be manifested in many areas (e.g., difficulties with academics, motor, sensory, memory, and organization). B. R. Bryant, Seay, & D. P. Bryant (in press) used the term *functional dissonance* to describe when a student's weaknesses do not correspond to the requisite abilities that are needed to accomplish tasks of the setting. The challenge is to identify adaptations (e.g., technological, nontechnological, instructional) that can alleviate the dissonance.

Technology Adaptations

Assistive technology devices or adaptations can be technological (e.g., speech synthesizer, alternative keyboard) or nontechnological (e.g., pencil grip). They range on a continuum from simple to complex (McGregor & Pachuski, 1996), depending on such factors as ease of implementation; technological features (e.g., hardware platform specifications, electronic capabilities); student, family, and teacher training requirements; and maintenance. For example, a tape recorder might be considered a relatively simple device because it requires pressing a button or a switch to activate the device; the technology features auditory output and recording capabilities; most people know how to use a tape recorder or can learn to operate one easily; and tape recorders are fairly durable, low maintenance devices. An example of a complex assistive technology device would be speech synthesis/screen reading programs, which might contain complex instructions and programming, be quite expensive to purchase, and require considerable training to use. Examples of devices for academic areas and tasks are given in Table 2. Sample questions for examining the features of technological and nontechnological adaptations are shown in Figure 1. Once evaluators have reviewed the features of assistive technology adaptations, they are prepared to problem-solve possible student–technology matches.

Table 2. *Examples of Assistive Technology Devices and Adaptations*

Academic area/task	AT devices/adaptations
Listening	• Assistive listening device • Variable speech control tape recorder/player • Conventional tape recorder/player
Writing	• Word processor • Spell checker • Proofreading programs • Outlining/"brainstorming" programs • Abbreviation expanders • Speech synthesis/screen reading programs • Word prediction programs
Reading	• Optical character recognition/speech synthesis • Speech synthesis for "books on disk" • Variable speech control tape recorders • Audiotaped books
Organization/memory	• Personal data managers (stand alone) • Personal data organization software • Free-form database • Calendar programs • Tape recorder/player
Mathematics	• Talking calculators • Conventional calculator • On-screen (computer-based) calculator

Note. From *Functional Evaluation for Assistive Technology,* by M. R. Raskind and B. R. Bryant, in press, Austin, TX: Psycho-Educational Services. Copyright 1998 by Raskind and Bryant. Adapted with permission.

Student–Technology Match

When selecting AT adaptations, IEP team members should examine carefully the student–technology match and work with family members to elicit their support and opinions. The features of the devices must be examined to determine an appropriate match with the setting-specific demands (i.e., tasks and requisite abilities) and the student-specific characteristics (i.e., capabilities and limitations). See Figure 2 for an example of a problem-solving

chart that can be used to determine technological, nontechnological, and instructional adaptations. Additionally, the evaluation loop signifies that AT assessment is an ongoing process as students use the devices across time and settings. Moreover, it is important to remember that adaptations range from simple to complex; thus, the most complex adaptation (e.g., most expensive, state-of-the art computer platform) should not automatically be considered the best or only choice to meet a student's needs and to guarantee FAPE. Rather, the selection process should be guided by the student's strengths and limitations and the device, at that time, that seems most appropriate as a compensatory tool.

In the selection of AT devices as adaptations, the student and family members are critical members of the team. First, the viewpoint and motivational level of the student are critical in the selection of AT adaptations (Carney & Dix, 1992; Raskind & Bryant, 1996). The student's opinions about the types of adaptation options and the sometimes-intrusive nature of adaptations, attitudes about using adaptations, and interest in trying available options must be considered during the selection process.

Second, family members should be active members of any decision-making process (B. R. Bryant & Kemp, 1995; Raskind & Bryant, 1996). Richards (1995) discussed family-related guidelines to be considered in order to make appropriate student–technology matches. Family members should be aware of the expected outcomes of assistive technology adaptations; these outcomes should reflect the needs of the students and family members in promoting independence (Parette & Brotherson, 1996). Assistive technology devices should enhance the abilities of the family to meet the child's needs, and training should be provided for devices as necessary. Finally, family members' experience and comfort level with technology should be considered, as should their acceptance of adaptations in general.

Summary

Students with learning disabilities require a variety of adaptations to be successful at school; assistive technology devices serve as possible solutions in helping students meet the setting demands of the classroom. IEP team members should evaluate the instructional environment and the student's strengths and weaknesses as they consider ways to help students with LD achieve FAPE. An evaluation process that is ongoing and includes an examination of setting-specific demands, student-specific characteristics, and features of technology adaptations will help decision makers as they consider good student–technology matches.

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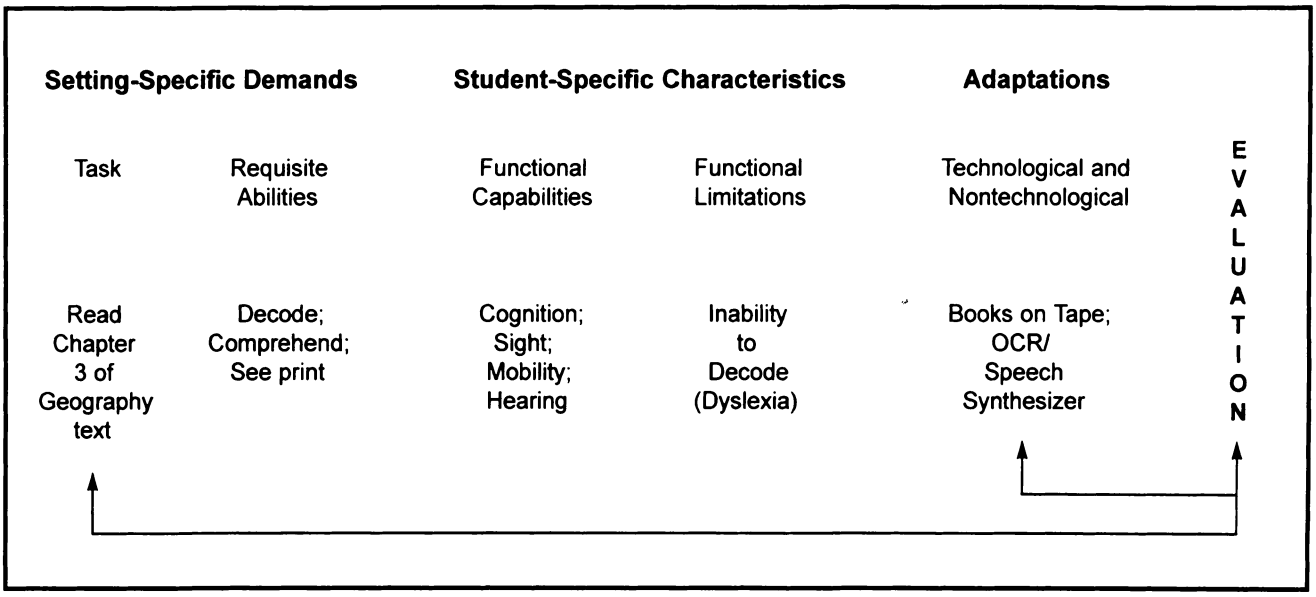

Figure 2. *Assistive technology adaptation problem solving and evaluation.* Note. *From "Using Assistive Technology Adaptations to Include Students with Learning Disabilities in Cooperative Learning Activities," by D. P. Bryant and B. R. Bryant, 1998,* Journal of Learning Disabilities, 31, *p. 51. Copyright 1998 by PRO-ED. Adapted with permission.*

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