Facilitating Student Achievement with Assistive Technology

Howard P. Parette and George R. Peterson-Karlan
Illinois State University

Abstract: This article discusses an evolving understanding of the relationship of assistive technology (AT) to student achievement. Clarifying the compensatory nature of AT and its role in creating a ‘floor of opportunity’ for students with disabilities, the authors then emphasize the importance of AT for access to and productivity within both the life skills and academic curricula. The distinction between AT, instructional technology, and universal design for learning (UDL) is clarified. Emphasis is then placed on three distinct aspects of the educational process for students with developmental disabilities in which the ‘consideration’ of AT is involved. These include IEP development, including placement alternatives; instructional interventions; and student progress monitoring. A statement is then made regarding the outcomes of AT interventions–student achievement in the academic and life skills curricula as evidenced by district- or state-wide measures of student progress.

In today’s educational environments, there are immense responsibilities placed on public schools for accountability (Anderson & Anderson, 2005; Wehmeyer, Lattin, & Agran, 2001), with particular emphasis on facilitating achievement among all students—including those with developmental disabilities (No Child Left Behind Act of 2001 [NCLB]). Basically, all children are now expected to participate in the general education curriculum and demonstrate academic progress, regardless of the nature of any existing developmental disability. This impetus is one of numerous convergent, ‘student achievement-related factors’ creating new opportunities and new demands on education professionals to integrate learning and assistive technologies into curriculum development and implementation (Peterson-Karlan & Parette, 2008). This article explores issues related to the role of assistive technology (AT) in supporting students with developmental disabilities in the curriculum. It presents a discussion of student achievement related AT factors that expands on the compensatory nature of AT and its relationship to student achievement. A description the process of AT consideration will be also examined, with emphasis on education professional roles in this decision-making process.

An Evolving Understanding of AT and Its Relationship to Student Achievement

The professional literature is replete with repetition of the federal definition of AT, i.e., “any item, piece of equipment or product system, whether acquired commercially or off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities” [20 U.S.C. § 1401(251)]. This definition places emphasis on the ‘compensatory’ nature of AT, i.e., it compensates for something a student cannot functionally do or perform. Unfortunately, no guidance has been provided by the federal government with regard to helping education professionals understand this compensatory function, and what devices are helpful in compensating for student deficits that are barriers to student achievement.

Peterson-Karlan, Hourcade, Parette, and Wojcik (in press) observed that since the first AT products were focused on physical, sensory and communication impairments, typical devices often found in classroom settings for students with developmental disabilities may have included such things as (a) communication wallets, (b) electronic communication devices, (c) wheelchairs, (d) prone standers, (e)
adapted eating utensils, (f) large print or books-on-tape, (g) Braille watches, closed circuit television (CCTV) units, (h) hearing aids, (i) sound field amplification systems, and (j) alternatives to the mouse or keyboard. Such technology exhibits a clear relationship between the student’s function that is lost or impaired and the function the AT replaces or enhances (e.g., the ability to communicate; to move in space; stand erect, grasp and hold; to perceive printed text; to hear others speak; to manipulate the keyboard; Peterson-Karlan et al.). Blackhurst (2005) stated that the functions for which the AT enhances, improves or maintains the student’s performance capabilities include: (a) activities of daily living; (b) communication; (c) body support; (d) protection and positioning; (e) travel and mobility; (f) environmental interaction; and (g) sports, fitness and recreation. The Supreme Court in an early ruling (Hedrick Hudson School District v. Rowley) provided a legal foundation that supports the compensatory nature of AT in ruling that schools are required to provide a ‘floor of opportunity’ when making curricula and student support decisions for students with disabilities (see Figure 1). This has important implications regarding the compensatory nature of AT. Acknowledging that students with disabilities fall below an expected level of performance in academic and life skill curricular areas, a performance gap subsequently exists between these students and their typical peers with regard to access to and participation in the curriculum (Parette, Peterson-Karlan, & Wojcik, 2007). AT, in essence, levels the playing field for students with developmental disabilities by compensating for deficits and creating a floor of opportunity that then creates the potential for achievement (educational progress) in the curriculum.

Sadly, despite the widespread availability of resources containing descriptions of devices available to education professionals (see e.g., Abledata.com, n.d.; Rehabtool.com, 2004; Warger, 2005) there is still misunderstanding about the ‘compensatory’ nature of these AT devices. We propose a more effective definition for education professionals, that AT is “a tool that allows a person to do a task they...
could not do without the tool at the expected performance level” (Parette et al., 2007). This working definition recognizes both the compensatory nature of AT (reflected in the federal definition) in the context of the modern academic or life skills curriculum where there is an expectation for progress toward some designated level of achievement (NCLB).

A particularly important student achievement-related factor is the legal requirement that education professionals must ‘consider’ assistive technology (AT) when developing individualized education programs (IEPs; Individuals with Disabilities Education Improvement Act of 2004 [IDEIA 2004]). Such consideration requires new AT skill sets among practitioners that are not emphasized in most teacher preparation programs currently (Parette, Peterson-Karlan, Smith, Gray, & Silver-Pacuilla, 2006; Parette, Peterson-Karlan, & Wojcik, 2005; Peterson-Karlan et al., in press). Similarly, given the ongoing reliance that school districts place on experts to assume leadership roles in AT decision-making (Parette et al., 2006), development of a broad base of knowledgeable and effective AT practitioners who understand the nature of AT and the AT consideration process remains a current challenge to the field (Parette, 2006; Parette et al., 2006). This process will be described in more detail in a later section.

Another student achievement-related factor is reflected in the mandate of IDEIA 2004 for education professionals to use (a) ‘universally designed’ curriculum materials, whenever feasible [118 STAT. 2668(C)(v)], and (b) accessible digital print materials [118 STAT. 2794(e)(2)]. Both of these factors are laden with AT issues, again requiring an AT knowledge base among practitioners that is not yet evident among school district personnel nationally.

These powerful student achievement-related factors are even more glaringly obvious against the dazzling backdrop of technology innovation permeating all aspects of modern society. More than 25,000 AT devices are currently available in the marketplace to assist students with developmental and other disabilities (Abledata cited in Edyburn, 2000). Such availability also places practitioners in the position of having to demonstrate some familiarity with the process of identifying which AT devices should be considered for students with developmental disabilities. The promise of this wide array of available technology was observed by Silver-Pacuilla (2006), who noted that “it has become easier to use and customize, more powerful and robust, and available at lower costs, making it attractive as part of a school-wide solution” (p. 11).

Access and Productivity

In the evolution of the field of special education, it was once typical that AT was viewed as devices provided to persons having physical, sensory (hearing and vision), and communication disabilities. Such ‘visible’ disabilities among children with developmental disabilities often required something special to compensate for the deficits exhibited by these children. Typically, the responses from education professionals was to provide AT to enable physical access to educational and community programs and services. However, the current convergence of student achievement-related factors, such as those noted above, have emphasized not just physical access, but rather the prominent role of AT in facilitating access to educational experiences as a means to achieving important curricular outcomes. There now should be an emphasis on student productivity using AT in the academic and life skills curriculum. For example, in the academic curriculum, two particularly important shifts that have occurred for students with developmental disabilities has been an emphasis on using AT to (a) acquire and use information from print, and (b) express one’s knowledge in written form. In the life skills curriculum, emphasis has shifted from mere inclusion in a variety of educational and community settings to the ability to do things such as (a) making and following a schedule, (b) completing a job that facilitates wage earning, and (c) managing one’s living space and finances. In each of these curricula areas, AT plays a powerful role both in ensuring student access to educational experiences and in supporting educational achievement.

AT, Instructional Technology, and Universal Design for Learning

Compounding the challenges of using AT to facilitate student achievement is the ‘blurring’
of understanding about varying types of technology found in classrooms today. Peterson-Karlan et al. (in press) have noted that development of technology has more recently evolved to encompass educational functions (Blackhurst, 2005) often associated with academic deficiencies and learning disabilities (Behrmann & Jerome, 2002; Edyburn, 2000; Hasselbring, Lott, & Zydney, n.d.; Silver-Pacuilla, Ruedel, & Mistreet, 2004; Thompson, Bakken, Fulk, & Peterson-Karlan, 2005). There is a range of technology that can support reading, writing, math, information acquisition, organization, and cognitive processing (Hasselbring et al.; Silver-Pacuilla et al.; Thompson et al.) that are evidence-based.

However, the distinctions between instructional technology (IT) and AT are often confused. IT has been defined as the application of "scientific knowledge about human learning to the practical tasks of teaching and learning" (Newby, Stepich, Lehman, & Russell, 2000, p. 10). Application and use of IT addresses the three desired learning outcomes of instruction: increased (a) instructional effectiveness, (b) instructional efficiency, and (c) instructional appeal (Newby et al.). Instructional effectiveness results in the student learning in a better way than would have been accomplished without the experience. Instructional efficiency results in the same amount (or more) of learning occurring but in a shorter amount of time. Instructional appeal enhances the possibility that students will devote time and energy to the learning task. To attain these outcomes, instructional technology supports teaching the curriculum content as well as the planning and evaluation of instruction. Thus, the tools of IT are used to plan instructional interventions, prepare print, audio, video or digital instructional materials, instruct the relevant content (knowledge and skills), and assess student learning (Newby et al.). IT tools used in classrooms for students with developmental disabilities either teach new skills, supplement or expand the curriculum, or remediate skill deficits. They are helpful in facilitating learning, but are not essential, i.e., the student can learn in other ways if an IT tool is removed. Conversely, when students with developmental disabilities require the continued use of the IT tool after its use in typical “learning situations” is done for the student without disabilities, the tool then becomes ‘compensatory’ and is AT, i.e., is individually matched to and uniquely required for a student to make educational progress or participate in the curriculum and/or classroom (Lewis, 1993; Rose et al., 2005). A case in point would be reading as a skill and reading as a means to obtain information. IT, in the form of computer-based software, might be used to teach or remediate reading-specific skill such as phonemic awareness or oral reading fluency. AT, in the form of text-to-speech software might be used to insure that the student is able to obtain relevant social studies or science information from print sources through conversion of digital text to auditory information. These are not mutually exclusive (Peterson-Karlan et al., in press). For a student in 6th grade, instruction in reading skills and support for participation in the academic curriculum are converging interventions IT and AT converge upon the goal of enhancing the progress of students with developmental disabilities in the academic curriculum. IT increases the effectiveness and efficiency of the instruction in the curriculum (Newby et al.) while AT permits students to access the classroom, materials, media and instructional activities, to enhance their productivity by increasing amount, frequency, rate or duration of communication and work output while decreasing cognitive or physical effort or time, and, ultimately to improve the quality or accuracy of their communication, interaction with others, and work products (King, 1999; Smith, 2000). (Peterson-Karlan et al., 2008, p. 197)

Recent emphasis of the IDEIA 2004 on universally designed learning [UDL; 118 STAT. 2668(C)(vi)] further compounds the blurring of distinctions between IT and AT. UDL is based on principles of universal design adopted decades ago in engineering and architecture, but emphasizes the special purpose of learning environments to support and foster changes in knowledge and skill (Rose et al., 2005) among diverse learners, including but not limited to those with disabilities. UDL differs from AT in that it is not a uniquely designed solution for a single learner; instead, it attempts to anticipate the needs and learn-
ing styles of a diverse range of learners (Rose et al.) with cost-effective solutions, such as auditory form of texts (e.g., book on CD) or text-to-speech options for any screen text. However, UDL solutions for the needs of all learners with disabilities, especially those with significant cognitive, sensory or physical disabilities may not be available, may be too cumbersome, complex, or cost-effective to provide to all learners as a UDL solution and so AT is needed to provide access and to support learning (Rose et al.). Another way to think of UDL is that it provides “standard” snaps, buttons, and zippers for AT to be added. Given that UDL is about all students—both with and without disabilities—having multiple means of accessing and participating in the curriculum, AT is added when the student with a developmental disability cannot access the existing universally designed learning curriculum and a compensatory tool is needed.

AT Consideration in the Educational Process

There are three distinct aspects of the educational process for students with developmental disabilities in which the consideration of AT is involved. These include (a) IEP development, including placement alternatives; (b) instructional interventions; and (c) student progress monitoring.

IEP Development

In developing the IEP, education professionals are required by IDEA 2004 to consider AT [§614(B)(v)]. This is more than simply ‘making a check mark’ on the IEP that the team has considered AT; rather, AT consideration may occur at multiple steps of the IEP development process.

Numerous models and frameworks have been proposed for the process of ‘considering’ AT (e.g., Bowser & Reed, 1995; Center for Technology in Education and Technology and Media Division, 2005; Chambers, 1997; Edyburn, 2005; Melichar & Blackhurst, 1993; Zabala, 1993). Though there are distinctions with regard to specific elements in the respective processes of these approaches, there are commonalities that provide broad direction for practitioners working with students having developmental disabilities (see Figure 2). This process has been described in particular detail elsewhere (see Center for Technology in Education and Technology and Media Division) and modified by others (Parette et al., 2007). The focus here is upon understanding the points during the development of a student’s IEP that the need for, role of, or integration of AT might occur.

During review of present levels of performance (PLP) and other pertinent information. In this initial step of IEP development, team mem-

Goal: Kevin will increase skills in reading comprehension from pre-K to 2nd grade level

- Initial use of AT: Objective focuses on acquisition of skills related to the use of AT (operational competence)

Objective: Given a text-to-speech application, Kevin will operate the application independently.

Objective (after acquisition): Given a text-to-speech application during a reading lesson, Kevin will successfully answer 5 comprehension questions. (AT is part of the condition)

Figure 2. Sample goal and objective statements incorporating AT. © 2007, SEAT Center. Used with permission.
bers must review current and prior IEPs for functional performance levels as well as past and current AT use and evidence of effectiveness (Center for Technology in Education and Technology and Media Division, 2005). The central AT-related question being explored is “Is AT needed?” Of particular importance is that the team summarizes the student’s performance with quantifiable indices. As Parette, Peterson-Karlan, Wojcik, and Bardi (2007) advocated,

This involves more than naming the problem, e.g., “the student cannot communicate” or “has difficulty writing.” Problem identification requires that the extent of the discrepancy between the current and desired performance is identified and confirmed through multiple sources of information (i.e., data (Friend & Cook, 2003, p. 23).

To appropriately describe any discrepancy between the current and desired performance, statements should be made regarding any discrepancy both with and without AT. For example, in making functional statements regarding the student’s PLP, statements such as, “Johnny performs at a 3rd grade level writing level when using his talking word processor. Without AT, Johnny performs at 1st grade level” (Parette et al., 2007). Thus, at the very earliest phase of the AT consideration process, thought is given to whether performance could be improved with AT. This broader interpretation of AT “consideration” is reflected in the language of IDEIA 2004 (118 Stat. 2647) wherein teams are now mandated to consider whether AT is “needed” rather than “required” (Mittler, 2007). The need for AT may be more easily demonstrated by considering the size of the discrepancy between current and expected performance and the immediacy of the need to engage in the expected performance.

During development of annual goals. Goals and benchmarks/objectives should address functional capabilities to actively participate (access) and to make educational progress. They should reflect what is and will be needed in the academic and life skills curricula (Parette et al., 2007). They also should reflect what the student with developmental disability will need to know and be able to do as s/he progresses (Center for Technology in Education and Technology and Media Division, 2005). Direction in making such determinations is gained by examining state standards, district curricula, and required assessments to be taken by students with developmental disabilities. An important question to ask during this point in the decision-making process is, “Will it be difficult or impossible for the student to perform at the expected level of performance during the next year?” (Center for Technology in Education and Technology and Media Division). This again addresses the question “Is AT needed” and may require data to determine the student’s expected performance level (for a comprehensive examination of AT data strategies see Parette et al., in press).

A second important point in developing goals and benchmarks/objectives is to distinguish between ‘operational use’ of AT and ‘functional skills improvement’ when using the AT (see Figure 2). It typically takes time for students with developmental disabilities to learn to use new AT devices before marked, sustained progress can be achieved on functional tasks. Thus, separate objectives or benchmarks may need to be written to address (a) functional skill improvement (e.g., increasing the number of spontaneous requests to engage in preferred activities from 2 to 6 per day) and (b) operational use of the AT (e.g., instruction in how to activate and retrieve messages from a dynamic display voice output communication device). Functional performance is the benchmark against which educational progress is measured. Operational competence is tool-specific and may need to be written after a period of consideration of several different devices (see “Step 6: Trial implementation” below).

During consideration of placement alternatives. AT may also be considered when decisions are made about placement alternatives. When AT is placed in a particular educational environment, it becomes problematic if the student participates in several different settings (e.g., special or general education classroom) during the school day. As noted by Dubbels (n.d.),

Removal of the student from one educational setting to access AT located in another is not appropriate except in situations where it is beneficial to the student and not
because the device or service is located outside of the classroom for staff convenience or administrative convenience.

To remove the student would both deny access to participation in the least restrictive setting identified by the team, while also potentially communicating a message that AT is not accepted in the environmental setting. Of particular importance is for the team to consider the least complex support that will remove barriers or enhance performance on the part of the student (Center for Technology in Education and Technology and Media Division, 2005). For example, if a student has difficulties reading print, a less complex solution to this challenge when the student is in gym class would simply be to have a classmate read any printed directions presented to all students (given that relatively little reading is typically expected in such classes). However, when the same student is in a classroom environment where considerable reading is required, use of a text reader, such as ReadPlease® (2005) or Ultra Hal Reader (Zabaware, 2007) may be appropriate in a class or environment where a great deal of reading is required.

During identification of appropriate supports and services, including existing AT. At this point, the team should determine whether any of the supports available to the student, teacher and family include AT and document this in the student’s IEP. This step is particularly important given that it provides documentation for all—including future decision-makers—regarding what is known about the student (Center for Technology in Education and Technology and Media Division, 2005), the available supports, and the relative effectiveness of the existing supports in specific activities and environments. It is useful to remember that, as far back as IDEA 1990, AT consists of both devices (including software) and services; such services may include (but are not limited to) assessments or evaluations needed to select or implement AT, assistance in the acquisition of AT, modifications of existing equipment or materials, training of the student, family or staff in the use and application of the AT, and maintenance of or upgrades to existing AT.

Instructional Interventions

With regard to academic instructional interventions, Lahm and Morrissette (1994) suggested that there are seven areas where AT could assist students: these include (a) organization (e.g., graphic organizers, outlining features in word processing software); (b) note taking (e.g., structured outlines, optical character recognition software, VCR paper, portable keyboards); (c) writing assistance (e.g., word processing software, grammar/spell checkers, dictionaries, thesaurus programs); (d) productivity (e.g., calculators, spreadsheets, databases, personal digital assistants [PDAs]); (e) access to reference materials (e.g., electronic encyclopedias, library references, and online publications, multimedia materials); (f) cognitive assistance (e.g., software for instructing students through tutorials, drill and practice, problem-solving, and simulations; CD-ROM-based application programs); and (g) materials modification (e.g., multimedia authoring software). When considering life skill interventions, AT can assist students with organization (e.g., schedules, materials lists); memory and cognition (e.g., task sequence charts; problem-solving scripts); communication (e.g., communication boards or devices); mobility (e.g., wheelchairs); and manipulation (e.g., adapted materials and equipment for personal hygiene or food preparation).

There are two important and distinct aspects of the relationship of AT to instructional interventions: (a) consideration of AT that might be needed within various academic or life skill activities and tasks in which desired educational goals are accomplished (i.e., what AT might be needed?); and (b) consideration of whether the AT selected is actually effective in enhancing performance within the targeted activities (i.e., is AT effective?). Identify tasks and AT tools needed to accomplish goals. Understanding the demands placed on students when performing specific tasks that are embedded within various academic environments is an important facet of AT consideration. Ultimately, AT is a tool that enhances the individual’s performance or functional capabilities in completing a task. Team members must examine activities across the curriculum and identify the routines and
tasks, which comprise those activities. Examples of activity areas in the life skills curriculum would include such things as personal maintenance, domestic maintenance, recreation and leisure activities, community transportation, shopping or work. Each of these activity areas would have embedded tasks. For example, personal maintenance includes the tasks of grooming, toileting, and bathing. Each of these tasks also has varying physical, cognitive, and linguistic (symbolic interpretation) demands (King, 1999). To bath oneself, one must meet the physical demands of turning handles in the bathtub or shower, lowering oneself into the tub or stepping into the shower stall, scrubbing one’s body with a soapy washcloth, rinsing appropriately, and drying off with a towel. Cognitive demands include remembering the time of day for the bathing to occur and sequencing the steps appropriately. Linguistic (symbolic) demands include differentiating the hot and cold water handles or shampoo and crème rinse bottles. Each of these varying demands may potentially require different AT solutions for the student with a developmental disability.

When considering the academic curriculum, activity areas that team members would consider are the broad curricula areas under which daily academic activities are organized. For example, at the preschool level such activities might include Circle Time, Snack Time, Show and Tell, Reading Activity Area, etc. In Circle Time, students have the tasks of sitting with peers, attending to the teacher, and responding to and asking questions. Each of these tasks has varying physical, cognitive, and/or linguistic demands placed on the students. At the Elementary level, activity areas might include Math, Language Arts (including Reading, Writing, Spelling), Science, and Social Studies. Even writing is not a single task but several different embedded tasks including planning and organization or the composition, transcription of ideas into text form, and revising and editing the composition. Each of these embedded tasks has its own cognitive, physical and linguistic demands requiring different types of compensatory tools (e.g., content-specific outlines, pencil grips or keyboarding devices, editing guides with embedded prompts; Peterson-Karlan, 2007). At the junior or high school level, activities would be the specific subject area classes such as English, History, Geometry, Civics, and Consumer Economics. Beyond the elementary level, reading, writing, and spelling are no longer specific instructional activity areas, but are skill processes employed across multiple activity areas (e.g., reading is required in History, English, and Geometry classes).

Initial or “trial” implementation. In order for education professionals to document the impact of a chosen AT device on a student’s performance, and his or her subsequent achievement in the curriculum, a distinction must be made between ‘operational’ competence and ‘functional’ competence with devices (see Figure 2). A student must learn to use a particular AT device first, before the compensatory potential of the device can be fully realized in life skills and academic curriculum activities. Thus, implementation will focus on building proficiency with using devices before measures of success with functional tasks can be reliably measured. This, however, raises the question of, “How long is “long enough” for functional competence to develop to occur?” The answer is, “It depends.” Three related factors will affect the time required to develop operational competence: (a) the student and his or her characteristics; (b) the features of the device; and (c) the physical, cognitive, and linguistic demands of using the device’s features. Some devices will be relatively simple to use and require little time for the student to become familiar with, depending again on the nature and severity of the student’s disabilities. Other devices will be more complex, having more features, and thus require greater time and effort on the student’s part to develop the necessary operational competence to be an effective user of the AT device.

Student Progress Monitoring

A final aspect of AT consideration is exhibited in activities associated with school district monitoring of student participation in assessment activities. The Individuals with Disabilities Education Act of 1997 (IDEA ‘97) required that all students with disabilities be included in regular statewide assessments, with accommodations as appropriate. IDEA ‘97 also required that those students who
could not be assessed with regular assessments be assessed through an alternate assessment to determine annual yearly progress (AYP) mandated by NCLB. Participation rates of students with disabilities in recent years have been due to three primary factors (Thurlow, Powers, Lewis, Laitusis, & Breslin-Larson, in press). First, two federal policies have contributed to increased participation of students with disabilities: the (a) Individuals with Disabilities Education Act of 1997 (IDEA ‘97) required that students with disabilities be included in regular statewide assessments, with accommodations as appropriate (and that those who could not be assessed with regular assessments be assessed through an alternate assessment). Also, NCLB added accountability on the part of school districts to the participation requirements. IDEIA 2004 merely reinforced the alignment of this legislation and NCLB (Cortiella, 2006). However, great variability exists across states regarding accommodations made for students with disabilities when taking large-scale assessments that provide data against which schools are evaluated regarding student progress (Thurlow et al.)

Generally, state issues regarding the use of AT as an accommodation focus on whether or not “the accommodation produces a valid score – one that does not violate the construct being measured” (Arthur & Cavalier, 2004; Thurlow et al., in press). Table 1 presents a recent summary of current accommodation practices across the U.S. Thurlow et al. (in press) have stated that increase in AT among states and increasing computer access, coupled with state education agency (SEA) efforts to implement the IDEIA 2004 requirements for implementation of universal design of assessment [§ 61216(E)] will culminate in all states offering similar accommodations in the future.

### Outcomes of AT Interventions

The growing national interest in AT outcomes is reflected in a range of professional publications in recent years (Assistive Technology Outcomes Measurement System, 2006; Edyburn, Higgins, & Boone, 2005; Hasselbring et al., n.d.; National Center for Technology Innovation, 2007; Silver-Pacuilla et al., 2004). A unique journal—Assistive Technology Outcomes and Benefits—has also emerged and specifically targets the reporting of AT outcomes activities (see http://www.atobjournal.org). It is clear on examination of a growing body of research that AT outcomes, and more specifically, achievement that is supported by AT in the life skills and academic curriculum, is more than merely knowledge of individual pieces of equipment. Equipment is constantly evolving and new products find their way into the educational marketplace at a dizzying pace.

To understand the role of AT and its relationship to student achievement requires education professionals to understand both how

### Table 1

Sample of State Accommodation Policies for Students with Disabilities – 2005

<table>
<thead>
<tr>
<th>Response Accommodation</th>
<th>N States Allowed</th>
<th>N State Allowed with Restrictions</th>
<th>N States Prohibited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proctor/Scribe</td>
<td>35</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Tape Recorder</td>
<td>33</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Computer/Machine</td>
<td>27</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Sign Responses</td>
<td>26</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Communication Device</td>
<td>24</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Speech to Text</td>
<td>15</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Spell Checker</td>
<td>13</td>
<td>16</td>
<td>2</td>
</tr>
</tbody>
</table>

and why AT works. As described previously in the discussion of the AT consideration process, education professionals must develop a better understanding of the demands placed on students with developmental disabilities. These demands must, of necessity, be examined in the context of specific physical, cognitive, and linguistic demands that are embedded in task requirements of major activities that students participate in across school settings. Equally important is that education professionals recognize that achievement of students with developmental disabilities is often contingent upon use of AT that allows access to educational or life skill experiences. Finally, access is insufficient in and of itself; it must be paired with consideration of student productivity, (i.e., increased amount of performance and/or increased quality or accuracy of performance). Ultimately, the benchmarks for determining AT effectiveness are student achievement in the academic and life skills curricula as evidenced by district- or state-wide measures of student progress.

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Center for Technology in Education and Technology and Media Division. (2005). Considering the need for assistive technology within the individualized education program, Columbia, MD: Author.


Individuals with Disabilities Education Improvement Act of 2004, 118 Stat. 2647


