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INFUSING ASSISTIVE TECHNOLOGY FOR LEARNING:

Assuring Access for all Students

A companion document of the *Educational Technology Plan for Virginia: 2010-15*

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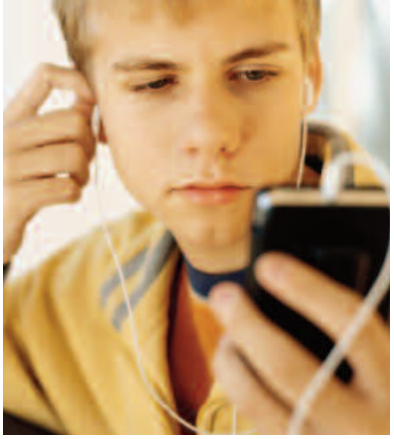

Infusing Assistive Technology for Learning:

Assuring Access for all Students

Historically, assistive and learning technologies have bridged gaps and helped level the playing field for students with disabilities. Assistive technologies (AT) include tools that allow students to communicate when they have no voice, understand when their eyes cannot view the printed text, and discern audio information when they cannot hear. Due to technology advancements and the current movement toward a digital world, many AT tools now are embedded within mainstream technology. Examples include software that speaks various formats of text aloud, mobile devices that automate and predict the written word, and personal computers (PC) that provide customizable accessibility options within applications.

According to a recent report (National Center on Technology Innovation, 2009, hereafter NCTI), promising technology platforms continue to evolve, and "applications designed for the disabled are crossing over into the mainstream, blurring the distinctions between AT and consumer technologies" (p. 6). Such convergence offers students with diverse learning approaches a wider access to tools that can remove barriers in the education environment.

The Horizon Report—2009 Edition (New Media Consortium, 2009) predicted that the education world would adopt popular mobile technologies widely within a year. The expanded functionality of mobile technologies, such as speech recognition, increases their range of possibilities for supporting all classroom learners. These types of technologies present solutions that can provide digital scaffolds, flexible formats, and engaging activities to enhance instructional experiences in the classroom (New Media Consortium, 2009).

Maximizing the intersections within educational technology (ET) offers opportunities to infuse assistive and learning technologies and assure access and success for all students. The NCTI (2006) notes that the continued speed of technology innovation paves a climate of convergence—where tools include rich features and are lower in cost—and that "consumer products and base technologies are increasingly incorporating accessibility and universal design features" (p. 8).

This document highlights opportunities in Virginia and details resources and solutions that that can enhance communication, instruction, learning, and convenience for all users throughout their life spans.

Considering Assistive Technology

The field of AT has progressed over the past several decades into one that is respected for promoting access and expanding options for students with disabilities. *The Technology-Related Assistance for Individuals with Disabilities Act of 1988 (The Tech Act)* defines AT as "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 the functional capabilities of children with disabilities" (PL 100-407). Over the years, this definition has been infused into many legal mandates that assure equal access for individuals with disabilities, including Section 504 of the *Rehabilitation Act of 1973*, *Americans with Disabilities Act of 1990*, *Rehabilitation Act Amendments of 1998*—Section 508, *Individuals with Disabilities Education Act of 1997 and 2004, No Child Left Behind Act of 2001,* and *Assistive Technology Act of 2004* (National Assistive Technology Research Institute, 2006). Accessibility is an especially important consideration as defined by Section 508 of the *Rehabilitation Act*, which, for the first time, emphasized the importance of making electronic and information technology accessible.

An appreciation for AT is evolving as technology innovations increasingly embrace functionality that improves access and efficiency for all users. According to an NCTI report (2009), five themes define today's state-of-the-art AT devices: convergence, customizability and universal design for learning (UDL), research, portability, and interoperability. Each theme helps focus effective ET and AT planning that maximizes success in the classroom and beyond.

Planning for Effective AT Considerations

Considering AT from the onset of a technology decision is critical. Mindful forethought helps all technology decision makers consider the best options, environments, and linkages for including AT within ET. Finding ways to infuse these tools across the instructional environment provides benefits for all users and situations.

Planning for these tools in the beginning keeps the focus on a universally designed environment and includes accessible technologies that all students can use. For example, considering the needs of

hearing-impaired students from the outset will help ensure the inclusion of captioning for video clips, text transcripts for audio recordings, and amplification for students requiring auditory cueing. Continued advances in designing accessible Web portals have increased the availability of accessible Web-based solutions, such as activating closed captioning in the popular YouTube (http://youtube.com) video-sharing service and TED Talks (http://www.tedtalks.com) online audio and video podcast services. The DotSub.com social network service (http://www.dotsub.com) is another example that melds the collective powers of social networking and AT—offering ready solutions.

Likewise, AT is an important planning consideration in terms of individuals with vision needs. Accessible Web coding provides textual information for users who are visually impaired and rely on the auditory reading from a screen-reading device. Teaching staff about accessibility options within operating systems allows them to take advantage of screen magnification options for enlarging page content, including text. Recent advances in mobile technologies, such as video MP3 players and the Apple iPod touch, offer this feature with the touch of a finger. Evolving trends in slate computers, such as the Tablet PC and Apple iPad, also promote this ease in touch sensitivity and screen magnification. In addition, many free and low-cost applications (apps) for Apple devices support text-aloud functions, background contrast adjustments, and access to commercially available, augmentative, communication symbol systems.

A Statewide AT Resource Portal

- In Virginia, the T/TAC Online (http://www.ttaconline.org) statewide Training and Technical Assistance Center (T/TAC) Web portal provides links to best practices and resources modeling these approaches. This service offers 24/7 online professional development support to teachers on AT best practices. Such on-demand training modules, links to state and national resources, and highlights of trainings allow classroom teachers and instructional technology resource teachers (ITRT) to stay up-to-date in their knowledge about AT. For example, several recent T/TA COnline instructional trainings have focused on such topics as audio recording in Microsoft Word and Web accessibility. As a model Web site, T/TAC Online follows best practices in Web design to assure that individuals posting materials include transcripts for audio files, alternative text tags for images, and captions for video.

Instructional videos posted to the T/TAC Online just-in-time online training section provide rich discussions about AT best practices. PowerPoint presentations are annotated with audio, and a text transcript is synchronized to offer immediate closed captioning. The titles in this growing collection include the following:

- AT Works: Laws, Definitions, and Benefits (http://www.ttaconline.org)
- A Brief Introduction to the National Library of Digital Manipulatives (http://www.ttaconline.org)
- Overview of Transition: The Middle School Perspective (http://www.ttaconline.org)

A Framework for AT Consideration

As outlined by law (IDEA, 1997/2004), decision makers should consider the significance of AT for students with disabilities to experience success in most life activities, such as reading, writing, using mathematics, communicating, seeking employment, and enjoying leisure activities. Clearly, AT opens doors for students with disabilities and often maximizes efficiency and functionality for all students. In today's technology-rich instructional settings, AT often is found in a variety of commonly used digital tools. For example, a word processor's zoom function can enable instant screen enlargement for anyone who has difficulty seeing. Auto-editing features, such as auto text and auto correct, can assist writers.

Recognizing the components involved in effective AT planning was the impetus for the Virginia Department of Education's (VDOE) Assistive Technology Priority Project's (ATPP) guiding document *Assistive Technology: A Framework for Consideration and Assessment* (Virginia Department of Education, 2008, hereafter VDOE). This document outlines important steps in developing and implementing a student's Individualized Education Plan (IEP) to assure that AT effectively supports the educational needs of students with disabilities. These resources include guidance on making decisions about and selecting AT tools and AT assessment forms. Additional links highlight successful national program models, including The Wisconsin Assistive Technology Initiative (http://www.wati.org/), The Georgia Project for Assistive Technology (http://www.gpat.org/), and Oregon Assistive Technology Project (http://www.otap-oregon.org/Pages/Default.aspx).

The Role of Assistive Technology in the Classroom

Opportunities to engage students' learning through technology are growing. Infusing technology into classroom instruction capitalizes on ways to customize students' learning experiences. Classrooms are becoming increasingly diverse, including non-native English speakers or students with disabilities. Understanding the potential role of technology for students with disabilities is critical. Often, a student with a disability will be challenged across a range of physical and cognitive areas, which may include low vision, blindness, hearing impairment, deafness, motor problems, learning disabilities, and epilepsy (WebAIM, 2005). A range of functional issues often exist within each of these areas. For example, in the category of visual disabilities, individuals may be legally blind, have low vision, or be color blind; individuals with cognitive difficulties may also have functional problems created by learning disabilities, brain injuries, or just the natural effects of aging (WebAIM, 2005). A disability can occur at any time in an individual's lifetime, which creates a demand for technology supports with a wide range of universal accessibility features.

It also is imperative to choose the appropriate AT for each student. Activating the text-to-speech features in a word processor can provide the writing tools for a student challenged with a physical disability. Using video clips with captioning can assist a deaf student or a student who is more successful when engaged by video vs. printed content. Read-aloud software programs can provide digital enhancements that visually cue text, scaffold passages, and read the text aloud for a student challenged by an intellectual or learning disability.

Accessible Instructional Materials

The potential significance of digital media in an instructional situation is central to the tenets of the National Instructional Materials Accessibility Standard (NIMAS), which offers national guidelines for K-12 electronic book publication for universal file formats. This standard provides a more universally accessible medium for instructional materials and addresses the needs of many K-12 students with disabilities who use AT. When considering NIMAS standards, publishers and curriculum providers provide digital formats that are usable across an array of assistive and technological devices (National Instructional Materials Accessibility Standard, 2006; U.S. Department of Education, 2006).

In Virginia, AIM-VA (http://kihd.gmu.edu) serves as the central point of contact for acquiring accessible instructional materials for students with identified disabilities. Virginia school divisions have received software tools such as the commercial program *Read OutLoud©*, which assists students with print disabilities (Helen A. Kellar Institute, 2010). This program uses digital instructional files to provide reading-aloud functionality, synchronous color highlighting, electronic notation tools, and interactive outlines that enhance reading comprehension. The flexibility of these digital texts enables students with print disabilities to better access the content of the text by reducing the barriers of print-based materials. AIM-VA disseminates these formats in various files, which can be interpreted by a screen reader, printed to a Braille embosser, spoken aloud by a text-to-speech program, or magnified. This type of digital solution offers students access to the curriculum, removes the burden of work from the teacher, and allows the process of learning to unfold. Resources that further clarify the AIM-VA program can be found at the following:

- AIM-VA (http://kihd.gmu.edu)
- T/TAC Online Module: *AIM-VA Overview (http://www.ttaconlineorg)*
- T/TAC Online Module: *NIMAS: The National Instructional Materials Accessibility Standard (http://ttaconline.org)*

AT coordinators and instructional and administrative staffs in several divisions have already adopted these models into their programs.

The Importance of Universal Design

Since its inception in the early 1970s, universal design has been interpreted as designing inclusive, accessible, and usable products and environments for all people (Center for Universal Design, 2005). Universal designs are increasingly more evident in many hardware and software products. Color coding on the backs of desktops and laptops match device connectors, accessibility features embedded within computer operating systems offer expanded functions, and ergonomic designs of keyboards ease repetitive use.

Over the past few decades, the Center for Applied Special Technology (CAST) has been instrumental in expanding the concept of universal design into universal design for learning (UDL), including classroom instruction, disability access, assessment, and learning. UDL features multiple formats, flexible representations, and varied ways to deliver and engage students. Researchers have found that offering instructional materials in more malleable formats, such as digital, increases the likelihood that students will recognize information, use the tools to acquire information, and maintain their interest in the topic (Rose & Meyer, 2002; Center for Applied Special Technology, 2008, hereafter CAST).

According to CAST (2008), three tenets guide a UDL approach: (1) providing multiple representations of instructional content, (2) allowing multiple opportunities for individuals to demonstrate mastery of content, and (3) creating multiple options for learner engagement. CAST encourages a shift from relying upon a single, printed text medium to a digital format—increasing its transformable and malleable qualities (CAST, 2006, 2008; Rose & Meyer, 2002). For example, instructional materials in digital formats can be easily enlarged, color coded or restyled, read aloud by a speech synthesizer, and hyperlinked to supporting materials. The 2008 reauthorization of the Higher Education Opportunity Act [HEOA] defines and underscores the importance of UDL for teacher education (National Universal Design for Learning Task Force, 2009):

> The term "universal design for learning" means a scientifically valid framework for guiding educational practice that—(A) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and (B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient.

Theoretical frameworks such as UDL and how people learn (HPL) clarify how instructional designs can reach all learners in a classroom (CAST, 2008; Bransford, Brown, & Cocking, 2000). UDL strategies and technologies applied to learning or instruction ensure that materials, activities, or goals are designed properly from the start and attainable by individuals who may have differences "in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember" (Allen, 2005, p. 1). Infusing digital media into classroom instruction, using AT, and embracing effective instructional approaches supported through UDL also help customize students' learning experiences while maximizing their chances for success (CAST, 2008). As the NCTI report (2009) notes, "When considering technology for instruction, applying the principles of UDL can be an effective way to customize instruction to meet the needs of a diverse group of learners" (p. 6).

The VDOE's Assistive Technology Priority Project has embraced the framework of UDL. It provides training, offers Web resources, and coordinates conferences to highlight links between the overarching UDL principles and incorporate AT to enhance instruction. AT and ET are natural extensions of a UDL model that strives toward instruction to reach all students.

Considering UDL with AT: The Local Level

At the local level, the Loudoun County Public Schools (LCPS) AT team's staff development showcases the benefits of using a UDL framework to differentiate instruction for diverse learners. Some of these opportunities include team-produced educational DVDs, a multimedia strategy-a-day calendar available to all division staff via the LCPS intranet, school-based workshops designed to meet the specific technology goals of school improvement plans, traveling display boards focused on integrating various classroom technologies to engage learners, and educational podcasts. The LCPS AT Web site (http://www.loudoun.k12.va.us/at) features examples of UDL strategies and resources. A compendium LCPS AT social bookmarking site (http://delicious.com/lcpsat) also is available.

UDL is a pinnacle component when considering AT for students in special education. Over the past two years, the LCPS AT and instructional technology teams have equipped every computer in the division with Texthelp's® Read and Write Gold software, which provides excellent tools to assist students with reading, writing, and research tasks and which makes learning more universally accessible to all learners. Several inclusive classrooms in various secondary schools have infused the UDL framework into their instructional designs to create dynamic learning opportunities for all students. To further educate school administration regarding best practices in UDL, the AT coordinator and other central office staff have conducted workshops that emphasize ways to model the UDL framework in everyday practice. Recognizing the importance of universal design in distance-learning classrooms also helps assure equal opportunities for all students to learn.

Distance Learning: Access and Accessibility on the Web

In 1989, Tim Berners-Lee (2000) envisioned a plan for the World Wide Web to become an open platform for communication—where people could "easily express themselves, quickly acquire and convey knowledge, overcome misunderstandings, and reduce duplication of effort" (p. 162). He hoped the Web would evolve into an efficient system that could support an open exchange of information. Since that time, the Web has become one of the world's primary means for sharing information—communicating with others, accessing information, networking with friends and family, securing reservations, and buying products. The growth and proliferation of the Web has also been accompanied by numerous software designs that hinder universal access for sharing information.

The Web has expanded into a graphical network of interconnected links of information. For students with disabilities and special needs, the Internet offers access to material they otherwise might not be able to obtain. Individuals who are deaf or hard of hearing often find the Web to be an important means of equal access in an inaccessible world of speech communication (WebAIM, 2005). Previously, reading a newspaper often was not an option for individuals who are blind. Early AT—such as electronic screen readers and Braille output—was difficult to use with print-based information; however, due to the evolution of the Web, newspapers and book publishers now provide these resources in electronic formats and often in accessible formats that can be interpreted by text-to-speech screen readers (Bohman, 2003).

All information on the Internet is not accessible. For example, video clips without text captions or equivalent text transcripts are inaccessible to people who are deaf (WebAIM, 2005). Likewise, Web sites that feature graphics without alternate HTML coding are inaccessible to people who are blind. Web portals designed with inaccessible java scripting cannot be accessed by those who cannot use a mouse and who must rely on keyboard commands and keystrokes to view information. Web sites and media created for the Web need to be developed from the standpoint of accessibility concerns.

The Growth of Social Media Tools and Resources

In addition, social media tools are accelerating in popularity. Teens increasingly are communicating digitally via text messaging and social networking (Lenhart & Madden, 2007). Access to social media tools is important to all students, regardless of their learning approaches or differences. Digital participation is key to accessing the wealth of information exchanged across this growing online network of social communities. In addition, social media can offer access to students who may be socially isolated by their disabilities; however, their participation thus far has remained relatively low (Gray, Silver-Pacuilla, & Saucer, 2008). According to a 2007 report, only 44 percent of students with disabilities had computers at home—compared with 72 percent without disabilities—and only 38 percent of students with disabilities had Internet access from home (KirkHart & Lau, 2007).

This instant-access appeal of social media tools offers an attractive convenience feature for many users and school divisions looking to engage diverse learners on shoestring budgets. Many portable handheld devices, smartphones, and portable USB keys include useful learning supports and AT program features (Gray, Silver-Pacuilla, & Overton, 2009).

Increasingly, individuals rely upon the quick speed of readily available Wi-Fi hot spots and Internet connections to access and share information. Broadband access typically maximizes the speed of these tools, which helps ensure better access for all. The U.S. Chamber of Commerce (2009, hereafter USCC) notes, "Broadband is quickly becoming an essential AT, both as a medium for the delivery of critical services to persons with a disability and as a vehicle that enables a wide range of services and tools" (p. 8). Apple, Verizon, AT&T, and other major commercial technology firms increasingly are including ubiquitous accessibility features and functionality within their products (USCC, 2009). This ubiquity is raising awareness about AT and the importance of universal designs.

Formalizing a Technology Plan for Success: ET and AT Partnerships

Infusing AT into a technology plan is critical for optimizing learning in classroom settings. ITRT, AT specialists and providers, technology trainers, and administrators need to forge important partnerships and share their knowledge and expertise when making decisions regarding technology. Teachers need technology options that can facilitate learning and success for all students. As the NCTI (2009) observed, "With students being served in general education classrooms of up to 30 students, devices need to offer as little complexity and facilitate as much independence for the user as possible" (p. 12).

Partnerships at the State Level

Since 2000, the Assistive Technology Priority Project has been an active partner in coordinating and providing AT conference training at Virginia's two premier ET conferences: the Educational Technology Leadership Conference and the Virginia Society for Technology in Education Conference. Several project members serve in liaison roles with state technology leadership to assure that technology teachers and staff are familiar with best practices and emerging trends.

These collaborations help facilitate discussions about the obvious connections among ET and AT professional development agendas, resources, and expertise. Administrators, teachers, and technology providers can benefit from attending state-level technology training, where a plethora of tools and resources are shared. AT providers can learn more about cutting-edge practices in instructional, distance, and informational technologies. ET providers can explore resources and tools that can be expanded in many instructional technologies and that can assure access for all learners.

Partnerships at the Local Level

Members of various technology groups increasingly are being brought together to share collective perspectives on drafting technology plans. These opportunities allow for sharing visions that produce technology plans with mutual goals and objectives, shared interests, and intersecting technologies.

For example, in Stafford County Public Schools' *2004-2010 Integrated Technology Plan*, AT is a targeted element for developing a systemwide "human-technology" infrastructure (Stafford County Public Schools, 2004). Looking towards the future, the focus considered "not just an instructional nor an infrastructure technology plan, but an integrated technology plan—a plan that focuses on what has to be in place if technology is to help students in all the ways a school can help students" (p. 2). Forging partnerships between AT and ET offers multiple opportunities to share resources and enhance instruction.

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