

Overview of Instructional and Assistive Technology: Critical Tools for Students Who Struggle

Family members, teachers, tutors, employers, and professionals often face difficulties in selecting appropriate technology to support individuals who struggle with literacy or math. This fact sheet offers an overview and some general recommendations for selecting appropriate tools for learning or practicing skills (*instructional technology*) and for allowing independent performance of a function that would be difficult without the technology (*assistive technology*).

Technologies for dyslexia and other learning disabilities are increasingly available and accessible at lower cost. Everyday devices found in homes, schools, and businesses such as smartphones, tablets, and other mobile devices provide access to technology that is literally at one's fingertips. Because the number of tools is rapidly expanding, this fact sheet does not review specific ones, but rather provides guiding principles for evaluating technology.

Benefits of Technology Tools

Children and adults with dyslexia and other learning disabilities can benefit from the instructional and compensatory strategies that technology can provide. Technology also has the potential to increase learner motivation, prolong focus, and build confidence (Bennett, 2012; McClanahan, Williams, Kennedy, & Tate, 2012). Use of technology aligns

In this fact sheet, the term device includes computers, mobile devices, and tablets as well as stand-alone devices that incorporate proprietary software into their design. The term app includes computer software, web-based pro-grams, and mobile or device-specific applications.

with best practices based on educational research. These technologies fit well with the principles of universal design for learning (UDL), personalized learning, differentiated instruction, and inclusion—especially in the ways that they help “make differences ordinary” (McLeskey & Waldron, 2007).

Fundamentals of Instructional Technology and Assistive Technology

Technologies that can be of help to those with dyslexia and other learning disabilities fall primarily into one of two categories: *instructional technology (IT)* and *assistive technology (AT)*.

Instructional Technology (IT)

IT tools are designed for all types of learners. They are usually used to reinforce or to provide additional practice for skills already taught. An example of IT is an app that provides practice for math facts. When used as IT, technological devices and apps help teachers and learners expand academic skills either as part of (a) independent learner practice or

Universal Design for Learning (UDL), personalized learning, differentiated instruction and inclusion are all terms used to describe aspects of teaching and learning that allow all students to learn and succeed by making sure they can engage with learning in a way that works for them.

(b) explicit teacher-led instruction. However, to improve skills, both devices and accompanying software programs must be well designed with accurate content validated by scientific research and must align with the student’s reading curriculum. When evaluating IT, make sure there is an intuitive and user-friendly interface along with clear instructions for the intended user (Ishizuka, 2011). Tools designed for independent practice need timely corrective feedback and professional sound and images to support learning. People with learning disabilities may also have attention issues, so it is important to select apps with few distracting images or sounds or that allow sounds and images to be modified. (Winters & Cheesman, 2013).

To support learning, tools need to have a clear focus that is aligned with the learner’s needs and one or more of the areas identified as essential for proficient reading, spelling, and writing. These skills fall into one of two areas: 1) word identification skills (letter identification and formation, phonemic awareness, explicit phonics, morphology, and text fluency) or 2) language comprehension (vocabulary, background information, language structures, verbal reasoning, and literacy knowledge) (National Institute of Child Health and Human Development, 2000; Scarborough, 2001). These guidelines apply to all types of apps, as all academic tasks require a fluid and automatic command of literacy skills as well as the targeted skill of the app. For example, understanding math word problems requires good language comprehension as well as competent number sense and calculation skills.

Assistive Technology (AT)

An assistive technology (AT) tool allows a learner to complete a task that the learner could not complete independently. An example of AT is providing a screen reader for someone who is visually impaired. Without the screen reader, this individual could not read what’s on a page; with it, he or she would be able to access the text independently. This example makes it obvious that technology access can be a vital tool for student learning, and text-to-speech (TTS) technology that translates written text into audio can be as vital for students with dyslexia as a screen reader is for someone who is visually impaired.

Be sure to ask about AT devices, services, and accommodations. The Individuals with Disabilities Education Act (IDEA), which is the federal law that governs public K–12 special education, requires that AT must be considered for every student who has an individualized education program (IEP). AT can provide critical support for individuals with mild or moderate disabilities by reading text aloud, supporting writing through word prediction, converting speech into written words, aiding brainstorming and organization during writing, or supporting spelling and other written language conventions. In addition, if an individual has a Section 504 plan or if the Americans With Disabilities Act (ADA) applies, technology is often an important accommodation component.

AT can support various aspects of literacy by helping individuals gather information through reading and express their knowledge and thinking through writing in ways not possible without AT. However, not every device or app is appropriate for every task. When considering AT, the user and his or her support team need to consider several aspects, such as the following four components—Student,

Environments, Tasks, and Tools—in the SETT framework (Zabala, 2005):

- **Student.** The Student, or individual, component focuses on the specific characteristics of the AT user, including strengths, challenges, interests, and preferences. Essentially, this component describes *who* the user is.
- **Environments.** The Environments component focuses on the setting in which the tool is going to be used. For a student, this may include characteristics of the classroom or home study area. For an adult, this may include the individual’s workplace such as an office, workstation, or other work setting. Essentially, this component describes *where* the user will be using the AT.
- **Tasks.** The Tasks component focuses on the specific tasks that the user needs to do in order to successfully meet requirements and expectations. Often a task involves several subtasks. In addition, in any single environment, multiple tasks are likely to exist. Essentially, this component describes *what* the user needs to do.
- **Tools.** The Tools component focuses on the specific tools the person needs to successfully complete the identified tasks. This component begins by identifying already available tools, such as a classroom computer, tablet, or personal smartphone. Then this component identifies potential devices and/or apps that might be better suited to the specific Student, Environments, and Tasks described in the previous components. Essentially, this component describes *how* the user is going to accomplish the tasks in the environment.

Practical Tips for Evaluating and Using Both IT and AT

When selecting either IT or AT, these guiding principles will increase the likelihood of successful technology use:

- **Whenever possible, try low-tech before mid-/high-tech.** Low-tech IT/AT doesn’t involve electricity (no batteries or cords), is often

inexpensive, is generally simple to use, and focuses on a single task. For example, pencil grips and cushioned pens help writers hold a pencil or pen correctly to increase the legibility and fluency of their writing. However, if a low-tech solution does not work, then the user should try mid- or high-tech. Mid-/high-tech uses electricity, is often more complex and expensive than low-tech, and may focus on one task (mid-tech) or multiple tasks (high-tech) (Winters, 2014).

- **When considering technology, one “size” does not fit all (Winters, 2014).** Many factors need to be considered when choosing technology, whether a device or an app. Chief among these is the user’s preferences, strengths, and challenges. Therefore, a good approach to technology is to offer or try several options in order to find the best device or app fit for the user and the specific task.
- **Whenever possible, take advantage of a trial offer or lite version of a device or app.** Even after careful consideration of the important factors that go into choosing a device or app to use, its appropriateness may not be fully evident until actual use. Therefore, trying a device or app through a trial offer or lite version first can increase the likelihood that the user will find the best device or app (Winters, 2015).
- **After getting a new tool, be sure to fully explore it and get plenty of practice with it before using it in a real-life or important situation.** High-tech IT/AT tools usually come with numerous features and settings. To increase the likelihood that users will experience success, they need to be very familiar with those features and settings. Both training and practice may be required, including practice with the tool when no pressure exists for quick and efficient use. Making sure the user is skilled at using the tool and verifying that the tool is actually working as intended are

essential steps to prepare the user for success when the device or app is actually needed (Winters, 2017).

When AT and IT are part of a student's instructional plan, a dual approach combining direct instruction and alternative access to text through AT and IT is critical, particularly when older students are experiencing reading, spelling, and/or writing difficulties. Too many times, when struggling readers and writers reach fourth grade, efforts to build accuracy and automaticity in foundational skills stop. However, work on fluent, automatic decoding, spelling, and writing should continue, and IT strategies may be a key component. In addition, AT strategies may become critical in helping the student keep up with peers when information demands (*input* and *output*) increase as the student moves through the grades, into higher education, and begins a career (Winters, 2015).

To gain maximum benefit from IT and AT tools from childhood through the transition to adulthood, it is important to use a team approach involving parents, educators, and technology specialists in ongoing communication and progress monitoring. Ask technology professionals in schools or local adult government services for recommendations. One can also do a web search using the word *review* and the appropriate type of IT or AT, or search back issues of IDA publications.

References

- Bennett, K. R. (2012). Less than a class set. *Learning & Leading With Technology*, 39(4), 22–25.
- Ishizuka, K. (2011). The app squad: SLJ's advisors weigh in on kids' book apps. *School Library Journal*, 57(5), 38–43.
- McClanahan, B., Williams, K., Kennedy, E., & Tate, S. (2012). A breakthrough for Josh: How use of an iPad facilitated reading improvement. *TechTrends: Linking Research and Practice to Improve Learning*, 56(3), 20–28.
- McLeskey, J., & Waldron, N. L. (2007). Making differences ordinary in inclusive classrooms. *Intervention in School and Clinic*, 42(3), 162–168.
doi:10.1177/10534512070420030501
- National Institute of Child Health and Human Development. (2000). Report of the National Reading Panel: Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction. Washington, DC: U.S. Government Printing Office.
- Scarborough, H. S. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In: S. Neuman & D. Dickinson (Eds.), *Handbook of early literacy research*. New York, NY: Guilford Press.
- Winters, D. C. (2014). Dr. Dave's AT Lab: Welcome to Dr. Dave's AT Lab! *The Examiner*. Retrieved from www.dyslexiaida.org/dr-daves-at-lab-welcome-to-dr-daves-at-lab/
- Winters, D. C. (2015). Reading E-text: Alternative strategies using AT. *The Examiner*. Retrieved from www.dyslexiaida.org/reading-e-text/
- Winters, D. C. (2017). AT for reading: Reading by pen. *The Examiner*. Retrieved from www.dyslexiaida.org/at-for-reading-reading-by-pen/
- Winters, D. C., & Cheesman, E. A. (2013). Mobile instructional and assistive technology for literacy. *Perspectives in Language and Literacy*, 39(4), 49–52.
- Zabala, J. (2005). Using the SETT framework to level the learning field for students with disabilities. Retrieved from www.joyzabala.com/uploads/Zabala_SETT_Leveling_the_Learning_Field.pdf

The International Dyslexia Association (IDA) thanks Elaine A. Cheesman, Ph.D., and David C. Winters, Ph.D., for their assistance in the preparation of this fact sheet.