The Possibility and Pragmatics of Identifying, Implementing, and Assessing the Use of Assistive Technology among LD Adolescents: A Classroom View from the Trenches

Current State of Research on Assistive Technologies

From the time of the National Reading Panel report nearly 15 years ago, the promise of Assistive Technologies (AT), particularly digital and computer-based technologies has been touted, while at the same time surveys of the literature have revealed very little research base for its efficacy: “...[F]or computer technology and reading instruction, there were relatively few studies, most of which used variables that differed from each other...the use of computer technology in reading is still in its infancy...Very few of these studies directly examined the effects of using computer technology for reading instruction.” ¹ The report concludes that “despite the current intense interest in computer technology, there has been relatively little systematic research into problems of involving computers or other technologies.”²

Many recent studies of individual Assistive Technologies report gains on a particular, localized measure. For example, a recent survey of the empirical studies of special needs students K-12 who used AT focused on literacy and speech concluded “that while some programs saw no improvement in spelling, reading or writing as a result of using the assistive technology, the majority of studies found consistently improved outcomes.”³ However, few studies have demonstrated 1) that Assistive Technology is effective for improving overall academic achievement in the classroom, 2) how to distinguish which students will benefit from which technology, 3) how many students adopt the technology and utilize it habitually and independently over the long term in such a way as to improve their academic achievement.

Sharon Judge, writing on “Constructing an Assistive Technology Toolkit for Young Children,” argues that the pragmatics of implementing such a program often get in the way of even the modest promise of AT in the classroom: “Yet, the full potential of technology remains unfulfilled due to insufficient knowledge of options available, limited professional development, and a dearth of evidence on its effectiveness for particular daily routines and activities.” ⁴

Despite this relative lack of evidence, common sense would dictate that use of AT can be beneficial to individual students, we have a wealth of anecdotal testimonies to the ways in which AT has helped individuals, and we remain committed to the goals of Universal Design which allow all students access to the means to learning, including compensatory tools like Assistive Technology. As Marshall Raskin points out, research has shown that AT can improve certain skill deficits (e.g., reading and spelling), ²,³ and AT can increase a child’s self-reliance and sense of independence.⁵ However, for such a program to function effectively, there still remain many pragmatic difficulties and complexities to consider. The use of Assistive Technology to help students with learning differences, particularly Specific Language Disability (SLD), is extremely promising, but implementing a coherent plan for assistive technology in such a way that students can use it effectively, independently, and habitually remains a challenge for teachers in the classroom.

Almost every survey of the literature has found that effective...
use of assistive technology requires a match of the particular technology to the systems in place in the school, a distribution system that allows the students access, student and family cooperation and familiarity with the technology, identification of the student’s individualized needs and careful matching of the technology to the student. One “Assistive Technology Selection Survey” published by the Macomb Intermediate School District of Clinton Township, Michigan has a five-page document featuring over fifty questions in seven different categories. Similarly, Marshall H. Raskind’s very useful and thorough “Assistive Technology: A Parents’ Guide” features forty-six different questions in five different categories to help guide parents in the selection and implementation of Assistive Technology, along with two pages of consumer tips for evaluating software.

Even the most careful selection process can go awry, however, since not all learning difficulties can be addressed by AT. “Holmes and Silvestri (2009) frames questions in the following manner: If reading deficits are the result of core impairments in working memory, for example, then how well does AT circumvent working memory deficits and thus improve reading ability? Ultimately, we may come to learn that AT is a better substitute for some of these processes than others and thus able to improve the reading of only some students with LD.” Sometimes another condition can interfere with its use, as in a student with auditory processing difficulties who may not be able to use audiobooks effectively, and there is even evidence that AT use can sometime impede functions. For example, “Higgins and Raskind (2005), summarizing the research on AT for use with reading (i.e., primarily text-to-speech software), commented that the evidence to date indicates that text-to-speech systems seem capable of both helping and hindering the reading comprehension of students with LD.” Furthermore, in a school setting, time and resources must be devoted to training for both the teachers and the students in the use of the technology, and time to practice its use (with guidance, trouble-shooting, and coaching from the teacher) until the student can become proficient on his or her own.

In addition, the definition of assistive technologies is so broad that it is almost impossible to make any large-scale claims about efficacy that would apply to all of them: Assistive technology is defined as any item, piece of equipment, or product that is used to increase, maintain, or improve the functional abilities of people with disabilities. In other words, assistive technology is a term used to describe a device that helps you learn. Since this would include pencil and paper as well as the most sophisticated digital software, this definition is fairly all-encompassing. Most of the current interest has been focused on electronic technologies, and more recently almost exclusively on computer-based and digital technologies, so much so that Assistive Technology is almost exclusively applied to these new, emerging technologies. Even with that restriction, the skills that each piece of technology aims to assist is so varied—from decoding ability, reading speed and fluency (audio books) to writing organization (graphic organizers) to writing production (keyboard or text-to-speech) to editing and proofreading (word processors and spell checkers)—that sorting out evidence for any one is very difficult. Moreover, each piece of technology also has its own capabilities, training curve, functional ease of use, and so forth.

Furthermore, the speed of change in assistive technologies, with new capabilities and new systems emerging yearly (if not monthly), is a double-edged sword. While these changes make the systems ever more universal (by making them free and web-based, for example) and ever more functional (improvements in the quality of text-to-speech programs and the decreasing need to train speech recognition programs, to name two recent developments), this same speed of change makes it difficult for the educator to stay abreast of and proficient in each one, and for the student to adapt their skill of use and adopt the new system as his/her own.

Finally, research into the efficacy of assistive technologies remains largely small-scale, anecdotal, based on a study of one particular system (rather than the functionality in a more global sense), and rarely includes long-term follow-up to see if the technology has been adopted and retained in the student’s “technological toolbox,” and if that box has had a real impact on the student’s achievement as they move on to higher education and the work world. “Despite the increasing use of AT by postsecondary students with LD there is a paucity of empirical research examining its efficacy to circumvent academic deficits” (87).
just such high tech/low tech and trial and error approaches. We have developed our own internal rubrics for identifying students’ needs, focusing on the large-scale skills of reading and writing, and looking for pragmatic ways to bridge the gap between the students’ skills and the grade-level, college preparatory tasks we are teaching them to master. For example, we measure each student’s fluency and comprehension with our course materials so that we can identify those who might benefit from audio versions of our texts. We have learned to distinguish which learners will benefit the most, based on findings such as Higgins & Raskind (1997) research “showing that the greater the reading disability, the more likely the technology was to elevate reading comprehension scores, and conversely the milder the reading disability, the more technology seemed to interfere with reading comprehension.” (cited in Holmes and Silvestri 13). We have also learned that students with ADHD often benefit from audio because it slows them down and increases concentration. As with so many of these findings, however, how effective it is varies widely from individual to individual.

Students Must be Trained to use Technology Automatically, Independently, and Habitually

Following identification, we provide in-class training in the correct use of audio (eyes and hands on text simultaneously), and in how to use the variable speed playback (which often increases a student’s reading speed by as much as 50% without a loss of comprehension), how to pause, bookmark a passage, and so forth. Even with this training, however, we have found that attitude and motivation play a large role in an individual students adoption of the technology. Most of our students have at least some functional reading skills, and they will often prefer to struggle with what they have become habituated to rather than learn a new skill (the use of audio). Students will often comment, as one recently did, that with text-to-speech, “The monotone annoys me.” While recent advances, text-to-speech technology has greatly improved in the past year--such as introducing pauses and intonation--getting students to use these technologies is an ongoing challenge. Another student, an 11th grader who reads at less than 100 wcpm, flatly states that she does not use audio books, even those from Learning Ally which have human voices because “I don’t like it.” Therefore, we need to continue to advocate for and monitor its use, and to re-train students if we hope for them to continue to use it.

We begin, as with all things, with the understanding that simply providing the students with the technology is never enough, any more than providing a mobility impaired person with a wheelchair is sufficient. The students first need to be taught how to use the AT automatically, independently, and habitually. Although occasionally the match between a student’s skills and the AT is so good that the student can pick up the AT almost effortlessly, just as often this requires direct, explicit, multi-sensory instruction, with modelling, guided practice, and sufficient repetition until the skill is mastered to the point of automaticity. If we are to expect students to use AT, it is not enough to present them with it. We have to teach a new skill just as we do the unmastered skills that this technology is designed to replace.

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Several principles guide our practice: First, **the teacher who is training the student in the AT must be proficient in its use him or herself.** This is just common sense--how can you show someone how to use a technology that you yourself cannot use--but it involves a good deal of time and effort, especially for those of us with advanced literacy skills. Who wants to learn to use word prediction when you can function well without it? Furthermore, each system has its own learning curve, and those systems have been changing every 2-3 years, such that one needs to continually train and re-train to stay current.

A case in point is the use of dictation software. While recent improvements in the software have reduced the training time (which used to be so labor-intensive and involved such a long learning curve that only the most persistent (and verbally adept) students persisted in using it), and thereby greatly increased its functionality, several barriers exist. Students are often very excited at the prospect of “talking out” their ideas, but their enthusiasm quickly fades when they discover that the software picks up every vocalization, including, “Hm” and “Um,” doesn’t automatically adjust for repetitions, stuttering, muttering or re-phrasing the way that a human auditor would, and finally doesn’t read your mind or make a half-formed or incoherent thought into fully-formed academic prose.

Furthermore, as our earlier article on functional grammar made clear, academic writing is substantively different from conversational language, and unless the student has some skill with composing academic sentences in his or her head before speaking them aloud--along with the working memory to hold that sentence in his or her head long enough to speak it out, and the clarity of diction to make it recognizable for the software, what comes out is likely to be a garbled mess that will take twice as long to undo as it would have been to do by typing in the first place.

My experience in trying to use dictation software reminded me that it was developed for dictation--and therefore works best when a person is dictating according to a template already existing in their head, such as a lawyer dictating a letter to a client or a doctor dictating his or her diagnosis and prescription. In other words, they are working from a mental template that is well-rehearsed. By contrast, most school writing is about novel topics, about which students are discovering or forming their ideas, often through the very act of writing, and in forms which they are just learning. Combine that with the fact that the software is not very functional in a classroom setting, as there is too much background noise, and it is distracting for those not using it. This requires that the student be separated and isolated, which not only requires additional facilities but also increases the students’ self-consciousness in using it. Thus, it is no wonder that very few students successfully adopt voice recognition software. As a rule, about 10% of our students successfully adopt voice recognition software. In fact, except for audio versions of our texts, which are used by about 40-50% of our population, this is a **pretty consistent rule of thumb: ten percent will benefit from any given assistive technology.**

In part this is because the student must be in a sort of proximal zone of utility--not so proficient that they can make do with the skills they have, and not so impaired that even the AT cannot bridge the gap. Even such a simple AT as spell checking software presumes a degree of underlying verbal ability. For example, one student diligently ran the spell check and handed in an essay that had a character lying on the ground being “serenaded by vouchers,” instead of being “surrounded by vultures.” The student’s phonetic spelling (“seraned by vuchers”) had produced different words than the ones he intended, but which with his poor decoding he could not recognize as wrong. In order for him to catch these errors, he would have not only had to have run spell check, but then had the text read back to him with text-to-speech, and then he probably would have had to figure out what the actual spelling he intended was, or more likely go to someone else to tell him how to spell it. Is it any wonder that most students with this level of disability, even the most conscientious, would skip right over to the last step (if even implicitly by simply turning it in as is, phonetic spellings and all)? The upshot of all of this is that **we need to take into account the student's skill, the functionality of the AT for compensating for that skill, the time and energy it takes to learn and use the AT, and the motivation of the student to adopt it.** In some ways, this calculus relies more on the decision theory than on an understanding of learning disabilities and compensatory tools for circumventing them.

One final pragmatic consideration that we have to consider is that of portability. That is, **is this a technology that can be used with ease beyond the bounds of our school,** particularly as the students progress to our stated goal of “future work and study.” We often see on a list of recommended accommodation that a student use a computer for all writing. In the first place, while the myth of the “digital natives” tells us that all of these students already have computer skills well.
in place, the reality is that 30-50% of our students come to us without the ability to touch type or keyboard above our baseline of 20 wpm. Secondly, while there is some evidence that computer use is beneficial to students in terms of speed and length of output, and computers undoubtedly help with editing and revising, in-class writing provides little time for those activities. The biggest factor for most of our students in terms of the length of their writing (total words) is extended time.

Thirdly, while use of a computer is virtually required for out-of-class writing in college, many colleges still do not provide for use of computer for in-class exams. Our internal investigation tells us that speed of composition that does not involve extensive editing and revising is virtually the same for almost all students—around 15 wpm (about 30% slower than the typical 18-20 wpm of college-bound students), with virtually no difference in quality, excepting spelling and, for those students who are truly dysgraphic, legibility. Therefore, for in-class writing, particularly on tests and exams, and presuming that extended time is available, the computer only benefits those who are truly dysgraphic, those with extreme spelling challenges, and a handful for whom the composition process truly is faster or more expressive—typically about 10-15% of our population. For the rest, if a student is college-bound, unless he or she is willing to limit the selection of a college to those that have a mechanism in place to provide for computer use on in-class tests, we urge them to practice handwriting for in-class writing activities. Because we have taken the time to think through the pragmatics of AT, and the time to measure each student and their abilities under classroom conditions, we are able to offer advice on the use of AT tailored to that individual.

At Delaware Valley Friends School, we have a commitment to AT that goes beyond mere awareness of what is available, how to make it available, and how it can be used. We train ourselves to be proficient in both its use and in how to train students in its use. Because we take a pragmatic approach to AT, we are better able to understand which Assistive Technology is effective for improving overall academic achievement in the classroom, which students will benefit from which technology, and how to convince students to adopt the technology and how to train them to utilize it habitually and independently over the long term in such a way as to improve their academic achievement. Because we address the pragmatics, we here at DVFS help make the promise of AT a reality.

Bill Keeney, Ph.D., CALP is the Director of Pedagogical Research and Faculty Development, and English Department Chair, and has taught English at DVFS for over a decade. Bill has a strong interest in educational research and pedagogy, serves on the PBIDA boards, and he was the PBIDA Annual Co-Chair in 2008, Chair in 2009, and Program Committee Chair in 2014. He has published poetry, plays, and scholarly articles in American literature, and presents on reading at national conferences such as the IDA. He was awarded the West Chester Public Library’s Literacy Hero Award in 2007. Bill earned his B.A. at Columbia University and his M.A. and Ph.D. at Boston University, where he studied with Nobel Laureate Derek Walcott.

References


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