

ODYSSEY

2015-2016 EXTRA



Michael Fitzpatrick, PhD, earned his degree in special education from the University of Kansas. His research agenda includes teacher preparation, media literacy, urban school issues, intervention strategies, and technology integration across the lifespan. Fitzpatrick currently serves as vice president of instruction at Pratt Community College in Pratt, Kansas.

Assistive Technology in the Classroom Benefits Deaf and Hard of Hearing Students

By Michael Fitzpatrick and Raschelle Neild

It has become increasingly difficult to dispute or ignore the omnipresence of technology (Fitzpatrick, 2010) and the significant role it plays within contemporary society (McDonald & Hannafin, 2003). Specifically within the field of education, technology has dramatically altered the way teachers teach and students learn. Historically, computer-based hardware devices and software programs have greatly impacted the lives of students, especially those with disabilities (see Bryant & Bryant, 1998; Fitzpatrick, 2005; Jones, Kirkup, & Kirkwood, 1993; Lewis, 1998; Raskind & Higgins, 1998; Theoharis & Fitzpatrick, in press). From these perspectives, it is clearly evident that deaf and hard of hearing students with disabilities (e.g., learning disabilities, behavioral disorders, autism) typically require specialized assistive and instructional technology (A/IT) to meet their unique educational needs (Fitzpatrick & Theoharis, 2010).

Legal Foundation

In 1988, Congress passed the Assistive Technology Act (P. L. 100-407), originally called the Technology-Related Assistance for Individuals with Disabilities Act of 1988, which was the first piece of legislation that (a) focused on technology integration for individuals with disabilities, (b) defined A/IT devices and services, and (c) allocated federal funds for implementing these services and devices into the classroom. The Tech Act's first dimension—devices—is defined 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 a child with a disability (20 U.S.C. § 1401(1), 1997, 2004).

Since the passage of the Tech Act, there has been an exponential influx of A/IT devices created for individuals with disabilities, including those within the Deaf community (Bausch & Hasselbring, 2004). AbleData (2014), an online database for assistive technologies, provides a list of over 40,000 available devices. With the enormous number of options, A/IT decisions are, at times, difficult for

Photos by John T. Consoli

Copyright © 2017
by Gallaudet University
Laurent Clerc National
Deaf Education Center.

For more articles,
visit <http://clerccenter.gallaudet.edu>.



Above and right: Technology (e.g., laptops, mobile devices) has played an important role in increasing not only access but the educational, social, emotional, and behavioral outcomes for deaf and hard of hearing students.



Raschelle Neild, PhD, earned a master's degree in deaf education and a doctorate in special education from the University of Kansas. An associate professor at Gallaudet University, Neild teaches courses focusing on deaf students with autism, K-12 assessment, special education law, the Individualized Education Program process, and special education. Her research agenda includes teacher attrition and retention in special education and deaf learners with autism.

The authors welcome questions and comments about this article at michael@prattcc.edu and nenaneild@gallaudet.edu, respectively.

The authors would like to thank the student and teacher models from the Clerc Center for their assistance in illustrating this article.

educators to make (Bausch & Hasselbring, 2004), particularly when considering that not every deaf or hard of hearing student with disabilities benefits from the same type of technology. The following five A/IT options benefit deaf and hard of hearing students with and without disabilities:

1. DEVICES AND SOFTWARE

Despite legal mandates, technological advances have served as a means of inclusion and exclusion for marginalized populations (Pilling & Barrett, 2008). Consider that our society's propensity toward speech (i.e., hearing communication) technology integration has aided and hindered deaf and hard of hearing students with disabilities. For example, only a few decades ago the Deaf community had to rely on relatives or neighbors to make a simple phone call (National Association of the Deaf, 2008). However, the recent proliferation of laptops and mobile devices (e.g., cellphones, palm pilots, tablets) has played a pivotal role in increasing not only access but the educational, social, emotional, and behavioral outcomes for deaf and hard of hearing students with and without disabilities.

2. NOTE TAKERS

Despite having ample means to employ a variety of instructional approaches and differentiated instruction to meet the learning needs of all students, Elliot, Foster, and Stinson (2002) reported that public school teachers continually rely on lecture as their primary means of information dissemination. Therefore, assigning note takers for deaf and hard of hearing students with disabilities continues to be a highly advantageous venture. According to Kiewra (1985), students who take notes have the ability to recall and perform better on assessments. Deaf and hard of hearing students with disabilities often experience greater difficulties when taking notes, even if they are using additional A/IT devices. However, using a note taker aids in their overall academic success because they have opportunities to engage with the materials in multiple ways.

3. COMPUTER-ASSISTED NOTETAKING

Computer-assisted notetaking (CAN) has been evolving since the 1990s (see Cuddihy, Fisher, Gordon, & Schumaker, 1994; James & Hammersley, 1993; Preminger & Leavit, 1997) and is an

inexpensive and convenient method to help ensure deaf and hard of hearing students, with and without disabilities, receive accurate lecture notes. CAN requires two devices (e.g., computers or tablets), a local area network, and a typist (similar to a scribe or stenographer), and it is recommended to purchase a computerized abbreviation software program (e.g., Typewell). The typist takes notes and the deaf or hard of hearing student with disabilities can either read the notes directly during class on his or her device or receive either a printed or digital copy of the notes at the end of class.

4. REAL-TIME CAPTIONING

According to Jensema, Danturthi, and Burch (2000), real-time captioning (RTC) is similar to subtitling but speech recognition technology is not typically used (Bain, Basson, & Faisman, 2005). Many school districts that can afford the cost for captioning services are integrating RTC for deaf and hard of hearing students (Stover & Pendegrift, 2005). Professional captioners instantaneously transcribe spoken language at speeds of more than 225 words per minute and transmit the information to deaf and hard of hearing students using a specialized stenotype machine (Stover & Pendegrift, 2005). The stenotype machine is connected to a computer with translating software that translates shorthand into words.

5. VIDEO MODELING

The vast majority of students with disabilities benefit from accessing information visually (Bellini, Akullian, & Hopf, 2007), and video modeling provides a platform for these students, including those who are deaf or hard of hearing, to acquire content, skills, strategies, language, etc. Video modeling allows students the opportunity to watch and review copious examples of themselves and others interacting, performing tasks and procedures, and other activities.



Additionally, research suggests that video modeling expedites the generalization process (Daneshvar, Charlop-Christy, Morris, & Lancaster, 2003) and helps maintain skill acquisition (Janzen, 2003).

Exploration of Communication Devices

Regardless of the ways the Deaf community adapts and uses technologies, little research has been conducted on how they use electronic communication in their daily lives (Power, Power, & Horstmanhof, 2007; Fitzpatrick & Theoharis, 2010). Currently, deaf and hard of hearing students, with and without disabilities, have a variety of ways in which they communicate with others (Power et al., 2007), including:

- **Videoconferencing**—Skype, Google+, FaceTime, and other conferencing technologies have revolutionized the way society communicates, and this is especially true for the Deaf community. Videoconferencing offers personalized and corporate engagement by accommodating person-to-person and multi-way connectivity. Unlike traditional relay services, the influx of mobile devices (discussed above) has made the necessity of immobilized hardware virtually obsolete. For example, a student who is attending the Pennsylvania School for the Deaf, located in Pittsburgh, may be separated from his or her family members who live in Erie. Videoconferencing is extremely beneficial because it helps mitigate potential stressors by allowing parents to attend their children's Individualized Education Program (IEP) meetings

remotely while simultaneously providing children with the ability to say hi to their parents at a moment's notice.

- **E-mail and instant messaging**—Individuals in the Deaf community traditionally relied on teletypewriters and relay

systems to communicate with others.

However, as noted above, hard-lined devices have significant limitations in our mobilized society. While everyone who uses e-mail or instant messaging benefits, these mediums allow deaf and hard of hearing students with disabilities the opportunity to read their messages and seek further clarification as necessary. For example, an individual can compose a message using editing functions (e.g., spell check) and archive or print sent and received messages (Bowe, 2002). Similarly, instant messaging allows a full-duplex service. An individual may compose a message and send a response instantaneously (Ibid.).

- **Text messaging**—Deaf students are often delayed in developing their independent living skills compared to their hearing peers (see Calderon & Greenberg, 2003; Greenberg & Kusche, 1993). Akamatsu, Mayer, and Farrelly (2005) found that parents of deaf teenagers typically place more restrictions on activities outside of the home because they worry about their child's general safety due to their inability to hear and communicate. In a recent study, researchers found that parents were uniformly satisfied with the two-way text messaging system one school implemented between the parents and their children. Additionally, the system was used by the school faculty and they found it extremely beneficial. Participants reported that they were able to have direct communication with the students, which significantly limited safety concerns and contributed to ease of coordination of activities (Akamatsu et al., 2005).

The Internet, Programs, and Software

Programs and software have been developed for the Internet to meet the educational and learning needs of deaf and hard of hearing students with and without disabilities. Programs can include, but are not limited to, speech-to-text software, captioned software, simulation software, and sign language software. Although the authors could provide specific examples of various software and innovative ways to use the Internet both inside and outside of the classroom and school setting to meet the learning styles of deaf and hard of hearing students with disabilities, the purpose of this section is not to endorse any one computerized software program or website over another. Rather it serves as a point of focus to expand the perspective

of how educators can utilize these platforms for deaf and hard of hearing students with and without disabilities.

Teacher Vigilance

Unfortunately, keeping up with trends and policy changes, differentiating between fads and industry standards, and identifying effective methods of implementation can be time intensive and, for some, all-consuming. However, it is vital that educators of deaf and hard of hearing students stay abreast of current A/IT software programs and hardware devices. Maintaining an active knowledge base by seeking out professional development opportunities or networking with colleagues is critical to the students' overall success, especially those students with disabilities.

Conclusion

A/IT can range from inexpensive low-tech software and devices to expensive high-tech options. Currently the law requires each student with an IEP to be considered for A/IT devices and services (Bausch & Hasselbring, 2004). The consideration process of appropriate A/IT devices during the IEP meeting is vital to a student's success. However, implementing the A/IT properly and systematically is critical to increasing the student's academic and social outcomes (Bausch & Jones-Ault, 2008; Luft, 2008). Finally, it is important to remember that the actual implementation of these devices is often difficult for educators of deaf and hard of hearing students due to the fact that technology changes rapidly (Stewart & Kluwin, 2001).

References

- AbleData. (2014). *On-line database of assistive technology and rehabilitation equipment*. Retrieved September 27, 2014, from <http://www.abledata.com>
- Akamatsu, C. T., Mayer, C., & Farrelly, S. (2005). An investigation of two-way text messaging use with deaf students at the secondary level. *Journal of Deaf Studies and Deaf Education, 11*(1), 120-131.
- Bain, K., Basson, S., & Faisman, A. (2005). Accessibility, transcription, and access everywhere [electronic version]. *IBM Systems Journal, 44*(3), 589-603.
- Bausch, M. E., & Hasselbring, T. S. (2004). Assistive technology: Are the necessary skills and knowledge being developed A/IT the preservice and inservice levels? *Teacher Education and Special Education, 27*(2), 97-104.
- Bausch, M. E., & Jones-Ault, M. (2008). Assistive technology implementation plan: A tool for improving outcomes. *Teaching Exceptional Children, 41*(1), 6-14.
- Bellini, S., Akullian, J., & Hopf, A. (2007). Increasing social engagement in young children with autism spectrum disorders using video self-modeling. *School Psychology Review, 36*(1), 80-90.
- Bowe, F. G. (2002). Deaf and hard-of-hearing Americans' IM and e-mail use: A national survey. *American Annals of the Deaf, 147*, 6-10.
- Bryant, D. P., & Bryant, B. R. (1998). Using assistive technology adaptations to include students with learning disabilities in cooperative learning activities [electronic version]. *Journal of Learning Disabilities, 31*, 41-54.
- Calderon, R., & Greenberg, M. (2003). Social and emotional development of deaf children: Family, school, and program effects. In M. Marschark & P. E. Spencer (Eds.), *Oxford handbook of deaf studies, language, and education* (p. 177-189). New York: Oxford University Press.
- Cuddihy, A., Fisher, B., Gordon, R., & Schumaker, E. (1994). C-note: A computerized notetaking system for hearing-impaired students in mainstream secondary education [electronic version]. *Information and Technology for the Disabled, 1*(2), 45-52.
- Daneshvar, S., Charlop-Christy, M. H., Morris, C., & Lancaster, B. M. (2003). Using video modeling and reinforcement to teach perspective-taking skills to children with autism. *Journal of Applied Behavior Analysis, 36*(2), 253-257.

References, continued

- Elliot, L., Foster, S., & Stinson, M. (2002). Student study habits using notes from a speech-to-text support service [electronic version]. *Exceptional Children*, 69(1), 25-40.
- Fitzpatrick, M. (2005). Emergence of e-learning for middle school students with specific learning disabilities: Comparing e-learning with face-to-face instruction (doctoral dissertation, University of Kansas). *Dissertations Abstracts International*, 67, 465.
- Fitzpatrick, M. (2010). Operation mindcrime: An era of globalized media consumers. *Educating Youth for Citizenship: East and West*.
- Fitzpatrick, M., & Theoharis, R. (2010). Assistive technology for deaf and hard of hearing students. In S. Seok (Ed.), *Research on human cognition and assistive technology: Design, accessibility and transdisciplinary perspectives*. Hershey, PA: IGI Global (CH 12).
- Greenberg, M. T., & Kusche, C. A. (1993). *Promoting social and emotional development in deaf children: The PATHS Project*. Seattle: University of Washington Press.
- James, V., & Hammersley, M. (1993). Notebook computers as notetakers for handicapped students [electronic version]. *British Journal of Educational Technology*, 24, 63-66.
- Janzen, J. E. (2003). *Understanding the nature of autism: A guide to the Autism Spectrum Disorders* (2nd ed.). San Antonio, TX: PsychCorp.
- Jensema, C. J., Danturthi, R. S., & Burch, R. (2000). Time spent viewing captions on television programs [electronic version]. *American Annals of the Deaf*, 145(5), 464-468.
- Jones, A., Kirkup, G., & Kirkwood, A. (1993). *Personal computers for distance education*. New York: St. Martin's Press.
- Kiewra, K. A. (1985). Investigating notetaking and review: A depth of processing alternative [electronic version]. *Educational Psychologist*, 20(1), 23-32.
- Lewis, R. B. (1998). Assistive technology and learning disabilities: Today's realities and tomorrow's promises [electronic version]. *Journal of Learning Disabilities*, 31, 16-26.
- Luft, P. (2008). Examining educators of the deaf as "highly qualified" teachers: Roles and responsibilities under IDEA and NCLB [electronic version]. *American Annals of the Deaf*, 152(5), 429-440.
- McDonald, K. K., & Hannafin, R. D. (2003). Using web-based computer games to meet the demands of today's high-stakes testing: A mixed method inquiry [electronic version]. *Journal of Research on Technology in Education*, 35(4), 459-472.
- National Association of the Deaf. (2008). Assistive technology. Retrieved December 14, 2008, from <http://www.nad.org>
- Pilling, D., & Barrett, P. (2008). Text communication preferences of deaf people in the United Kingdom. *Journal of Deaf Studies and Deaf Education*, 13(1), 92-103.
- Power, M. R., Power, D., & Horstmanshof, L. (2007). Deaf people communicating via SMS, TTY, relay service, fax, and computers in Australia. *Journal of Deaf Studies and Deaf Education*, 12(1), 80-92.
- Preminger, J., & Leavit, H. (1997). Computer-assisted remote transcription: A tool to aid people who are deaf or hard of hearing in the workplace [electronic version]. *Volta Review*, 99, 219-230.
- Raskind, M. H., & Higgins, E. L. (1998). Assistive technology for postsecondary students with learning disabilities: An overview [electronic version]. *Journal of Learning Disabilities*, 31, 27-40.
- Stewart, D. A., & Kluwin, T. N. (2001). *Teaching deaf and hard of hearing students: Content, strategies, and curriculum*. Needham Heights, MA: Allyn & Bacon.
- Stover, D. L., & Pendegraft, N. (2005). Revisiting computer-aided notetaking: Technological assistive devices for hearing-impaired students [electronic version]. *The Clearing House*, 79(2), 94-97.
- Technology-Related Assistance for Individuals with Disabilities Act of 1988, PL 100-407. (1988, August 19). Title 29, U.S.C. 2201 et seq; U.S. Statutes at Large, 102, 1044-1065.
- Theoharis, R., & Fitzpatrick, M. (in press). *Trains, video games, and super heroes: Autism in context*. Dubuque, IA: Kendall Hunt.