USING TECHNOLOGY TO ENHANCE SPECIAL EDUCATION

Edited by Jeffrey P. Bakken
and Festus E. Obiakor

ADVANCES IN
SPECIAL EDUCATION

VOLUME 37

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CONTENTS

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PREFACE

Students with disabilities are continuously facing challenges in our educational systems and programs. One area of focus that has been challenging is technology. For many years, the use of technology in the classroom for students with disabilities was nonexistent andthen, the focus was on the use of microcomputers and drill and practice activities. Over time, technology has become very important for teachers, parents, and their students with disabilities. Technology has allowed these students to be successful and have access to environments they previously could not participate in because of their disability. For example, during the global COVID pandemic that devastated the world, technology became the livewire of most societies. However, while legislation has mandated the use of technology for students with disabilities, school systems, teachers, and other professionals are sometimes slow to implement changes that will positively impact these students. It could be the training on the use of the technology, cost, or individuals just not being aware of certain technologies that could benefit the learning of students with disabilities. Providing the appropriate technology is definitely an area that has not been addressed to the level that it should for students with disabilities. This journey to improve the use of technology has not been easy for these students and their teachers and families. The use of technology for students with disabilities needs to be a primary focus in the future so students have positive school outcomes that will make them positive contributors for themselves and society.

This book, *Using Technology to Enhance Special Education*, Volume 37 of *Advances in Special Education*, is a logically, thoughtfully organized, and well-sequenced text. It focuses on how general and special educators can use technology to work with children and youth with disabilities. This cutting-edge book involves researchers, scholars, educators, and leaders who are knowledge producers in the field. It is written to respond to today's changing world where technology has become a very powerful force. As it stands, the world is getting smaller and smaller; and what is happening in a location quickly becomes known everywhere. For example, during the tense periods of the global COVID pandemic, technology became the livewire of our world. This book begins with an introduction to technology and students with disabilities; and the remaining chapters focus on the role of technology in the education of students with learning disabilities, emotional and/or behavioral disorders, intellectual disabilities, autism spectrum disorders, physical and health impairments, hearing impairments/deafness, visual impairments, and traumatic brain injuries. In addition, some chapters focus on the role of technology in achieving equitable and inclusive education, building culturally and linguistically responsive general and special

education, and creatively using digital comics to improve written narratives. This book concludes with a chapter that addresses forward-looking ways to infuse technology in special education.

Even though technology is still rare in some disadvantaged communities, it is here to stay. As a result, it behooves us to use it to advance our future. And, for a brighter future, general and special education must continue to infuse cutting-edge technology in all programs to reach all students regardless of gender, socioeconomic status, cultural difference, ethnic group, disability, or health impairment. When used appropriately, technology can be a positive factor in students' learning, academic, or social processes. The use of computers and other technology must be thoughtfully planned to provide for students' growing needs. General and special education teachers and leaders should (1) develop policies about computer usage, (2) work with parents to provide technological guidance as needed, (3) allow students to be in control without letting technology (e.g., computer) to serve as the babysitter. To a large extent, technology must be used cautiously in special education to positively impact students, educators, and leaders, as well as educational systems.

We feel that *Using Technology to Enhance Special Education* is an excellent resource for special education researchers, scholars, practitioners, and professionals who teach and serve students with disabilities. This book is of great benefit to those teaching required undergraduate and graduate special education courses and those engaged in research on technology for students with disabilities. It can also serve as an excellent supplementary text for advanced students who are looking for detailed, comprehensive, and current information for their research papers or theses.

Jeffrey P. Bakken
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Series Editors

USING TECHNOLOGY TO ENHANCE SPECIAL EDUCATION: AN INTRODUCTION

Erik A. Dalmasso, Jeffrey P. Bakken, T. Scott Estes and Quentin M. Wherfel

ABSTRACT

Technology has become a very important aspect of our sacred existence as humans. It has penetrated all sections of our society – it is now an enrichment tool for our economy, politics, education, and society. While these enrichments are naturally inclusive, this chapter focuses on the use of technology in enhancing the education of students, especially those with disabilities. Things that were once inaccessible are now accessible to students with disabilities through the use of technology. These students might have some atypical traits; however, they are humans who can learn and function in our society when provided with appropriate learning tools such as technology. With technology, these students' learning and social activities can be enhanced, modified, adapted, and adjusted so that they can maximize their fullest potential. This is the premise of this chapter; and it sets the stage for the other chapters.

Keywords: Technology; students with disabilities; access; success; communication; support

INTRODUCTION

Years ago, research did not focus much on technology in the area of education, teacher effectiveness, and student learning. The reason may be that there really was not that much technology to investigate. Technology research did not exist in the 1970s or the early 1980s. There was a limited number of studies in special education technology from those years and they tended to reflect a general interest on the impact of microcomputers on all students in public schools. At the

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time, general and special education largely focused on the effectiveness and the efficiency of computer-assisted instruction (CAI). Software programs for general and special education students were commercially developed and were predominantly limited to drill-and-practice programs, tutorials, or simulations (Budoff et al., 1984) that focused on rote memorization skills. Over time, this has changed dramatically. Currently, there is a multitude of technologies that can help teachers, students with disabilities, and parents.

Technology research in special education became more distinctive when researchers began examining ways that technology could improve the complex roles required of public school special educators. Early on, special education teachers, particularly resource room teachers, were charged with diagnostic responsibilities (i.e., determining eligibility for special education services), as well as documenting student progress toward the goals enumerated in individualized educational programs (IEPs). Recent pedagogies in special education highlight the value of technology integration into special education classes in order to support teaching and learning (Baglama et al., 2017; Okolo & Diedrich, 2014; Saddler et al., 2006). Educational technologies consist of any tool, resource, or educational practice integrated to facilitate learning or improve the learning outcomes (Parkman et al., 2018). Classroom practices include the students' use of computers or tablets, teachers' use of whiteboards and presentation tools, and the use of learning management systems (LMS). Integrating technology in classrooms that serve students with special needs has been found to have positive impact on their academic progress, affective development, behavioral goals, and learning motivation (Okolo & Diedrich, 2014). Moreover, technology has been found to increase and improve communication and share of information between different staff members as well as parents, which is an essential factor in improving learning outcomes of students with special needs (Siyam, 2018). On the other hand, teachers often find technology difficult to integrate, especially when there is a lack of appropriate training, insufficient time, a scarcity of available tools and resources, and lack of technical support (Saddler et al., 2006). In addition, technical issues such as loading time, internet access and login failure, and training were found to actually hinder the actual use of technology (Elkaseh et al., 2016; Juhary, 2014; Oye et al., 2014). Moreover, previous research found that computer accessibility and ownership were the best predictors of technology usage in special education settings (Siegel et al., 1996; Tyler-Wood et al., 1997). However, the availability of technology does not necessarily indicate that it is being integrated effectively (Saddler et al., 2006).

ASSISTIVE TECHNOLOGY

One area of research that has been investigated very thoroughly is the use of assistive technology (AT) to help accommodate students with disabilities to perform more equal to their peers. AT 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 functional

capabilities of a child with a disability" (Assistive Technology Act, 2004). Teachers can seamlessly integrate IT tools and employ built-in assistive features, as needed, for students with and without disabilities. For example, most mobile devices have features, text-to-speech (TTS) and speech-to-text (speech recognition; SR) but, a decade ago, the features were available only with the purchase of specialized and expensive software (Ok & Rao, 2019). To make classrooms inclusive, teachers can encourage all students to explore AT features that facilitate learning and provide supports by designing learning activities that integrate the use of these tools for all students. If students are given the opportunity to use tools and reflect on the ones that are useful and supportive to them, they can have the self-awareness and wherewithal to seamlessly use both IT and AT tools as needed. By having the choice to select and use tools to meet their own learning needs, students can access personalized accommodations in the classroom and at home (Ok & Rao, 2019). Teachers, however, still need to be aware of these technologies and how they operate in order to incorporate them into their teaching. These technologies can also help teachers with planning lessons, ongoing assessments and engage in other teacher-related activities.

There are a few points that summarize important principles in the integration of technology in educating or in training students with disabilities, namely: (1) low-tech tools should be the first option when looking for AT that will help promote students' learning (Johnston et al., 2007); (2) educators must search among available tools and devices first before looking for tools that are specially made for educational purposes, which could be very costly (Skylar, 2008); (3) the most expensive tools or devices are not always the best choice, which will be determined based on the student's needs and prior skills; (4) small adjustments to existing technologies, often, will make a difference for students with disabilities; for example, the highlight and enlarge functions already accessible within a program will be helpful (Johnston et al., 2007). In regards to choosing appropriate technology, it is important to choose an appropriate and efficient device or tool, which does not necessarily have to be an expensive device designed just for educational purposes or for students with disabilities. Stodden et al. (2003) found that complex and expensive devices (e.g., high-tech devices) have been used less and appeal to a smaller percentage of students compared to low tech devices. Sometimes, it is much more efficient to look within the normal, existing technology to find useful devices or software for students with disabilities than to just focus on finding a specific technology designed specifically for people with disabilities. For instance, Skylar (2008) calculated the cost that can be saved by using an iPod Touch for students with disabilities to replace many devices such as SMART Boards, Kurzweil 3000 software (designed for students who have reading difficulties), a laptop (capable of running Kurzweil 3000, calculators, electronic organizers, calendars, multiple alarms, and portable internet access), and a flash drive data storage device. Technology, if chosen correctly, can help students with disabilities overcome academic difficulties and develop academic skills.

MOBILE DEVICES < APPS < VIRTUAL REALITY AND MIXED REALITY

Students are now interacting more and more with mobile devices, apps, and virtual reality. Mobile devices continue to permeate the classroom environment with a wealth of available applications (apps). EdWeek's annual Technology Counts reported over 54% of all K–12 students and teachers have access to a school-issued mobile device and that number continues to climb (Molnar, 2015). Augmented reality (AR) is another area that should be considered when teaching students with disabilities. AR is defined as (1) a combination of real and digital content (e.g., text, audio, video, and links), (2) a real-time interaction with digital content, and (3) the digital content is integrated fluidly with physical content (Azuma, 1997). Although no definitive consensus on the current definition of AR exists, researchers agree that AR is a way to view digital content embedded in a physical world (Chen et al., 2016; McMahon et al., 2015). The growing appeal and innate features of AR outside the classroom provide teachers with a resource to create opportunities to encounter real-time situations inside the classroom. Many AR apps extend innovative supports for students with disabilities; and they offer districts, teachers, parents, and other stakeholders cost-efficient, attainable way to harness a growing innovation to support individual student outcomes (Carreon et al., 2020). While by definition AR is a visual support that can be interactive, it is important to include all available tools the technology has. This pairing has the ability to "bring to life" objects creating an exciting, interactive, and relevant environment for students with disabilities. Current literature on AR is limited in education and further limited for students with disabilities; however, research continues to investigate this innovative practice. Recent studies suggest that AR can have an immediate impact for students with disabilities (McMahon et al., 2015).

Another possibility for students with disabilities is mixed reality. Milgram and Kishino's (1994) continuum of mixed reality compared AR navigation to traditional methods of navigation for students with disabilities and found that AR navigation was most successful in aiding students with disabilities. The use of visuals and graphics is a well-known support for students with disabilities, and AR provides the platform to further augment and innovate with visuals such as graphic organizers, picture cards, social narratives, and other picture-based supports. Additionally, AR can be implemented to support the entire classroom population and is not limited to only students with disabilities (Bacca et al., 2014). Kamarainen et al. (2013) found positive effects of AR on student knowledge of biology by taking students on an AR-supported field trip. Students went to a local pond and collected samples through multiple predetermined locations in an AR environment that provided users with digital prompts and content. Positive gains in biological knowledge and positive engagement were reported at the conclusion of the study. McMahon et al. (2016) created AR flash cards for teaching students with disabilities science vocabulary words and found students had a significant increase in vocabulary acquisition when using the AR flash cards. The flash cards allowed students to have an interactive, replicable,

and easily accessible multimedia support. Teachers can integrate digital tools into their instruction to provide learning supports and increase engagement in the classroom (Costely, 2014). Digital devices also can provide essential AT supports for students with disabilities (Dell et al., 2011).

ONLINE LEARNING

Given the situation the pandemic has caused the last two years, online learning has become an avenue that students with disabilities have discovered. These students are enrolling in online courses with the hopes of experiencing a barrier-free environment; but many educational institutions realize that additional barriers to learning in terms of this learning environment's technical structure and processes may exist (Barrett, 2013). Educators may not yet receive adequate preparation for meeting the needs of students with disabilities (Vitelli, 2015) because university instructors may not receive enough formal training in effective practices for teaching students with disabilities (Katsiyannis et al., 2009). College instructors may need to know more about how to promote educational apps that access and meet the diverse learning needs of their students (Izzo et al., 2008). Thus, with a lack of knowledge of dealing with students with disabilities in higher education (Long et al., 2011), barriers continue to be present in the online learning environment in terms of challenges in the use of technical software applications. In addition, many students with disabilities do not have the proper technology to participate fully in their online classes. Edmonds (2004) noted these students who enroll in online courses often experience barriers and challenges to full participation in online learning environments. As Edmonds indicates, part of the problem is related to a push for higher education to increase overall online enrollment at the expense of the needs of students with disabilities. Support for students with disabilities is essential to their success; and they perform interactively better in online courses than in traditional courses (Stewart, Mallery, & Choi, 2010). As it appears, their learning environment (their home or apartment) may provide them less anxiety and more opportunities to interact.

Challenges associated with traditional learning lead to a high dropout rate in the public schools for students with disabilities (Cavanaugh et al., 2013). In some cases, due to the fact that these students have different characteristics related to slower learning rates, the need for extended time to achieve mastery or a need for differentiated learning strategies may result in a forgotten group. Not only have a number of students with disabilities enrolled in online learning (Allday & Allday, 2011), they increasingly choose to participate in online courses at higher rates than do other student populations (Cavanaugh et al., 2013; Coy et al., 2014; Hashey & Stahl, 2014; Phillips et al., 2012). One of the benefits of the online learning opportunity is that virtual schools allow students to choose the best type of environment for them as individuals through flexible pacing. Students can work at their preferred time of the day instead of having to work during scheduled class times (Allday & Allday, 2011; Case & Davidson, 2011; Coy et al., 2014). Also, some students benefit from working on coursework more frequently

for shorter periods of time at each sitting (Case & Davidson, 2011). Fichten et al. (2009) indicated that the benefits of online learning included availability of online course notes, availability of information anywhere and anytime, and the availability of online course materials other than course notes. Finally, online learning allows students to work at their own pace, study from home, and easily communicate with peers, teachers, and service providers.

ENHANCING SPECIAL EDUCATION USING TECHNOLOGY

Benefits for teachers of students with disabilities range from curriculum, instructional practice, student independence, assessment practices, and even a teacher's own personal learning. "Tablet devises and their applications [have] opened a new avenue for special education teachers to facilitate the learning processes for their students behind the boundaries of traditional teaching experiences" (Qahmash, 2018, p. 648). Thomas et al. (2019) acknowledged that "technology, with its ability to provide easy access to a wide range of resources, enabling self-paced learning and a focus on learner needs and preferences, is a powerful self-directed learning tool" (p. 300). This access to resources can begin early in a teacher's experiences – even as they prepare themselves to be teachers. Why? The motivation is the proven and measurable gains that can potentially be experienced by students with disabilities.

Several benefits of technology to students with disabilities have been mentioned earlier; however, the access that students can have to the wider world of learning can be viewed as limitless. Practically speaking, the use of applications beyond the limits of education prepares students for leveraging those tools to solve future life problems. "With the help of developing technology, interactive devices can be used in various areas in our daily life" (Gümüş et al., 2021, p. 554). This use of everyday technology has become as much of a life skill as management of money, telling time, or planning a vacation. Students have opportunities in controlled school settings to tackle a problem, first, by looking for tools to help. A part of that discovery is evaluating the appropriateness of that tool and knowing how to use that tool to find a solution for a problem or issue. Researchers mention access to a variety of options such as touch screen functions, summer "tech camp" experiences, student assessment pieces, parent portals, and other pieces of hardware and software that can benefit students beyond the doors of the classroom (Heyward & Gill, 2021; Qahmash, 2018). "[T]echnology is not a service exclusive to school life" (Dalsen, 2017, p. 103). Creating sustaining systems of support is a key administrative component to maintaining this access. "Special education professionals must learn to facilitate... access" (Thomas et al., 2019, p. 298). Thomas et al. (2019) agreed that "designing for accessibility does require a knowledge base and skill set, but apparently it is approachable once developers attend to user needs" (p. 298). That development seems never ending since the new technology is being created all the time, making accessing

the right tools a bit complicated, but according to the research done, not impossible (Thomas et al., 2019).

As recent events have dictated more use of remote learning, many schools have used the learned experience from the virtual environment to open up a new way of viewing how students are educated. There are resources to support this. "[C]ontinued remote learning, combined with an influx of federal funds, means that many schools can continue to use computers and devices in daily instruction... This will be a boon for students with disabilities and schools' desire to maintain inclusion" (Heyward & Gill, 2021, p. 7). Combine the current climate of technology with legal guidance, students with disabilities should see their access increased right along with their peers. "The field of special education technology is guided by the Individuals with Disabilities Education Act in conjunction with additional legal mandates that prevent discrimination against persons with disabilities, including issues of access" (Thomas et al., 2019, p. 295). When students with disabilities are found to not have that equal access, legal means are available to ensure that the rights of the student are protected and action to mediate issues of lack of access can be taken if needed (Thomas et al., 2019).

Any new endeavor requires not only appropriate implementation but continual evaluation for effectiveness and positive impact. Technology is often a welcomed addition to any program due to the opportunity for all stakeholders to receive immediate feedback. "Measurable outcomes given special education technology access might include differences in function, participation, and satisfaction, not just changes in academic or behavioral performance" (Thomas et al., 2019, p. 300). The issue goes further than just an evaluation of the student's performance but an evaluation of the effectiveness of the tool, itself, bringing with it ethical, professional, and financial appraisal – and sometimes change. "[Technology pieces need to have] sufficient evidence to render them useful for teacher development and for students with high-coincidence disabilities. These and all recommendations should be combined with good clinical judgment and data to demonstrate if these tools function in a specific context, for a specific student" (Thomas et al., 2019, p. 300). All in all, it is the assumption of the existing research that if a tool is deemed appropriate and successful in support of student growth and learning then that tool has the potential to be more widely accepted. Teachers from one study "stated that [technology] application is beneficial for students and it was suggested that the lessons taught in the classroom teaching program should be supported with virtual environments" (Gümüş et al., 2021, p. 554). Here we see a school that not only expresses value for the use of the technology and value for the virtual world of educating students, but marrying the face-to-face classroom environment with virtual technology methods to strengthen instructional practice. That is progress for all students'.

While students with disabilities have engaged in a seemingly continual battle for equal access, true equal access speaks to the needs of all students whether there is an identified disability or not. As the interest in technology increases for the general student population, educators inside and outside of special education can be seen coming together in a common interest to use technology to increase

student performance for students at *any* level of instruction. "This problem [of equal access] resulted in shifting the general research interest to examine the impact of computer technology on all students attending public schools" (Qahmash, 2018, p. 647). This is a powerful movement for education in general even though a keen eye is still needed on our most needy students to ensure their right to an educational experience that encourages them to flourish and grow – and that includes the tools that help facilitate just that. In the end, technology has eventually become an integral part of general and special education.

USING TECHNOLOGY TO DELIVER INSTRUCTION DURING COVID-19

In March of 2020, school districts across the country went into emergency learning protocols due to the emergence of COVID-19. Guided by the United States Department of Education (2020), the Individuals with Disabilities Education Act (IDEA), and individual state emergency learning protocols, school districts were forced into immediate planning and distribution of online learning technologies to enhance communication between parents, students, and teachers (Frederick et al., 2020; Individuals with Disabilities Education Act, 2004; Kim & Fienup, 2021; USDOE, 2020). Understandably, this immediate shift in content planning, delivery, assessment, and communication provided varying levels of stress and disruption for all those involved. The emergency protocols provided themes of commonality across the nation. Whether individual districts operated in a fully online environment, a hybrid environment (physical in class instruction mixed with an online presence), or completely in person, immediate changes were required to lesson problems of planning, support, communication, and assessment for district officials, teachers, students and parents (Frederick et al., 2020; Kim & Fienup, 2021).

For students with disabilities, where familial communication and support is essential, emergency protocols created integral disruption to normal routine. All routines associated with learning, including IEP facilitation and review, daily/weekly educator feedback, and familial support faced harsh interruption from learned and practiced norms (Hurwitz et al., 2022). For many, this interruption proved to be initially challenging. Within days, districts and individual educators in the United States were forced to create a complete alternative to normal, daily in-class learning environments. Planning for alternative delivery methods varied across the country, based on individual state mandates, in accordance with federal guidance. Often, mandates changed in real time, requiring a high level of nimbleness on the part of district officials, educators, students, and families (Tremmel et al., 2020). The constant assessment of delivery and real-time changes was noted as a particular stressor within the literature (Cormier et al., 2022; Glessner & Johnson, 2020). To this end a growing body of scholarship has emerged, focused on the lessons learned from pandemic protocols, their planning and execution, and the mental health challenges presented because of the immediate changes for students with disabilities, families, special education