Texas Education Review

Training Special Educators in a World of Technology Changes

Nigel P. Pierce, PhD
North Carolina Central University

Volume 4, Issue 1, pp. 60-70 (2016)
Available online at www.txedrev.org

Training Special Educators in a World of Technology Changes

Nigel P. Pierce, Ph.D.
North Carolina Central University

Today, many of our public school systems are in need of special education teachers with a high level of digital competence (Connor, Snell, Gansneder, & Dexter, 2010; Maderick, Zhang, Hartley, & Marchand, 2016). Digital competence has been described in research as an individual's ability to effectively operate across three specific skill areas: technology, pedagogy, and content knowledge (e.g., [TPACK]; Koehler, Mishra, & Cain, 2013). Special educators who demonstrate digital competency are well equipped to integrate technology and other assistive devices into any classroom instruction that is designed to meet the needs of special education students (Bailey, Stoner, Parette, & Angell, 2006; Benton-Borghi, 2013; Connor, Snell, Gansneder, & Dexter, 2010; Costigan & Light, 2010; Smith & Okolo, 2010). A large percentage of school age children—with and without disabilities—are entering the classroom already accustomed to using technology in ways that far outpace many pre-service special education teachers (Costigan & Light, 2010; Ribble, 2012). As a result, keeping pace with technological advances while maintaining a high level of digital competence that match the needs of this generation of students will continue to be a challenge for special educators.

The Individuals with Disabilities Education Act (2004) requires special educators to provide services via assistive technology devices that could include "any item . . . whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities" (IDEA, 2004, 20 U.S.C. § 1400 et seq.) of special education students. Special educators must use the evaluative process to determine what type of technology works best for multiple students and how any particular form of technology can enhance learning (Wissick & Gardner, 2008). Fulfilling this responsibility is especially difficult for special education teachers, who cannot be familiar with every piece of technology available. But, it does highlight the critical need to provide in-depth training to teachers on both the range of technology available, as well as how to use key pieces of it.

Not only do the legal duties of special educators indicate a need for better technologically trained teachers, but so does the rapid proliferation and use of technology among students. Students across the learning continuum are applying technology skills differently and more frequently outside of the school environment (Korpan, Bisanz, Bisanz, Boehme, & Lynch, 1997; Sharkins, Newton, Albaiz, & Ernest, 2015). Smartphones for example, have changed how students access, engage, and disseminate digital information (Parnell & Bartlett, 2012), while providing students several platforms—such as social media—to communicate their thoughts and ideas (Druin, 2010; Giles, 2006; Mao, 2014; Merchant, 2012; Ribble, 2012). Mao (2014) suggests, however, that students today use technology tools like social media informally, even in the context of the classroom. Mao further notes that teachers are not effectively harnessing the learning power of social media in ways that engage and benefit students. While smartphones are a great tool that can be used in multiple capacities, assessing it as an adaptive tool and incorporating it into ongoing lessons remains a significant challenge.

Teacher Education Institutions and Technology Instruction

To better prepare special educators who face the challenges of teaching new technology savvy students, teacher education institutions (TEIs) have attempted to include more courses that focus on integrating technology into instruction and the learning environment (Allday, Neilsen-Gatti, & Hudson, 2013; Collier, Weinburgh, & Rivera, 2004; Costigan & Light, 2010; Judge & Simms, 2009; Mulholland, 2006). The TPACK framework has been used as a standard for program development at many of our TEIs (Benton-Borghi, 2013; Koehler et al., 2013; Tondeur, Roblin, van Braak, Fisser, & Voogt, 2013), yet the level of technology competency acquired still lags behind technology development, which limits special education teachers as they enter the classroom (Edyburn, 2013). Do to their everyday recreational use of technology during non-educational activities, new teachers are frequently overestimating their technology competence as it relates to instruction (Maderick, Zhang, Hartley, & Marchand, 2016). For some special educators, this has led to high levels of frustration when using technology in the classroom and fewer technology opportunities for students because these teachers feel inadequately trained (Clausen, 2007; Flanagan, Bouck, & Richardson, 2013).

There seems to be a gap between the level of technology competency needed in special educational settings and how TEIs are providing instructional training for pre-service special education teachers to acquire these technology skills (Judge & Simms, 2009; Theeb, Muhaidat, & Al-Zboon, 2014). Gaps between what is taught by TEIs and what is implemented by special education teachers could be impacted by how broadly defined special education technology is in IDEA (2004). Likewise, technology can also be categorized based on its use: such as instructional technology or informational technology. Differences are further compounded by the rapid changes in new technology that often take time to adapt to in educational settings (Thompson, Schmidt, & Davis, 2003).

In order to make up these differences, TEIs must continuously assess what technology skills special education teachers need beyond the basics in order to better prepare them in meeting the varied needs of their students. TEIs must continue to incorporate broad standards like TPACK, but should also increase the specific technology training special educators receive before completing any program (King-Sears, 2008; Koehler, Mishra, & Cain, 2013). This should provide a better match between the technology needs of special education students and the training provided.

Challenges for TEIs: Special Education Technology

Assistive technology in special education has supported individual's achievement by promoting meaningful participation in multiple settings (Lee & Templeton, 2008). Over the years, both low and high tech devices have been used to access the general curriculum by allowing special education teachers to adapt material to fit the ability of special education students (Akpan, & Beard, 2013). Low tech tools, such as printable communication symbols, have provided a pragmatic approach for special educators to incorporate assistive technology (Flanagan et al., 2013; Lee & Templeton, 2008). Some suggest that using low tech devices is less challenging to implement for special educators than a high tech device, like a digital voice output communication system, because of the ease of use associated with low tech tools (Bock, Stoner, Beck, Hanley, & Prochnow, 2005; Boesch, Wendt, Subramanian, & Hsu, 2013).

Despite the fact that some low and high tech tools provide similar supports, the level of training required to implement various types of technology can be different (Mulholland, 2006; Parette & Stoner, 2008). Parette and Stoner (2008) suggest that teachers-in-training must be provided the opportunities to practice using high tech devices, in order to demonstrate a high level of proficiency. Unfortunately, TEIs do not always offer these opportunities to their pre-service special educators. Martin and colleagues (2014) report that fewer than 10% of teachers received any training during college on technology found in many of today's classrooms, such as Smart Boards. Additionally, because special education courses can cover a number of disabilities and characteristics associated with each disability type, exposure to specific technology for special educators may be limited or may be taught more generally (Chicoine, 2004; Costigan & Light, 2010). For example, students diagnosed with autism spectrum disorder might communicate using an app on an iPad (Boyd, Hart Barnett, & More, 2015). Special educators must first be familiar with the communication ability of a student with autism. Then, the special educator must also be able to effectively operate an iPad and apply this specific form of technology to the lesson. If the special educator is not familiar with this type of technology, or is not given the opportunity to practice when attending a TEI, they may struggle to incorporate iPad technology in the classroom.

Another challenge that TEIs face is providing technology training for special educators in a way that matches policies implemented by state and local education agencies. Many states, if they have not already done so, are shifting resources toward digital technology and other electronic devices (Hew & Brush, 2007). This has a direct effect on TEIs technology training because school districts are adopting educational and instructional resources like Smart Boards and e-texts. These technology tools are frequently designed with built-in features and supports for instruction. E-texts, for example, frequently include study guides, videos, and hyperlinks. At the same time, individual laptops and tablets will soon replace more traditional learning tools—which seems to be the logical progression—as evidence suggests that today's students prefer electronic devices as a way to access information (Davis & Neitze, 2012; Wright, Fugett, & Caputa, 2013). TEIs must, therefore, mirror a shift to an all-digital classroom by increasing exposure to technology such as Smart Boards and other digital devices that many local school districts have adopted. Other technological devices used by students in special education settings will require a higher level of training, making it even more difficult for pre-service teachers to gain the adequate skills needed to implement such devices prior to entering the classroom setting (Costigan & Light, 2010).

A continuous push for inclusion classrooms further complicates TEI's ability to provide adequate technology training for teachers. Inclusive classrooms are educational settings where special education students are taught alongside their typically developing peers (Broderick, Mehta-Parekh, & Reid, 2005; Sansosti & Sansosti, 2012). Though pre-service special education teachers are required by IDEA to receive a different level of training than general education teachers in the utilization of technology, in inclusion settings many students with disabilities are taught by general education teachers. For example, a student diagnosed with autism spectrum disorder—depending on the types or extent of support needed—may spend the majority of their time in the general education setting. According to the U.S. Department of Education, National Center for Education Statistics (2015), students with disabilities receive the majority of their support in the general education classroom. While training that focuses on differentiation of instruction varies between general and special educator programs (Allday, Neilsen-Gatti, & Hudson, 2013; Judge & Simms, 2009), a pre-service general education teacher typically devotes

only a small segment of their academic stint focused on differentiating instruction for special education students (Allday et al., 2013; Dee, 2011), and even less time on differentiating via technology. Now, TEIs must not only focus on the needs of pre-service special educators, but also must consider this seemingly permanent shift towards inclusion classrooms when constructing course sequences and requirement for general educators.

Keys to Ensuring Technology Competence

While there is clearly no one way to prepare future special educators (Suell & Piotrowski, 2007; Wong & Osguthorpe,1993), TEIs must provide pre-service teachers opportunities to hone their technology skills. At the end of any program, special educators should know how to incorporate multiple forms of technology within a lesson plan at above average competency. The ability to adapt technology (e.g., audio, video files) across multiple domains and embed or incorporate digitally formatted content within a lesson or intervention should be one standard of demonstrating digital competence. For example, creating a video model to improve social skills will assist a student diagnosed with autism (Wilson, 2013), or being able to program a multi-switch device to help augment the communication needs for a child with limited speech (Bailey, Stoner, Parette, & Angell, 2006), are just two of many methods for demonstrating technology competence when working in a special education setting. All of these are necessary skills, but also must be accompanied by the ability of special education teachers to evaluate the technological needs of their students (Wissick & Gardner, 2008).

Programs will have to factor in the core course requirements needed for special educators to demonstrate digital competency. Many TEIs align their programs of study to meet state licensure requirements for teaching. For instance, some TEIs may only offer one course associated with technology (i.e., assistive, adaptive, and instructional), which meets the minimum standard needed to obtain teaching credentials (Andrews, 2002; Clausen, 2007; Collier et al., 2004; Ottenbreit-Leftwich, Glazewski, & Newby, 2010). Additionally, some courses even embed Universal Design for Learning (UDL) principles (Courey, Tappe, Siker, & LePage, 2013; Spooner, Baker, Harris, Ahlgrim-Delzell, & Browder, 2007), but may provide only limited practicum or clinical exposure for special education teachers (Scott, Gentry, & Phillips, 2014). Despite the positive evidence in applying UDL principles, one course or semester of technology training for pre-service special education teachers may not enough for them to effectively integrate technology (Fleming, Motamedi, & May, 2007). This is a dilemma for many education programs that have already begun to stream-line coursework to stay competitive with other universities that offer a more rapid, and seemingly more convenient, path to a degree/licensure for most education majors (Chicoine, 2004; Heineke, Carter, Desimone, & Cameron, 2010; Tournaki, Lyublinskaya, & Carolan, 2009; Wong & Osguthorpe, 1993).

Changing Technology Changing Competence

As TEIs attempt to align their programs to best practices, identifying innovative ways to provide access to new technology will help improve special educator's competence in the midst of technology change (Edyburn, 2013; Van Laarhoven & Conderman, 2011). Likewise, understanding that the needs of special education students must align with the practicality of how technology is adapted to the learning style of students they serve and the technology readily available in the classroom. Demonstrating a high level of competence, a special education

teacher should be able to enter the classroom prepared to use technology despite technology changes or the availability of technology for teachers during pre-service training (Collier et al., 2004; Judge & Simms, 2009). Changing technology does benefit special educators and their students as electronic devices and technology offer additional tools; however, research suggests teachers do not use technology to the greatest extent possible when they lack specific training beyond the basic application (Aldunate & Nussbaum, 2013; Douglas, Ayres, Langone, & Meade, 2009; Bouck & Meyer, 2012). TEIs must continue address these differences by offering classes or seminars that are skill specific. Another area should focus on increasing the ability of special educators in addressing technical problems as well. Troubleshooting problems with technology increases their ability to modify lessons designed or supported by technology (Kobak & Taşkın, 2013).

The need of family involvement in support technology implementation has been overlooked in the midst of changing technology. Families play a critical role in the ongoing use of all technology and the transition of technology from schools to the home (Palmer, Wehmeyer, Davies, & Stock, 2012). High levels of technology competence will become irrelevant if TEIs do not increase special educators' ability to provide a level of expertise that supports families who may have limited access to technology (Parette, Huer, & Hourcade, 2003). It is hard to believe—but still true no less—that some students, families, and school districts do not have an adequate level of access to technology (Banister & Fischer,2010; Wood & Howley, 2012), or, as suggested, face barriers associated with technology infrastructure including appropriate support (Javeri & Chen, 2006). Therefore, the context of families and technology is critical and must be a focus for special education programs as technology continues to advance.

Implications

So how do TEIs address the gaps between technology training for special educators and the rapid pace that technology evolves? Much will be determined by a number of factors including budget, the expertise of faculty, and the immediate needs of the local school districts in which they serve. Likewise, TEIs must evaluate which courses are offered and how are they offered.

National and local budget constraints in education will continue to hinder all education programs including pre-service programs for special educators (Giroux, 2010; Martusewicz, 2013). Regrettably, there are no real solutions to budget cuts when many budget decisions are made at the federal and state level. TEIs must become creative in how they implement these technology changes as a result of limited budgets. Van Laarhoven and Conderman (2011) suggest that ultimately building a quality teacher preparation program that includes improved technology competencies takes time, faculty commitment to technology, and resources.

Finally, the most noticeable implication of changing technology and the need for highly competent special educators is the ongoing shortage of special education teachers across many states (McLeskey & Billingsley, 2008; McLeskey, Tyler, & Flippin, 2004). School districts face such a shortage that many schools cannot fill current vacancies (Billingsley & McLeskey, 2004; McLeskey, J., & Billingsley, 2008). This will require TEIs to examine the best way to increase teacher preparation without compromising quality of teachers, particularly when it comes to technology implementation in the classroom (Brownell, Hirsch, & Seo, 2004). TEIs will play an important role in helping local school districts hire and retain highly qualified special educators by offering training that provides not only high quality experiences but multiple opportunities to

practice the implementation of technology (Connor et al., 2010; Scott, Gentry, & Phillips, 2014; Van Laarhoven & Conderman, 2011).

Dr. Nigel P. Pierce is currently the program coordinator for the Adapted Curriculum Licensure program at North Carolina Central University. Dr. Pierce earned his Bachelor of Science degree in Early Childhood and Special Education from Bowie State University, his Master of Science in School Administration and Supervision from the Johns Hopkins University, and his Doctor of Philosophy from the University of Texas at Austin. In addition, Dr. Pierce holds dual certifications in pre-K through 8th grade in general and special education as well as a certificate of licensure through the Interstate School Leaders Licensure Consortium (ISLLC). Dr. Pierce's research interests include the effects of ethnicity, socioeconomic status, and linguistics differences on treatment and accessibility of services for individuals diagnosed with autism spectrum disorder.

Acknowledgement: Dr. Pierce would like to acknowledge the students in his spring 2016 adaptive technology course who provided discussion and insight regarding their level of technology competence as they matriculate through their program of study.

References

Akpan, J. P., & Beard, L. A. (2013). Overview of assistive technology possibilities for teachers to enhance academic outcomes of all students. *Universal Journal of Educational Research, 1*(2), 113-118.

Aldunate, R., & Nussbaum, M. (2013). Teacher adoption of technology. *Computers in Human Behavior, 29*(3), 519-524. doi:10.1016/j.chb.2012.10.017

Allday, R. A., Neilsen-Gatti, S., & Hudson, T. M. (2013). Preparation for inclusion in teacher education pre-Service Curricula. *Teacher Education and Special Education, 36*(4), 298 -311.

Andrews, L. (2002). Preparing general education pre-service teachers for inclusion: Web-enhanced case-based instruction. *Journal of Special Education Technology, 17*(3), 27 35.

Bailey, R. L., Stoner, J. B., Parette, H. J., & Angell, M. E. (2006). AAC team perceptions: Augmentative and alternative communication device use. *Education and Training in Developmental Disabilities, 41*(2), 139-154.

Banister, S., & Fischer, J. (2010). Overcoming the digital divide: The story of an urban middle school. *Mid-Western Educational Researcher, 23*(2), 2-9.

Benton-Borghi, B. H. (2013). A universally designed for learning (UDL) infused technological pedagogical content knowledge (TPACK) practitioners' model essential for teacher preparation in the 21st century. *Journal of Educational Computing Research, 48*(2), 245-265. doi:10.2190/EC.48.2.g

Billingsley, B. S., & McLeskey, J. (2004). Critical issues in special education teacher supply and demand: Overview. *The Journal of Special Education, 38*(1), 2-4. doi:10.1177/00224669040380010101

Bock, S. J., Stoner, J. B., Beck, A. R., Hanley, L., & Prochnow, J. (2005). Increasing functional communication in non-speaking preschool children: Comparison of PECS and VOCA. *Education and Training in Developmental Disabilities, 40*(3), 264-278.

Boesch, M. C., Wendt, O., Subramanian, A., & Hsu, N. (2013). Comparative efficacy of the picture exchange communication system (PECS) versus a speech-generating device: Effects on social-communicative skills and speech development. *AAC: Augmentative and Alternative Communication, 29*(3), 197-209. doi:10.3109/07434618.2013.818059

Bouck, E. C., & Meyer, N. K. (2012). eText, mathematics, and students with visual impairments: "What teachers need to know." *TEACHING Exceptional Children, 45*(2), 42-49.

Boyd, T. K., Hart Barnett, J. E., & More, C. M. (2015). Evaluating iPad technology for enhancing communication skills of children with autism spectrum disorders. *Intervention in School and Clinic, 51*(1), 19-27. doi:10.1177/1053451215577476

Broderick, A., Mehta-Parekh, H., & Reid, D. K. (2005). Differentiating instruction for disabled students in inclusive classrooms. *Theory into Practice, 44*(3), 194-202. doi:10.1207/s15430421tip4403_3

Brownell, M. T., Hirsch, E., & Seo, S. (2004). Meeting the demand for highly qualified special education teachers during severe shortages: What should policymakers consider? *The Journal of Special Education, 38*(1), 56-61. doi:10.1177/00224669040380010501

Clausen, J. M. (2007). Beginning teachers' technology use: First-year teacher development and the institutional context's affect on new teachers' instructional technology use with students. *Journal of Research on Technology in Education, 39*(3), 245-261.

Chicoine, D. (2004). Ignoring the obvious: A constructivist critique of a traditional teacher education program. *Educational Studies: Journal of the American Educational Studies Association, 36*(3), 245-263. doi:10.1207/s15326993es3603_4

Collier, S., Weinburgh, M. H., & Rivera, M. (2004). Infusing technology skills into a teacher education program: Change in students' knowledge about and use of technology. *Journal of Technology and Teacher Education, 12*(3), 447-468.

Connor, C., Snell, M., Gansneder, B., & Dexter, S. (2010). Special education teachers' use of assistive technology with students who have severe disabilities. *Journal of Technology and Teacher Education, 18*(3), 369-386.

Costigan, F. A., & Light, J. (2010). A review of preservice training in augmentative and alternative communication for speech-language pathologists, special education teachers, and occupational therapists. *Assistive Technology, 22*(4), 200-212. doi:10.1080/10400435.2010.492774

Courey, S. J., Tappe, P., Siker, J., & LePage, P. (2013). Improved lesson planning with universal design for learning (UDL). *Teacher Education and Special Education, 36*(1), 7-27. doi:10.1177/0888406412446178

Davis, D. S., & Neitzel, C. (2012). Collaborative sense-making in print and digital text environments. *Reading and Writing, 25*(4), 831-856. doi:10.1007/s11145-011-9302-2

Dee, A. L. (2011). Preservice teacher application of differentiated instruction. *Teacher Educator, 46*(1), 53-70. doi:10.1080/08878730.2010.529987

Douglas, K. H., Ayres, K. M., Langone, J., Bell, V., & Meade, C. (2009). Expanding Literacy for Learners with Intellectual Disabilities: The Role of Supported eText. *Journal of Special Education Technology, 24*(3), 35-44. doi:10.1177/016264340902400304

Druin, A. (2010). Children as codesigners of new technologies: Valuing the imagination to transform what is possible. *New Directions for Youth Development, 2010*(128), 35-43. doi:10.1002/yd.373

Edyburn, D. L. (2013). Critical issues in advancing the special education technology evidence base. *Exceptional Children, 80*(1), 7-24.

Flanagan, S., Bouck, E. C., & Richardson, J. (2013). Middle school special education teachers' perceptions and use of assistive technology in literacy instruction. *Assistive Technology, 25*(1), 24-30.

Fleming, L., Motamedi, V., & May, L. (2007). Predicting preservice teacher competence in computer technology: Modeling and application in training environments. *Journal of Technology and Teacher Education (JTATE), 15*(2), 207-231.

Giles, R. M. (2006). Connecting kids and computers. *Childhood Education, 83*(2), 108.

Giroux, H. A. (2010). Dumbing down teachers: Rethinking the crisis of public education and the demise of the social state. *Review of Education, Pedagogy & Cultural Studies, 32*(4/5), 339-381. doi:10.1080/10714413.2010.510346

Heineke, A. J., Carter, H., Desimone, M., & Cameron, Q. (2010). Working together in urban schools: How a university teacher education program and Teach for America partner to support alternatively certified teachers. *Teacher Education Quarterly, 37*(3), 123-136.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223-252. doi:10.1007/s11423-006-9022-5

Individuals with Disabilities Education Improvement Act of 2004, 20 U.S.C. § 1400 et seq. (2004) (reauthorization of the Individuals with Disabilities Education Act of 1990).

Javeri, M., & Chen, P. (2006). Preparing Urban Teachers to Integrate Technology for Instruction: Challenges and Strategies. *Journal of Urban Learning, Teaching, and Research*, 2151-167.

Judge, S., & Simms, K. A. (2009). Assistive technology training at the pre-service level: A national snapshot of teacher preparation programs. *Teacher Education and Special Education, 32*(1), 33-44.

King-Sears, M. E. (2008). Facts and fallacies: Differentiation and the general education curriculum for students with special educational needs. *Support for Learning, 23*(2), 55 -62.

Kobak, M., & Taşkın, N. R. (2013). Determining student teachers' perceptions of using technology via Likert scale, visual association test and metaphors: A mixed study. *World Journal on Educational Technology, 5*(1), 223-237.

Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)? *Journal of Education, 193*(3), 13-19.

Korpan, C. A., Bisanz, G. L., Bisanz, J., Boehme, C., & Lynch, M. A. (1997). What did you learn outside of school today? Using structured interviews to document home and community activities related to science and technology. Science Education, 81(6), 651 -662. doi:10.1002/(SICI)1098-237X(199711)81:6<651::AID-SCE3>3.0.CO;2-H

Lee, H., & Templeton, R. (2008). Ensuring equal access to technology: Providing assistive technology for students with disabilities. *Theory into Practice, 47*(3), 212-219. doi:10.1080/00405840802153874

Maderick, J. A., Zhang, S., Hartley, K., & Marchand, G. (2016). Preservice teachers and self -assessing digital competence. *Journal of Educational Computing Research, 54*(3), 326 -351. doi:10.1177/0735633115620432

Mao, J. (2014). Social media for learning: A mixed methods study on high school students' technology affordances and perspectives. *Computers in Human Behavior*, 33213-223. doi:10.1016/j.chb.2014.01.002

Martin, W., Strother, S., Beglau, M., Bates, L., Reitzes, T., & Culp, K. M. (2010). Connecting instructional technology professional development to teacher and student outcomes. *Journal of Research on Technology in Education, 43*(1), 53-74. doi:10.1080/15391523.2010.10782561

Martusewicz, R. (2013). Educational imagination in a period of 'reconfiguration'. *Educational Studies: Journal of The American Educational Studies Association, 49*(4), 299-302. doi:10.1080/00131946.2013.808531

McLeskey, J., & Billingsley, B. S. (2008). How does the quality and stability of the teaching force influence the research-to-practice gap?: A perspective on the teacher shortage in special education. *Remedial and Special Education, 29*(5), 293-305. doi:10.1177/0741932507312010

McLeskey, J., Tyler, N. C., & Flippin, S. S. (2004). The supply of and demand for special education teachers: A review of research regarding the chronic shortage of special education teachers. *The Journal of Special Education, 38*(1), 5-21. doi:10.1177/00224669040380010201

Merchant, G. (2012). Mobile practices in everyday life: Popular digital technologies and schooling revisited. British Journal of Educational Technology, 43(5), 770-782. doi:10.1111/j.1467-8535.2012.01352.x

Mulholland, R. (2006). A technology snapshot: Teacher preparation program and the local public schools. *Contemporary Issues in Technology and Teacher Education (CITE Journal), 6*(2), 284-292.

Ottenbreit-Leftwich, A., Glazewski, K., & Newby, T. (2010). Preservice technology integration course revision: A conceptual guide. *Journal of Technology and Teacher Education, 18*(1), 5-33. doi:10.1111/j.1467-8535.2012.01318.x

Palmer, S. B., Wehmeyer, M. L., Davies, D. K., & Stock, S. E. (2012). Family members' reports of the technology use of family members with intellectual and developmental disabilities. *Journal of Intellectual Disability Research, 56*(4), 402-414. doi:10.1111/j.1365-2788.2011.01489.x

Parette, H., & Stoner, J. (2008). Benefits of assistive technology user groups for early childhood education professionals. *Early Childhood Education Journal, 35*(4), 313-319. doi:10.1007/s10643-007-0211-6

Parette, P., Huer, M. B., & Hourcade, J. J. (2003). Using assistive technology focus groups with families across cultures. *Education and Training in Developmental Disabilities, 38*(4), 429-440.

Parnell, W., & Bartlett, J. (2012). Document: How smartphones and tablets are changing documentation in preschool and primary classrooms. *YC Young Children,67*(3), 50.

Sansosti, J. M., & Sansosti, F. J. (2012). Inclusion for students with high-functioning autism spectrum disorders: Definitions and decision making. *Psychology in the Schools, 49*(10), 917-931.

Scott, L. A., Gentry, R., & Phillips, M. (2014). Making preservice teachers better: Examining the impact of a practicum in a teacher preparation program. *Educational Research and Reviews, 9*(10), 294-301.

Sharkins, K. A., Newton, A. B., Albaiz, N. A., & Ernest, J. M. (2015). Preschool children's exposure to media, technology, and screen time: Perspectives of caregivers from three early childcare settings. *Early Childhood Education Journal*, doi:10.1007/s10643-015 -0732-3

Sipilä, K. (2014). Educational use of information and communications technology: Teachers' perspective. *Technology, Pedagogy and Education, 23*(2), 225-241.

Smith, S. J., & Okolo, C. (2010). Response to intervention and evidence-based practice: Where does technology fit? *Learning Disability Quarterly, 33*(4), 257-272. doi:10.1177/073194871003300404

Spooner, F., Baker, J. N., Harris, A. A., Ahlgrim-Delzell, L., & Browder, D. M. (2007). Effects of training in universal design learning on lesson plan development. *Remedial and Special Education, 28*(2), 108-116. doi:10.1177/07419325070280020101

Suell, J. L., & Piotrowski, C. (2007). The Ohio state teacher efficacy scale: Differences between alternative and traditionally trained teachers. *Psychology and Education: An Interdisciplinary Journal, 44*(3-4), 29-31.

Ribble, M. (2012). Digital citizenship for educational change. *Kappa Delta Pi Record, 48*(4), 148-151. doi:10.1080/00228958.2012.734015

Theeb, R. S., Muhaidat, M. A., & Al-Zboon, E. K. (2014). Professional competencies among pre-service teachers in special education from their perspectives. *Education, 135*(1), 133 -143.

Thompson, A. D., Schmidt, D. A., & Davis, N. E. (2003). Technology collaboratives for simultaneous renewal in teacher education. *Educational Technology Research and Development, 51*(1), 73-89. doi:10.1007/BF02504519

Tondeur, J., Roblin, N. P., van Braak, J., Fisser, P., & Voogt, J. (2013). Technological pedagogical content knowledge in teacher education: In search of a new curriculum. *Educational Studies, 39*(2), 239-243. doi:10.1080/03055698.2012.713548

Tournaki, N., Lyublinskaya, I., & Carolan, B. V. (2009). Pathways to teacher certification: Does it really matter when it comes to efficacy and effectiveness? *Action in Teacher Education, 30*(4), 96-109.

U.S. Department of Education, Office of Special Education Programs, Individuals with Disabilities Education Act (IDEA) database, retrieved October 3, 2014, from https://inventory.data.gov/dataset/8715a3e8-bf48-4eef-9deb fd9bb76a196e/resource/a68a23f3-3981-47db-ac75-98a167b65259. See Digest of Education Statistics 2014, table 204.60.

U.S. Department of Education, National Center for Education Statistics. (2015). *Digest of Education Statistics*, 2013 (NCES 2015-011), Table 204.30.

Van Laarhoven, T., & Conderman, G. (2011). Integrating assistive technology into special education teacher preparation programs. *Journal of Technology and Teacher Education, 19*(4), 473-497.

Wilson, K. P. (2013). Incorporating video modeling into a school-based intervention for students with autism spectrum disorders. *Language, Speech, and Hearing Services in Schools, 44*(1), 105-117. doi:10.1044/0161-1461(2012/11-0098)

Wissick, C. A., & Gardner, J. E. (2008). Conducting assessments in technology needs: From assessment to implementation. *Assessment for Effective Intervention, 33*(2), 78-93. doi:10.1177/1534508407311427

Wong, M. J., & Osguthorpe, R. T. (1993). The continuing domination of the four-year teacher education program: A national survey. *Journal of Teacher Education, 44*(1), 64-70.

Wood, L., & Howley, A. (2012). Dividing at an early age: The hidden digital divide in Ohio elementary schools. *Learning, Media and Technology, 37*(1), 20-39. doi:10.1080/17439884.2011.567991

Wright, S., Fugett, A., & Caputa, F. (2013). Using e-readers and Internet resources to support comprehension. *Journal of Educational Technology & Society, 16*(1), 367-379.