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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).

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