The Digital Divide and Inequities for Students with Disabilities: Needed….A Bridge Over Troubled Waters!

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Abstract

One of the key concepts of the NCLB legislation was the improvement of student achievement in academics with the use of technology (NCLB, 2001). Ironically, the NCLB mandate of accountability has not provided the necessary resources for achieving its goals, and students with disabilities are, in fact, being left behind. Therefore, the law is intensifying the digital divide. The impact of legislative policies such as this on students with disabilities, while well intended, has led to barriers of access and equity that prevent teachers from effectively integrating the technology. The focus will be barriers to access and equity in types of special education technology, pedagogy and teacher training, and Universal Design for Learning. This paper will review relevant law, address implications of the digital divide on students with disabilities, and will conclude with recommendations for bridging the gap over the troubled waters of inequity and discrimination.

The Digital Divide and Inequities for Students with Disabilities

For over a decade anyone interested in school reform had to be well versed in the phrase "No Child Left Behind". Congress passed the No Child Left Behind (NCLB) Act of 2001 as a reauthorization of the Elementary and Secondary Education Act. Signed into law by President George W. Bush, NCLB has brought many significant changes to schools nationwide (NCLB, 2001). Just as in the landmark case, *Brown v. Board of Education (1954)*, NCLB aims for all students to have access to quality education. Schools must now consider the performance of students with disabilities to ensure their curriculum provides opportunities for student success (Hehir, 2009).

One of the key concepts of the NCLB legislation was the improvement of student achievement in academics with the use of technology (NCLB, 2001). Included in the goals for NCLB Title 2, Part D-Enhancing Education Through Technology Act of 2001 is the following:

> *To assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability* (20 U.S.C.A § 6752(b)(2)(A)).

Following in the footsteps of President Bush, President Bill Clinton said that technology "gives us the tools to ensure that no one gets left behind" (Kennedy & Agron, 1999, p.17). Unfortunately research has proven otherwise, and inequity of access and achievement is well documented in America's schools.

Ironically, the NCLB (2001) mandate of accountability has not provided the necessary resources for achieving its goals, and students with disabilities are, in fact, being left behind. Therefore, the law is intensifying the digital divide. In 1970, popular recording artists Simon and Garfunkel topped the charts with their hit song "Bridge over Troubled Water" whose lyrics spoke of providing support and comfort in times of need. The simplicity of the message is universal and especially applicable to students with disabilities as they continue to need a bridge over the troubled waters of both access and equity.

The impact of legislative policies such as NCLB (2001) on students with disabilities, while well intended, has led to barriers of access and equity that prevent teachers from effectively integrating the technology. In fact, today's classroom teachers face a myriad of challenges such as high stakes testing, diverse populations, and lack of resources. Those teaching students with diverse abilities face even greater demands in demonstrating progress with inflexible measures (Rose & Meyer, 2002). With comprehensive legislation focusing on technology compliance, it is imperative that not only educators, but also policy makers take action to ensure that students with disabilities have access to and effectively use information and communication technology.

Arne Duncan (2013), U.S. Secretary Of Education, remarked," We have to get better, faster, even during a tough economy, and technology is critical to raise the bar for all students and close what I call the *opportunity gap*" (para. 29). Although a promising ideal, will the bar be raised for all students, including those with disabilities? According to Hasselbring and Glaser (2000), "Technology has the potential to act as an equalizer by freeing many students from their disability in a way that allows them to achieve their true potential" (p.118). However, there are many barriers that must be first overcome.

It is beyond the scope of this paper to discuss all technology barriers. Therefore, its focus will be barriers to access and equity in types of special education technology, pedagogy and teacher training, and Universal Design for Learning. This paper will review relevant law, address implications of the digital divide on students with disabilities, and will conclude with recommendations for bridging the gap over the troubled waters of inequity and discrimination.

Review of Relevant Law

The Individuals with Disabilities Education Improvement Act (IDEIA) of 2004 includes a focus on technology. IDEIA amendments under Title1, Part D, Section 674 concentrate on technology development, demonstration, and utilization as well as media services and instructional materials (20 U.S.C. § 1400 (2004)). Within subpart b of this federal law, "the term *universal design* was officially defined" (Edyburn, 2010, p.34) making technology accessible to the broadest range of individuals with disabilities. Edyburn (2010) also notes concern in operationalizing the construct of Universal Design for Learning (UDL), "…while we are awaiting widespread availability of the promise of UDL (Accessibility Phase), we are left to our own devices to try to apply the UDL principles to create more accessible accommodations…" (p.36).

What is also of significance in subpart e is the definition of print instructional materials. Ten years ago, this was sufficient to include all curriculum materials that would need to be made accessible for students with vision, hearing, print, and other sensory disabilities. The issue is that

with the rapid changes in technology and this new digital age, curricular materials now include far more than printed textbooks. For example, these may include electronic books (eBooks), learning applications (apps), and digital learning objects (LOs) as noted by Reiser and Dempsey (2012).

Rose and Meyer (2002) state, "Barriers to learning are not, in fact, inherent in the capacities of learners, but instead arise in learners' interactions with inflexible educational materials and methods" (p.vi). Pisha and Coyne (2001) agree, "Today's textbooks and learning materials are as inaccessible to many students as school buildings of old were to wheelchair users" (p.197). Policy makers in support of open source, or free access to software into the public domain, have been impeded by "selfish commercial interests" (Edyburn, 2008, p.63) and limitations of the Copyright Act (Hombal & Prasad, 2012). The law is not supporting the modification of all the types of curriculum materials students with disabilities will need; therefore, the law must be modified to accommodate students with disabilities and ever changing technologies.

Impact: The Digital Divide

With the acceleration of technology comes the task of deciphering the jargon for digital literacy. The Digital Divide in its earliest classification focused on disparity. Hargittai (2002) referred to the Top-Level Digital Divide as the difference between the "haves" and "have nots." The proliferation of information and communication technology (ICT) has led to a more complex definition. Warschauer, Knobel, and Stone (2004) refer to the digital divide as "a host of complex factors that shape technology use in ways that serve to exacerbate existing education inequalities" (p.584).

Ongoing research indicates that the Second-Level Digital Divide is both subtle and multifaceted, affecting society in countless respects, while having the potential for social exclusion (Singleton & Longley, 2009). Reinhart and her colleagues (2011) posit, "Gone are the days of believing that the Digital Divide is simply a partition between those who have access to a computer and a modem, and those who do not" (p.181). A more subtle division is in how technology is utilized (Hargittai, 2002; Stevenson, 2008).

Most educators would agree that marginalized populations, such as students with disabilities, continue to suffer from this opportunity gap (Banister & Fischer, 2010). Judge, Puckett, and Bell (2006) refer to digital equity as a "social justice goal, ensuring that all students have access to information and communication technologies for learning, regardless of socioeconomic status (SES), disability, language, race, gender, or any characteristics that have been linked with unequal treatment" (p.52). Unfortunately, glaring inequities and barriers in school districts across America have been documented. Complex barriers include resources, curriculum and pedagogy, environmental setting, and teacher attitudes (Edyburn, Higgins, & Boone, 2005). Strategic reform is needed to bridge the inequities of both the Top-Level and Second- Level Digital Divides.

Barriers: Types of Special Education Technology

Research, like legislation, can often take years for resolution. Fifteen years ago researchers were studying equal opportunity and technology. In the center of equity struggles, the acceleration of technology has provided hope to educators and decision makers that computers could close the gap between those who have and those who have not (Kennedy and Agron, 1999). However, access to technology, even to differing types, does not equal effective use.

Even though computers may be present in the classroom, there is little correlation that presence alone is beneficial to students with disabilities (Brown, 2005). Mouza (2008) notes that simply having the physical access to technology within the school does not significantly change learning outcomes. Additionally, the presence of computers does not necessarily mean that their operating systems and their potential are being supported by the appropriate technological infrastructure. Of significance is the cost to support the computer systems needed for students with disabilities, especially those with more severe challenges, which can be daunting (Hasselbring & Glaser, 2000). The fact is that even when computers are available, they are often outdated sitting in many classrooms like furniture gathering dust.

Many educators fail to see that "the methods and materials that are employed may create additional barriers to improved access, participation, and progress within the general education classroom" (Hitchcock & Stahl, 2003). Martinez (2011) reflects on the use of Information and Communication Technology (ICT) as "useless if its adaptation and use creates another form of social exclusion for students with special needs" (p.150). Three applications of special education technology provide access, but without proper implementation may also serve as barriers to students with disabilities: Assistive Technology, Instructional Technology, and Universal Design for Learning.

Assistive Technology

Assistive Technology is strategic in that it spans "age, disability, and health challenge whether temporary, fluctuating, degenerative, or a permanent condition faced by the individual" (Dove, 2012). According to the IDEIA (2004) amendments, "assistive technology (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" (20 U.S.C. §1401(1)(2004)). It is "designed to assist individuals with disabilities in overcoming barriers in their environment and in increasing their opportunities for independence" (Rose, Hasselbring, Stahl, & Zabala, 2005, p.509). The IDEA Amendments of 1997 legally mandated that during the development of an Individual Education Plan (IEP) assistive technology must be considered (Alper & Raharinirina, 2006). Dove (2012) states, "Assistive technology for persons with disabilities is not an option; it is a necessity and a right mandated by several U.S. federal laws."

Despite legislation, several studies indicate that students with disabilities are not receiving technology devices and/or services as required (Okolo & Diedrich, 2014; Davis, Barnard-Brak, & Arredondo, 2013; Alper & Raharinirina, 2006). The IEP or AT team may fear suggesting assistive technology due to its cost (Zascavage & Winterman, 2009). One of several studies conducted by Quinn and colleagues found that approximately 87% of the AT users had low

incidence disabilities and less than 15% of AT use was reported to occur in the general education classroom (Quinn, Behrmann, Mastropieri, Bausch, Ault, & Chung, 2009; Okolo & Diedrich, 2014). In addition, Newton and Dell (2011) note that traditional AT devices can be overwhelming for teachers to use and adequate training too time consuming. Unfortunately, many educators are uninformed of AT legislation, which may prevent them from carrying out the mandate (Davis et al., 2013). Finally, there is no legislation providing guidelines as to the required level of improvement or even a definition of the benefit in using assistive technology (Edyburn, 2013). The findings of the aforementioned studies clearly reiterate the need for restructuring of educational policies to ensure the use of AT in classrooms where needed or appropriate.

Instructional Technology

The inclusion model, serving students with disabilities, brings concerns of access to the curriculum in the general education setting (Edyburn, 2008). The high standards and accountability mandated by NCLB (2001) have been disabled by a general curriculum ill designed for students requiring special education services. With respect to evolving computer technology, a systematic approach to instruction and curriculum design is needed (Rothwell & Kazanas, 2008, p.16). Edyburn et al. (2005) notes historical trends in the perception of technology; "The Congressional Committee on Instructional Technology (1970) concluded that, in addition to devices and equipment, instructional technology also involves a systematic way of designing and delivering instruction" (p.7). It is evident that experts in the field have understood the need for appropriately designed instructional technology, but there is a disconnect. Hasselbring (2001), in discussing human learning and technological advances, emphasizes that what is known about how people learn is too often ignored. Students with disabilities, disregarded and powerless, have not been included in curriculum design, and they "find barriers rather than supports for learning" (Hitchcock & Stahl, 2003). Rose and Meyer (2002) argue that we should shift the dynamics of disability from the student to the curriculum. They debate that the curriculum poses many barriers to access, engagement, and success. Therefore, it is the curriculum and not the student that we should consider disabled (Jackson, Harper & Jackson, 2001; Hitchcock, Meyer, Rose, & Jackson, 2002).

Barriers: Pedagogy and Teacher Training

The digital divide is also defined by inequities in the way technology is used. Edyburn (2011) asserts that even though schools are more diverse than ever, "few teachers and professors are adequately prepared to effectively teach diverse learners" (p.38). In classrooms at all levels studies indicate marked differences in the way Instructional Computer Technology (ICT) is used (Reinhart, Thomas, & Toriskie, 2011). Due to rapid and exponential advancements in technology, maintaining teachers' proficiency levels as well as their ability to integrate digital learning into the classroom can be challenging (Hicks, 2011). Innovative technologies have a limited lifespan, which can also impact teachers' knowledge base (Edyburn, 2013). Educators are hesitant to accept change especially when it involves technology and students with disabilities (Cuban, Kirkpatrick, & Peck, 2001). Additionally, educators historically resist new solutions that do not align with their current practices (Kennedy & Deshler, 2010). Newton and Dell (2011) also argue that technology training costs time and money, a budgetary concern for

many school districts. Therefore, teachers are not given adequate training or technical support to develop their technology skills.

Voithofer and Foley (2007) contend that educators focus on intervention "in terms of what it can add or how it can supplement current educational practices rather than as a material change in the pedagogical dynamics between teachers and students" (p.14). Morse (2004) notes disparities in computer use of students with disabilities such as the skills and drills approach rather than developing higher order thinking skills. Uses of technology in similar ways contribute to what Morse (2004) references as "the hidden curriculum" or "implicit computer technology use, skills, and beliefs" (p.271) that were developed by degree of expertise with which students used the technology. Hence, there is the need for additional research to support and develop a culture that actively invests in developing instructional strategies dominated by pedagogically relevant technology.

Other inequities contributing to the digital divide are inadequate teacher training and lack of professional development opportunities (Morse, 2004). DiBello (2005) notes the need for teacher training and support and the lack of pre-service preparation programs, which includes specific computer training and strategies for incorporating into current and future practice. Judge, Puckett, & Bell (2006) report updated information from a longitudinal study that "only 15-20% of all teachers believed that they were well prepared to use computers" (p.58). Relevant research suggests that teachers continue to resist new technologies because they feel insecure, intimidated, and unprofessional rather than tech-savvy (Adiguzel, Capraro, & Willson, 2011; Hicks, 2011). Ongoing technology integration and training must become a critical focus.

Barriers: Universal Design for Learning

Although both Assistive Technology and the Universal Design for Learning both serve students with disabilities, their use of technology is quite different (Rose et al., 2005). The Universal Design for Learning was inspired by demographic changes, new technologies, the inclusion movement, and legislation (Pisha & Coyne, 2001). The Center for Applied Special Technology (CAST) began using the concept of universal design with curriculum materials and methods and "coined the term Universal Design for Learning or UDL" (Hitchcock et.al, 2002, p.9). Schools are becoming increasingly diverse due to changing policies and demographics (Rose & Meyer, 2002). As the number of students with learning disabilities physically increases in the general education setting, so does the demand for access to the general education curriculum (Edyburn, 2010; Rose & Meyer, 2002).

As noted earlier, universal design was officially defined in the IDEA (2004) reauthorization, but its origin was developed in the field of architectural design as it applied to environmental public access (Bernacchio & Mullen; Edyburn, 2010). One example of its novelty is the lack of clarity as it relates to the field of education (Rose, Hasselbring, Stahl, & Zabala, 2005). Although universal design features allow students with disabilities access to technology, it does not ensure their comprehension of the content (Sapp, 2009). By comparing these two different concepts within the field of education, scholars and teachers often confuse the very essence of instructional design.

Edyburn (2010) notes that UDL in education is "fundamentally different from Universal Design in the built environment;" for example, UDL "involves complex physical, cognitive, and social interactions to make sense of the information" (p.36) as
opposed to environmental designs, which are static and limited. Additionally, Edyburn (2010) discusses the role of UDL and refutes educators who claim they are applying instructional design principles when, in fact, they are only using multimedia tools. UDL is not a commodity that can be purchased, "it's a way of thinking and acting" (Hitchcock & Stahl, 2003, p.49). The issue is that already overburdened teachers, skilled only in the basics of technology, continue to reify the notion that word processing, PowerPoint Presentations, and *drill and kill* exercises actually fulfill the requirement for effective UDL pedagogy.

The UDL framework embraces instructor creativity in the development of teaching strategies and flexible curricula (Bernacchio & Mullen, 2007). Since UDL focuses on design and problem solving, Edyburn (2010) questions "whether… the demands of daily instruction will allow teachers to function effectively as instructional designers"(p.37). In developing UDL goals, teachers must explicitly understand the learning objective, which according to Hitchcock et al. (2002) is not as easy as it seems. Unclear goals can be problematic causing inappropriate accommodations or modifications.

When the content is digital, it becomes even more essential to use a medium that does not undermine the learning goal. Edyburn (2011) cautions administrators against adopting digital technology without understanding its value. DiBello (2005) notes how easy this can happen in marginalized schools. Outdated technology shifts the focus from the learning outcome to unreliable technology issues. Although the Universal Design for Learning holds great promise, educators must first dialogue and reflect on its flaws and limitations for students with disabilities, particularly those in impoverished rural and urban settings.

Recommendations for Improving Student Outcomes

The future of special education technology is certainly marked with challenges. Hitchcock and Stahl (2003) clearly understand the dilemma as they note, " Some barriers have existed for so long, that most educators no longer even see them" (p.46). Granted, these barriers are challenging; but they can be overcome. Students with disabilities have the potential to powerfully redirect the waves of their future given access and equity to digital mainstreaming or inclusion.

Student Focus

First and foremost, students with disabilities should be included in curriculum design, technology choice, and all levels of decision making as developmentally appropriate so that they learn self-determination strategies and skills. Students are the future, and in order for them to succeed in the 21st century they must be digitally literate. By focusing on social capital, local schools could recruit community volunteers to offer evening and weekend training sessions and summer camps. The creation of after school tech clubs and multimedia gaming events could introduce technology to students who would otherwise be victims of the hidden curriculum. The local community might also collaborate to provide technology internships and part time job opportunities to better prepare students for the workforce.

Ongoing Training
Pre-service and ongoing training and professional development for educators must become a priority. Technology is constantly changing, and in order for teachers to be a source of enlightenment, they must be given access to the kind of technology that will serve their students best. Palak and Walls (2009) suggest, "Focus on teacher training should move away from isolated technology training and toward integration of technology into curriculum to help teachers use technology to support student-centered pedagogy" (p. 437). Additionally, administrators should budget for a tech facilitator to provide continued support for their staff and student body.

Physical Proximity
Local teachers and decision makers should research proven practices of computer and technology placement in their facilities. Computers should be located in classrooms rather than concentrated in lab settings. Studies have shown that students were more likely to use computers when they were accessible on a daily basis rather than having to wait for a computer lab schedule (Brown, 2000; Morse, 2004; Judge et.al, 2006). To promote ownership students should be in charge of turning the computers on/off and preparing them for scheduled use.

Policy and the Law
Legislators and policymakers must identify and rectify discrimination and inequities in technology in local districts as well as in state agencies. Zascavage and Winterman (2009) clearly state that federal law mandates high quality standards, yet implementation has not been addressed. Burgstahler (2002) notes, "Legal mandates… that apply to computer access for students are not always reflected in practice." Policy groups in support of UDL curriculum design need research-based evidence in order to encourage the publishing of accessible materials. It is time for stakeholders to voice their outrage that further change is needed- change that is culturally and pedagogically responsive to students with disabilities.

Research
Further research is needed in assistive technology and the Universal Design for Learning. Implementation is required that is consistent, current, and research based. Quinn et.al (2009) note, "There has been little research as to whether all students are receiving access to AT" (p.1). Whether the problems are teacher driven such as lack of training or budget driven due to lack of resources, studies are needed to determine appropriate educational access and equity. Additional research is also needed in the integration of assistive technology with the Universal Design for Learning model.

The empirical basis for UDL methodology has not been scientifically validated (Edyburn, 2010; P. King-Sears, 2014); therefore, research teams are necessary to ensure these technologies are sound. Studies are promising according to Spencer (2011), "Although there is not yet a conclusive body of quantitative research on student outcomes related to UDL, the literature documents benefits that include reduced behavior problems, increased metacognitive knowledge, and improved access to the curriculum for struggling learners" (p.10). Equitable use of curriculum materials like digital text is possible through the lens of UDL if key features are targeted and weaknesses redesigned (M. King-Sears, 2009). However, further research is needed

to inform practitioners and educators. Curriculum that is flexible, differentiated, and research-based could break down the barriers that students with disabilities face.

Curriculum Access

Finally, research is needed to determine what various forms of curriculum materials are being utilized today for students with disabilities. In addition, what types of curriculum materials are students with disabilities being denied access to, or conversely, being provided appropriate access? Studies should also determine what forms of curriculum materials are not included in the IDEIA (2004) statute and what materials students require.

Conclusions

Bridging the Gap

Reinhart et al. (2011) state, "The Second Level Digital Divide shapes the future for all students as they navigate a technologically advanced global village." Solving the problem requires careful examination of access to technology as well as technology equity. Further studies are needed to investigate pedagogical practices that advance higher order thinking skills. Moreover, research evidence for UDL as a scientifically validated intervention has been limited to date.

The marginalization of students with disabilities continues to plague our nation's educational system. Kalyanpur & Kirmani (2005) conclude, "The implications are enormous and the costs to society great, as these students are impeded by their lack of technological skills from entering the competitive world of college… or work." The digital divide continues to be a significant issue and will need a collaboration of policy and decision makers to bridge the troubled waters of inequity in support of students with disabilities.

Although it has been over four decades since Simon and Garfunkel topped the chart with their popular song "Bridge over Troubled Water", the lyrics for students with disabilities prove encouraging…"Your time has come to shine…all your dreams are on their way." Bridging the troubled water of inequity and fully embracing the potential of digital inclusion is a lofty goal, but one that deserves critical attention and discourse.

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