

Redefining Literacy: The Realities of Digital Literacy for Students with Disabilities in K-12

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Abstract

Technology has shaped the definition of literacy from the traditional meaning of having the ability to read and write to being a social practice that enables individuals to learn and interact with the world. With this notion of literacy, technology has become a tool to motivate and engage all learners through broad practices and platforms that could effectively strengthen a student's learning experience. The shifting from printed content to digital form is a transfer point of the traditional understanding of literacy to a new and modern meaning. This has led to a new term known as digital literacy, whereby perceiving information, gaining knowledge, and expressing understanding for the purposes of learning are delivered through a digital format. Therefore, this study has comprehensively reviewed implementing technology into digital learning for K-12 students with disabilities. Moreover, the study has investigated special and general education teachers ($n = 682$) through open-ended questions to have a better understanding of the integration of learning and digital literacy. The results of the study have been interpreted to enhance the practice and research of the future of technology through digital literacy.

Keywords: Digital literacy, students with disabilities, K-12, special education, general education, technology

1. Introduction

Literacy goes beyond the ability of reading and writing; it is a social practice that enables people to learn and interact with the world. The traditional meaning of literacy meant enabling individuals to read and write to increase the levels of proficiency necessary to interact in society (The Workforce Investment Act, 1998). Holistically, from the perspective of a student, literacy is an essential skill that enables students to (a) learn about the world (Street, 2003), (b) participate in society (Jalkanen & Vaarala, 2013; Labbo, Reinking, & McKenna, 1998), (c) complete tasks for supporting betterment (Wolfe & Flewitt, 2010), and (d) interact with surrounding environment through exchange of ideas and knowledge sharing (Kolb, 2014). Creeden (2010) further explains that only when a child has developed these basic literacy skills will he or she be able to take part in social discussions and occupy space in the societal group. Considering English, French, Chinese, Arabic, or any other language to be the mode of communication, literacy can be expressed as the ability to think, communicate, and rationalize within, and if bilingual across, language. The new shift of traditional literacy from a printed word format toward a more integrative approach poses new challenges as well as various benefits for the education system, especially for those individuals with disabilities.

1.1 Literacy in the Digital Medium

The relationship among society and literacy is a complex phenomenon that has led to major transformations in society in response to the multiple functions of the digital forms that now compose literacy (Gee, 2005). Understanding literacy in the context of modern society carries with it the reality that the world is largely digital, and digital literates should possess certain skills to enable individuals to parse information from a variety of forms of sources as well as produce content in the same mediums (Bawden, 2001). When using these digital tools, digital literates should consider what they are communicating as well as how they are communicating within their selected medium. Slightly different from traditional paper-based text, digital literacy places new demands on an author's ability to be creative, innovative, and to think critically (Jansen, Spink & Saracevic, 2000). It is about how the various objects come together to support or distract from understanding for the intended audience (Courey, Tappe, Siker & LePage, 2013). The ability to effectively take in information from the digital world as well as effectively communicate is critical to modern society (Martin, 2008).

In line with digital literacy, many schools are regularly updating their teaching methods and instructional design to keep up with the acceleration of technological developments (Weng, Maeda, & Bouck, 2014). Interwoven within digital literacy is the understanding that the learning process is also influenced by the digital nature of content. Thus, schools have begun to integrate and make use of more digital technology. For instance, many schools have adopted tablets to support the use applications and digital books in the learning process (Ertem, 2010). The marriage of teaching and learning with digital literacy has developed new understanding guided by digital learning. According to the Alliance for Excellent Education, digital learning is defined as any instructional practice that uses digital technology to support learning (2014), which can facilitate the learning process by motivating and engaging all students through broad practices and platforms that could effectively use technology

to strengthen a student's learning experience.

Digital learning can intermix various forms of digital technology to support the process of learning. In all, effective digital learning incorporates a myriad of digital technologies with a number of research and evidence-based strategies to support a variety of learners in achieving the desired outcomes. As a practice, digital learning has the potential to provide students with a means to more rapidly and efficiently gain new knowledge (Chen, Wu, Ling, Tsai, & Chen, 2009; Faux, 2005), to have more engagement (Bouck et al., 2010; Rao et al., 2009), to demonstrate their new understandings (Coleman-Martin et al., 2005; Rappolt-Schlichtmann et al., 2013), and to enhance students' achievements and support overall self-betterment (Courey, Tappe, Siker & LePage, 2013; Weng, Maeda, & Bouck, 2014). Digital literacy became commonly used to enlighten citizens as well as informally empowering them (Erstad, 2010). The need for digital literacy is guiding and shaping education programming (Pianfetti, 2001). Some developing countries are upgrading their learning systems by supporting digital literacy through the integration of digital learning in their learning system (Madon, Reinhard, Roode, & Walsham, 2009). Understanding digital literacy intermixed with the emergence of digital learning provides the education profession an opportunity to redesign its practices to be more inclusive for all learners, especially those with diverse learning needs and disabilities.

As a term, digital literacy has received great focus in education over the last few years (Leu, 2000), but there has been limited focus in educating learners with disabilities and diverse learning needs. If done correctly, digital literacy provides opportunities for all students, especially those with disabilities and other diverse learning needs (Coyne, Pisha, Dalton, Zeph, & Smith, 2012; Strangman & Dalton, 2005). For instance, using a number of internet-based and online tools in a classroom provides students with disabilities new ways to engage with the content, take in information, and express their understanding of this content (Katims, 2000). Overall this allows for new learning opportunities in improving reading, writing, and comprehending skills (Chen, 2010). Digital literacy is not only the ability to use devices, software, or applications for the purpose of reading or writing, but is also includes an enormous amount of complex variability that requires preparation and practice (Eshet, 2004).

Digital literacy, however, does not take the place of the older or existing forms of literacy but instead seeks to build upon the fundamentals of these forms (Labbo, Reinking, & McKenna, 1998). It allows individuals to quickly access information as well as share it at a low financial cost. Also different from traditional forms of literacy, digital literacy allows individuals to quickly search for information that is available across a number of forms of images, sound, and written forms (Ertem, 2010). As a skill and a tool, this form of literacy is important to the future of society and therefore is necessary within the modern education system (Gunter & Kenny, 2012). Generally, digital literacy entails the use of plain digital text along with various tools including audio, video, images, and hypertext. Thus, the platform of digital literacy provides numerous ways to facilitate the learning process. While this enables more students, it also requires new understandings and practices from the teacher in their ability to effectively integrate the technology into a cohesive learning environment (Coyne, Pisha, Dalton, Zeph, & Smith, 2012).

1.2 Researching Literacy in the Digital Age

For decades, researchers have designed, researched, and implemented strategies that support literacy development for diverse learners in general and specifically for students with disabilities with traditional paper-based materials (Kennedy & Deshler, 2010). A specific focus of this work has been on how students acquire new information through reading (Deshler, Palincsar, & Biancarosa, 2007) and how they demonstrate understanding through writing (Graham & Harris, 2000). As a result, various strategies and techniques have been designed that support students, especially those with disabilities in the learning process. As the education system adopts new forms of literacy, the impact of these forms must be studied and understood in a full range of contexts, not just for its mental achievements, but in the ways it impacts participation of various social and cultural groups (Gee, 2000; Street, 2003). To that end, Gee (2005) advocates for a new approach whereby literacy is perceived as a societal occupation rather than solely a mental undertaking.

The recent research that supports literacy in its multiple forms includes the means by which individuals gain or perceive information, take action, express understanding, and engage in the world around them (Belson & Sherman, 2013; Chen, Wu, Ling, Tsai, & Chen, 2009). Within the modern learning environment, this understanding supports literacy as it relates to gaining information through traditional forms, such as text, but it also incorporates watching a movie or listening to audio books. The education field should strive to understand the cognitive processes as well as the interactive and engaging qualities associated with new literacies and digital learning in order to design and teach in modern learning environments. Logistically, research in this area should support educators in making better decisions to design learning environments that help students with disabilities gain information and express understanding when afforded an opportunity to engage with information in multiple forms.

The interplay of digital literacy interlaced with digital learning for students with disabilities move special education into new territory. The research needs to redefine digital literacy through a framework that relates to

students with disabilities. With the growing emergence of digital literacy in research, greater understanding is needed to guide practitioners and researchers alike. An initial step in this process is to investigate the relationship among digital literacy and students with disabilities by considering the many devices that are available to assist in reading, writing, and interacting with the content digitally. For example, from a perspective of expressing understanding, students may write a report, develop a podcast, or even build an interactive presentation. To build a better understanding of this relationship, the profession can discuss how to effectively design a more inclusive modern learning environment (Rao, Dowrick, Yuen, & Boisvert, 2009).

Understanding the practice of literacy in its multiple forms requires literacy to be seen from different angles in the modern environment. Based on the aforementioned notion of digital literacy, it includes any information that students receive or deliver digitally (Chandler-Olcott & Mahar, 2003). Therefore, an initial step of this study was a comprehensive investigation of the literature related to the practice and research of literacy relative to K–12 students with disabilities. The study has found different articles and various studies that used hundreds of applications for the purpose of literacy by way of multimedia, digital text, and across devices (e.g., computer, tablet, and mobile). Also, many studies have applied devices such as laptops, iPads, Smartphones, Amazon Kindle, Sony Reader, Barnes and Noble Nook, and Netbook. In addition, other studies have considered computer-assisted instruction (CAI), computer-based instruction (CBI), and micro-computer for the purpose of literacy (Weng, Maeda, & Bouck, 2014).

1.2.1 Using Digital Media to Support Reading

Many studies have focused on technology to enhance reading skills among students with disabilities through various strategies and approaches. The study by Chen (2010) showed positive outcomes for 58 learning disability students in the fifth and sixth grades through examining different online activities and searching tasks for reading comprehension. The use of computer-assisted reading has benefited students with intellectual disabilities (Coleman, Hurley & Cihak, 2012) as well as students with autism when they use computer-based early reading program (Chen, Wu, Lin, Tasi, & Chen, 2009; Whitcomb, Bass, & Luiselli 2011). McClanahan, Williams, Kennedy, and Tate (2012) looked at the role of iPad as an instructional tool to improve reading for Attention Deficit Hyperactivity Disorder students through e-books. In the same scenario, Retter, Anderson, and Kieran (2013) looked at 13 students with disabilities and how using iPads led to significant gains in their reading comprehension and vocabulary.

Research has shown the benefit of reading in digital format for students with disabilities on a regular basis. For example, Ertem (2010) looked at the effect of storybooks with computer with animation and traditional print storybooks. The results indicated a significant difference for those students who read the electronic storybooks compare to the group of students who read regular print storybooks as seen in their comprehension reading scores. Gunter and Kenny (2012) examined the impact of implementing digital narratives to motivate and improve reading proficiency among 48 twice-exceptional students in middle school, and the outcome indicated significant improvements in reading proficiency for students after the intervention. Reading achievement through digital forms has enabled students with significant intellectual disabilities to develop reading skills. (Coyne, Pisha, Dalton, Zeph, & Smith, 2012).

1.2.2 The Use of Digital Learning to Support Writing

The emphasis of improving writing through technology has been a primary task in much research for students with disabilities in K-12. Many studies have shown improvement in students' writing skills, specifically students who have learning disabilities and ADHD, through digital pens in order to increase the quality of student notes and note-taking strategies (Belson, Hartmann, & Sherman, 2013). Faux (2005) found improvement for students with learning disabilities and ADHD in producing and creating independent stories. Furthermore, using web-based technology designed to support writing facilitated writing performances and abilities to produce organized texts and sentences as well as generate more topically coherent pieces for learning disabilities students (Englert, Manalo, & Zhao, 2003; Englert, Wu, & Zhao, 2005). Technology such as Pentop have increased writing essays for students with mild disabilities (Bouck, Doughty, Flanagan, Szwed, & Bassette, 2010).

Different and various studies have shown how the role of technology has a positive impact on developing writing skills for students with disabilities. Some studies showed the benefit of technology to generative multimedia environment for writing for students with disabilities at K-12 (Rao, Dowrick, Yuen, & Boisvert, 2009). Applications that enable students to write through computer-assisted instruction on story writing responses have positive results in teaching students to construct stories related to various topics, particularly for autism (Pennington, Stenhoff, Gibson & Ballou, 2012). Tablets such as iPads have become frequently used in teaching writing; Cumming, Strnadova, and Singh (2014) have integrated iPads into teaching students with developmental disabilities, and they found that iPads helped students to become more independent learners. Thus, various studies have shown how iPads help students to achieve independent completion of classroom-based digital literacy activities (Flewitt, Kucirkova, & Messer, 2014; Smith, Spooner & Wood, 2013). Using smartphones for the purpose of teaching literacy have emerged in several studies for students with disabilities (Campigotto, McEwen & Demmans Epp, 2013); for example, a study by Fernández-López, Rodríguez-Fórtiz, Rodríguez-Almendros,

and MartiNez-Segura (2013) indicated that using Smartphones helped to increase students' language skills.

1.2.3 Supporting Vocabulary and Word Identification in Digital Forms

Over the past years, a few studies have focused on vocabulary and word identification in digital form for students with disabilities. Computer-assisted instruction has been used in most of the studies that focused on K-12 students with disabilities. For instance, Coleman-Martin, Heller, Cihak, and Irvine (2005) showed that using computer-assisted instruction allowed students to practice decoding and word identification by themselves. Also, computer-assisted instruction helped students with autism to increase their learning of orthographic symbols (Hetzroni & Shalem, 2005) as well as sight-word reading (Yaw, Skinner, Parkhurst, Taylor, Booher & Chambers, 2011). Tablets have entered the educational field through iPads to help make connection between words and pictures for students with severe disabilities (Campigotto, McEwen & Demmans Epp, 2013; Kagohara et al., 2013; Rappolt-Schlichtmann, Daley, Lim, Lapinski, Robinson, & Johnson, 2013). In addition, iPads were used to provide explicit instructions for teaching science terms for students with autism (Smith, Spooner & Wood, 2013). According to Sugasawara and Yamamoto (2007), teaching reading and word construction is augmented through technology, especial for those who have developmental disabilities.

3. Purpose of the Study

The purpose of this study was to investigate the literature related to the practice and research of digital literacy for K-12 students with disabilities through comprehensive review. In addition, the purpose was to investigate general and special education teachers' perspectives of digital literacy. With the notion of digital literacy, this paper investigates the intersection of new literacy through the lens of digital learning by way of multiple media and digital text across devices (e.g., computer, tablet, and mobile) as it relates to students with disabilities in K-12 settings. Therefore, the study aims to examine how technology is changing the meaning of literacy through special and general education teachers who use any instructional practice involving technology to support literacy for students with disabilities. Thus, in order to understand the role of technology through the literacy development of students with disabilities, the study posed three major questions:

1. What are the perspectives of general and special education teachers of digital literacy?
2. What are the major challenges of implementing digital literacy with students with disabilities?
3. What kind of devices do general and special education teachers use to teach students with disabilities?

4. Method

4.1 Participants

The total participants were both special and general education teachers ($n = 682$) who directly or indirectly taught students with disabilities in Riyadh City, the capital of Saudi Arabia. Teachers were from diverse schools and districts who taught at different grade levels either in inclusive education or in institutions. Table 1 shows the demographic information of the participants.

Table 1: Teachers Demographics

	Frequency	Percent
Type of Teachers		
Special Education Teachers	406	59.5
General Education Teachers	276	40.5
Gender		
Male	318	46.6
Female	364	53.4
Years of Teaching Experience		
1-10 years	291	42.7
11-15 years	227	33.3
16-20 years	112	16.4
20 years and above	52	7.6
Class level		
Elementary School	265	38.8
Middle School	246	36.1
High School	171	25.1
Teachers Level of Education		
Bachelor's Degree	486	71.3
Graduate	196	28.7
Total	682	100

4.2 Instrument

This study has sought to collect data through a set of three open-ended questions to obtain a better understanding that includes special and general education teachers' perspectives, challenges of implementing digital literacy, and kinds of devices and applications that teachers use to teach. The open-ended questions considered recent practices in teaching students with disabilities through technology related to literacy.

4.3 Data Analysis

The open-ended questions were coded and analyzed through content analysis that was derived directly from the text into coding categories (Klenke, 2008) by using a systematic text analysis including themes and subthemes (Creswell, 2013).

5. Results

The findings of the research questions fit into major themes based on participants' answers. In reviewing the teachers' perspectives, we can draw three major themes that were found to interweave across the results. These themes include digital literacy as a form of engagement and motivation, as a form of representation, and as a medium for enhancing students' skills and achievements. It is noteworthy how digital literacy designs within the research demonstrated a strong focus on overcoming obstacles and barriers associated with student performance needs, specifically for students with disabilities. Table 2 shows the themes and subthemes of research question 1.

Table 2: Themes and Subthemes of Research Question 1

Categories	Themes	Subthemes	Frequency	Percent
Teachers' Perspectives	Benefits of Digital Literacy	Digital literacy increases students' performance and academic achievement.	207	30.36
		Digital literacy accommodates different types of diverse students' needs.	197	28.89
		Digital literacy supports collaborative learning and making the learning processes more effective.	174	25.51
		Digital literacy helps to increase both self-efficacy and self-motivation among students.	136	19.94
		Digital literacy produces positive learning environments.	121	17.74
		Digital literacy provides better communication for both students and teachers.	86	12.61
		Digital literacy facilitates the engagement among student in and outside the class.	67	9.83
		Literacy through technology helps students to be more independent.	47	6.89
		Digital literacy improves student's technological skills.	34	4.99

Regarding the major challenges of implementing digital literacy with students with disabilities, Table 3 shows the themes and subthemes of research question 2.

Table 3: Themes and Subthemes of Research Question 2

Categories	Themes	Subthemes	Frequency	Percent
Challenges	Technology Issues	It requires extra load and work on teachers to prepare digital content.	346	50.73
		Students do not have enough skills to use technology for the purpose of literacy.	311	45.60
		Some Students have issues reading through devices/ do not like to read through devices.	274	40.18
		Lack of students' experience in the use of digital materials for the purpose of literacy.	187	27.42
		Schools do not have the necessary equipment.	182	26.69
		Schools do not provide technical support during the work hours.	163	23.90
		Teachers do not know how to use technology for the purpose of digital literacy.	103	15.10
		There is no standardized evaluation for digital literacy performance.	76	11.14

The last question addressed devices that general and special education teachers use to teach students with disabilities. Table 4 shows the themes and subthemes of research question 3.

Table 4: Themes and Subthemes of Research Question 3

Categories	Themes	Subthemes	Frequency	Percent
Devices	Devices/Application that most used among teachers	Computer/ Laptop	526	77.13
		Smart Boards	471	32.12
		Tablets	193	28.29
		Digital Platforms	132	19.35
		Traditional Method (paper and pencil)	62	9.09
		Smartphones	46	6.74
		Web-quest	14	2.05
		Virtual Reality	7	1.02

6. Discussion

Many studies have indicated that youth spend more time on the Internet than they do on any other single activity, and they regard the Internet as their primary and most useful resource in helping them with their schoolwork (Olsson, 2006). This information alone provides motivation to both research and implement new ways of representing material to learners. The purpose of this study was to ascertain what is known in the available research literature and teachers' perspectives on digital literacy across a variety of devices to support traditional forms of reading and writing academic purposes. All of the studies that been reviewed in this study have shown a positive relationship between the implementation of digital content and associated outcomes for students with disabilities. Based on the results, there were three major themes: digital literacy as a form of engagement and motivation, as a form of representation, and as a medium for enhancing students' skills and achievements.

6.1 Digital Literacy Increasing Engagement and Motivation

Teachers, as designers of the learning environment, have concerns about how students are engaging within the learning process. This would start through simply being concerned about the accessibility and usability of the digital materials to a wider understanding of engagement that includes whether students are actively engaged, working collaboratively in a group, or working separately on their own (Rappolt-Schlichtmann et al., 2013). Engagement includes motivating and stimulating students' interest to learn through meaningful instruction and hands-on activities, and in being creative to recruit students' interests and sustain their level of engagement with the teaching content (Courey, Tappe, Siker & LePage, 2013). The productivity and benefits of different technologies and strategies varies with the nature of students, classroom environment, and student background. Coyne et al. (2012) indicated that the core criterion for analyzing a digital learning intervention is to evaluate the level of students' engagement it offers. One of the barriers to learning in a conventional classroom setting is that students get fewer opportunities to take ownership of learning, and they tend to be followers rather than leaders.

Digital learning, through the use of computers and devices, provides ownership opportunities for students where they can engage in the lesson plan, make changes, personalize the learning, and adjust their speed of learning all by themselves (Coyne et al., 2012).

A good learning tool should have different ways of engagement to tap into learners' interests, motivate them to learn, and challenge them appropriately. Such a tool seeks to involve students in the content and encourages them to learn, communicate, and solve problems. Engagement could be seen through digital books used by many teachers who support the benefits from evidence-based reading instruction that are applied in meaningful literacy contexts where learning is scaffolded in relation to students' needs (Katims, 2000). Belson, Hartmann, and Sherman (2013) reported how technology helped to engage the participants for more than three hours every day. Different studies have examined the vital role of multimodal and digital literacy to engage students with disabilities (Coleman-Martin et al., 2005; Mills, 2010b; Vasudevan, 2006).

Motivation plays a large role in maintaining student engagement, and technology as a tool enhances the motivation of students with disabilities (Bouck et al., 2010; Englert et al., 2004, 2007). It helps students to rely on themselves rather than completely rely on teachers, which leads to more confidence among students to explore their strengths and enables them to play more roles in the learning environment (Campigotto, McEwen, & Demmans Epp, 2013; Faux, 2005; Rao et al., 2009). Through digital literacy, learners could present how much they possess intellectually through different means. Students with disabilities often lack the skills that build the transitional bridge to access the general education curriculum and be successful in school. Evidence suggests that using technologies such as digital texts and translational supports enhances the outcomes for students with disabilities (Anderson-Inman & Horney, 2007).

It is critical that instructional designs that make use of digital learning tools to support digital literacy skills use technology to support motivation as well as skill development. Specifically, digital literacy should scaffold motivation in the instructional process. By design, scaffolding is a balance between obtaining and maintaining a student's motivation and engagement, simplifying the task when needed, providing confidence for risk taking, marking relevant information, and demonstrating potential solutions (Englert et al., 2007). Thus, to encourage motivation, activities that support digital literacy should identify the learners' weaknesses and strengths as they progress. Through this gained understanding, these learning environments should maintain engagement through scaffolding in leveled content and strategies for supporting an instructional path of acquisition and comprehension. Beyond the content, digital literacy provides motivational hooks to maintain student interest throughout the learning process.

6.2 Digital Learning as Form of Representation

Learning through digital literacy gives students various ways of representation and of acquiring knowledge that target their interests in a way that best fits how students receive information. The digital content that comes in different forms, types, or platforms embodied in tablets, tools, or applications can have an important influence on students with disabilities. Representation refers to making the content more accessible and usable for the majority of students by designing instructional materials to reach a broader range of diverse learners (McGuire, Scott, & Shaw, 2006). A critical feature in designing digital literacy activities is the various ways that learners can take action and express understanding. This form of literacy aims at training learners on new reading strategies and new means of comprehension for materials they have read.

Digital literacy meets all requirements of variety norms of representation by provide many options to complete assignments through different media such as speech or text, (Leu, 2006). For example, as a form of digital literacy, the electronic storybook is widely used for students to enhance their reading levels to allow more interaction with content (Moody, Justice, & Cabell, 2010, Shamir & Korat, 2006). The electronic storybook comes as digital version to replace the paper storybooks that includes animations, text, pictures, and videos to allow more opportunities for students to engage and interact with these books (De Jong & Bus, 2004). Digital literacy helps to allow students in general, and particularly students with disabilities, to acquire advanced skills and knowledge through the multiple means of representation (Dalton, Shlepper, Kennedy, Lutz, and Strangman, 2005).

6.3 Designing for Enhanced Students' Skills and Achievements

A primary component within the instructional design process is consideration for how to overcome barriers within the learning process. New devices (e.g., tablets or smartphones) and their applications are growing fast and showing the advantages compared to computers or laptops. They provide more accessibility that allows students to operate these devices with different levels of physical and cognitive abilities (Douglas, Wojcik, & Thompson, 2012; Newton & Dell, 2011). Thus, these devices are receiving attention from researchers, practitioners, and scholars in the field of special education based on their abilities to help students with disabilities (Weng, Maeda, & Bouck, 2014).

Within the literature and teachers' perspectives, technology has been used at different levels to support students. For example, most of the software that has been used in CAI provided students with disabilities unique

learning opportunities. CAI was able to enhance skill development to increase in the quality of life (Coleman, Hurley, & Cihak, 2012). In other examples, teachers used iPad-enhanced lessons and learning opportunities for students with developmental disabilities (Cumming, Strnadova, & Singh, 2014), which helped improve reading for students with attention deficit hyperactivity disorder (McClanahan, Williams, Kennedy, & Tate, 2012). These methods also helped to enhance reading skills for secondary students with learning disabilities (Retter, Anderson, & Kieran, 2013). Through the studies and based on teachers' responses, the results show the positive trend of the literacy shift from traditional means into a digital format. Ertem (2010) found digital storybooks had a positive impact on comprehension for students with disabilities. Fernández-López et al. (2013) found smartphones were useful in increasing the interest of students and helping students with disabilities to learn.

7. Implications for Future Research and Practice

This study was able to establish and map out the implementations surrounding digital literacy and students with disabilities. It covered the general outlook of the key aspects with regard to digital literacy in the last 15 years and it looked at recent teachers' perspectives regarding digital literacy. The research has shown that digital literacy is a key tool in modern society as it is extensively used by the current generation of students. Unlike the traditional understanding of literacy as the ability to read and write, digital literacy has been perceived as a societal occupation rather than merely a means of mental understanding (Gee, 2010). Digital literacy includes devices, tools, and applications as applied in the context of digital learning with all of the advantages of helping students with disabilities to read, write, and learn vocabulary. Yet the implications for future research go beyond reading and writing skills and include the notion of digital literacy. This should be aligned with the sociocultural and social practice that helps students engage with information to perceive, gain, or express an understanding for purposes of learning, achieve a task, interact with others, and know more about the world (Mills, 2010a; Street, 2003). A need exists to have more research in the area of empirical studies to have a deeper understanding of how digital literacy could help all students, including students with disabilities, in many contexts.

Students with disabilities should be at the center stage of digital learning to allow them to demonstrate their knowledge. Experience helps them build their confidence to improve their learning and enables them to discover the world around them using various devices. They should be given opportunities that allow them to use different devices to carry out their learning activities and to express themselves in order to adapt to social and cultural norms. One of the primary considerations in instructional planning for students with disabilities is designing learning experiences that allow them to discover the world around them through digital literacy. As demonstrated in this study, considerations for how students engage in the digital literacy experience, how they are supported in understanding the content, and how they take action and express understanding are important considerations in this process. This will help to produce a new generation of student with disabilities who are aware of how to communicate and interact digitally as the world moving rapidly to this destination. As noted earlier, this process aligns with a new shift of learning from the traditional method to a new experience for learners, where technology becomes the most important source of teaching literacy (Gee, 2005; Leu, 2000). Thus, digital literacy should be implemented as primary method of teaching reading and writing for students with disabilities.

8. Conclusion

The aims of this study were to provide a general outlook by investigating the available literature and to consider teachers' perspectives through open-ended questions regarding students with disabilities in K–12 education. This is important to ensure a positive impact of digital literacy for students with disabilities. As mentioned, there is a need for more research in the area of digital literacy for students with disabilities because of how pervasive digital interaction has become in modern society (Gee, 2010; Wolfe & Flewitt, 2010). The goal of this study was to help the field of special education move beyond the traditional understandings of literacy development into a new vision.

References

- Alliance for Excellent Education. (2014). *Digital Learning*. Retrieved from <http://all4ed.org/issues/digital-learning/>
- Anderson-Inman, L., & Horney, M. (2007). Supported eText: Assistive technology through text transformations. *Reading Research Quarterly*, 42(1), 153-160.
- Bawden, D. (2001). Information and digital literacies: A review of concepts. *Journal of documentation*, 57(2), 218-259.
- Belson, S. I., Hartmann, D., & Sherman, J. (2013). Digital note taking: The use of electronic pens with students with specific learning disabilities. *Journal of Special Education Technology*, 28(2), 13-24.
- Bouck, E. C., Doughty, T. T., Flanagan, S. M., Szwed, K., & Bassette, L. (2010). Is the pen mightier? Using pentop computers to improve secondary students' writing. *Journal of Special Education Technology*, 25(4), 33-47.
- Campigotto, R., McEwen, R., & Demmans Epp, C. (2013). Especially social: Exploring the use of an iOS

- application in special needs classrooms. *Computers & Education*, 60(1), 74-86.
- Chandler-Olcott, K., & Mahar, D. (2003). "Tech-savviness" meets multiliteracies: Exploring adolescent girls' technology-mediated literacy practices. *Reading Research Quarterly*, 38(3), 356-385.
- Chen, H. Y. (2010). Online reading comprehension strategies among fifth- and sixth-grade general and special education students. *Education, Research and Perspectives*, 37(2), 79-109.
- Chen, M., Wu, T., Lin, Y., Tasi, Y., & Chen, H. (2009). The effect of different representations on reading digital text for students with cognitive disabilities. *British Journal of Educational Technology*, 40(4), 764-770.
- Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (2008). Central issues in new literacies and new literacies research. In J. Coiro, M. Knobel, C. Lankshear, & D.J. Leu (Eds.), *Handbook of research in new literacies* (pp. 1-21). Mahwah, NJ: Erlbaum.
- Coleman, M., Hurlley, K., & Cihak, D. (2012). Comparing teacher-directed and computer-assisted constant time delay for teaching functional sight words to students with moderate intellectual disability. *Education and Training in Autism and Developmental Disabilities*, 47(3), 280-292.
- Coleman-Martin, M., Heller, K., Cihak, D., & Irvine, K. (2005). Using computer-assisted instruction and the nonverbal reading approach to teach word identification. *Focus on Autism and Other Developmental Disabilities*, 20(2), 80-90.
- Courey, S. J., Tappe, P., Siker, J., & LePage, P. (2013). Improved lesson planning with universal design for learning (UDL). *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children*, 36(1), 7-27.
- Coyne, P., Pisha, B., Dalton, B., Zeph, L. A., & Smith, N. C. (2012). Literacy by Design: A universal design for learning approach for students with significant intellectual disabilities. *Remedial and Special Education*, 33(3), 162-172.
- Creeden, J. (2010). *Assessment Strategies: Tools that support nonverbal students, with multiple disabilities, acquiring literacy skills*. NY: St. John Fisher College.
- Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches* (3rd ed.). Thousand Oaks, CA: Sage Publications.
- Cumming, T., Strnadová, I., & Singh, S. (2014). iPads as instructional tools to enhance learning opportunities for students with developmental disabilities: An action research project. *Action Research*, 12(2), 151-176.
- Dalton, B., Shlepper, D., Kennedy, M., Lutz, L. & Strangman, N. (2005). *Chapter by chapter: Thinking reader for students who are deaf and hard of hearing*. (Final Report to Gallaudet University and the Laurent E. Clerc National Center on Deaf Education). Wakefield, MA: Center for Applied Special Technology.
- De Jong, M., & Bus, A. (2004). The efficacy of electronic books in fostering kindergartenchildren's emergent story understanding. *Reading Research Quarterly*, 39(4), 378-393.
- Deshler, D., Palincsar, A., Biancarosa, G., & Nair, M. (2007). *Informed choices for struggling adolescent readers: A research-based guide to instructional programs and practices*. Newark, DE: International Reading Association.
- Douglas, K., Wojcik, B., & Thompson, J. (2012). Is there an app for that? *Journal of Special Education Technology*, 27(2), 59-70.
- Englert, C., Manalo, M., & Zhao, Y. (2003). I can do it better on the computer: The effects of technology-enabled scaffolding on young writers' composition. *Journal of Special Education Technology*, 19(1), 5-22.
- Englert, C., Wu, X., & Zhao, Y. (2005). Cognitive tools for writing: Scaffolding the performance of students through technology. *Learning Disabilities Research & Practice*, 20(3), 184-198.
- Englert, C. S., Zhao, Y., Dunsmore, K., Collings, N. Y., & Wolbers, K. (2007). Scaffolding the writing of students with disabilities through procedural facilitation: Using an Internet-based technology to improve performance. *Learning Disability Quarterly*, 30(1), 9-29.
- Erstad, O. (2010). Educating the digital generation. *Nordic Journal of Digital Literacy*, 5(1), 56-70.
- Ertem, I. S. (2010). The effect of electronic storybooks on struggling fourth graders' reading comprehension. *The Turkish Online Journal of Educational Technology*, 9 (4), 140-155.
- Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, 13(1), 93-106.
- Faux, F. (2005). Multimodality: how students with special educational needs create multimedia stories. *Education, Communication & Information*, 5(2), 167-181.
- Fernández-López, Á., Rodríguez-Fórtiz, M. J., Rodríguez-Almendros, M. L., & Martínez-Segura, M. J. (2013). Mobile learning technology based on iOS devices to support students with special education needs. *Computers & Education*, 61, 77-90.
- Flewitt, R., Kucirkova, N., & Messer, D. (2014). Touching the virtual, touching the real: iPads and enabling literacy for students experiencing disability. *Australian Journal of Language and Literacy*, 37(2), 107-116.

- Gee, J. (2000). The New Literacy Studies: From “socially situated” to the work of the social. In D. Barton, M. Hamilton, & R. Ivanic (Eds.), *Situated literacies: Reading and writing in context* (pp. 180–196). London: Routledge.
- Gee, J. (2005). The new literacy studies: from 'socially situated' to the work. *Situated literacies: Reading and writing in context*, 2, 177-194.
- Gee, J. (2010). A situated-sociocultural approach to literacy and technology. In E. A. Baker(Ed.), *The new literacies: Multiple perspectives on research and practice* (pp. 165–189). NY: Guilford.
- Graham, S., & R. Harris, K. (2000). The role of self-regulation and transcription skills in writing and writing development. *Educational psychologist*, 35(1), 3-12.
- Gunter, G., & Kenny, R. (2012). UB the director: Utilizing digital book trailers to engage gifted and twice-exceptional students in reading. *Gifted Education International*, 28(2),146-160.
- Hetzroni, O., & Shalem, U. (2005). From logos to orthographic symbols: A multilevel fading computer program for teaching nonverbal children with autism. *Focus on Autism and Other Developmental Disabilities*, 20(4), 201-212.
- Jalkanen, J., & Vaarala, H. (2013). Digital texts for learning Finnish: Shared resources and emerging practices. *Language Learning & Technology*, 17(1), 107-124.
- Jansen, B., Spink, A., & Saracevic, T. (2000). Real life, real users, and real needs: A study and analysis of user queries on the web. *Information Processing and Management*, 36(2), 207-227.
- Kagohara, D., Van der Meer, L., Ramdoss, S., O'Reilly, M., Lancioni, G., Davis, T., & Sigafos, J. (2013). Using iPods and iPads in teaching programs for individuals with developmental disabilities: A systematic review. *Research in developmental disabilities*, 34(1), 147-156.
- Katims, S. D. (2000). Literacy instruction for people with mental retardation: Historical highlights and contemporary analysis. *Education and Training in Mental Retardation and Developmental Disabilities*, 35(1), 3–15.
- Kennedy, M., & Deshler, D. (2010). Literacy instruction, technology, and students with learning disabilities: Research we have, research we need. *Learning Disability Quarterly*, 33(4), 289-298.
- Labbo, L., Reinking, D., & McKenna, M. (1998). Technology and literacy education in the next century: Exploring the connection between work and schooling. *Peabody Journal of Education*, 73(3-4), 273-289.
- Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development* (2nd ed). New Jersey: Pearson Education, Inc.
- Leu, D. (2000). Literacy and technology: Deictic consequences for literacy education in an information age. In M. Kamil, P. Mosenthal, P. Pearson, & R. Barr (Eds.), *Handbook of reading research* (pp. 743–770). Mahwah, NJ: Erlbaum.
- Leu, D., Kinzer, C., Coiro, J., & Cammack, D. (2004). Toward a theory of new literacies: Emerging from the internet and other information and communication technologies. In R.Ruddell & N. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed.) (pp.1570-1613). Newark, DE: International Reading Association.
- Leu, D. (2006). New literacies, reading research, and the challenges of change: A deictic perspective. In J. Hoffman, D. Schallert, C. Fairbanks, J. Worthy, & B. Maloch (Eds.), *The 55th Yearbook of the National Reading Conference*. Milwaukee, WI: National Reading Conference.
- Madon, S., Reinhard, N., Roode, D., & Walsham, G. (2009). Digital inclusion projects in developing countries: Processes of institutionalization. *Information Technology for Development*, 15(2), 95-107.
- Martin, A. (2008). Digital literacy and the “digital society.” In C. Lankshear & M. Knobel (Eds.), *Digital literacies* (pp. 151–176). NY: Peter Lang.
- McClanahan, B., Williams, K., Kennedy, E., & Tate, S. (2012). A breakthrough for Josh: How use of an iPad facilitated reading improvement. *TechTrends*, 56(3), 20-28.
- Mcguire, J., Scott, S., & Shaw, S. (2006). Universal design and its applications in educational environments. *Remedial and special education*, 27(3), 166-175.
- Mills, K. (2010a). A review of the “digital turn” in the new literacy studies. *Review of Educational Research*, 80(2), 246-271.
- Mills, K. (2010b). Shrek meets Vygotsky: Rethinking adolescents' multimodal literacy practices in schools. *Journal of Adolescent & Adult Literacy*, 54(1), 35-45.
- Moody, A., Justice, L., & Cabell, S. (2010). Electronic versus traditional storybooks: Relative influence on preschool children’s engagement and communication. *Journal of Early Childhood Literacy*, 10(3), 294-313.
- Newton, D., & Dell, A. (2011). Mobile devices and students with disabilities: What do best practices tell us? *Journal of Special Education Technology*, 26(3), 47–49.
- Olsson, T. (2006). *Active and calculated media use among young citizens: Empirical examples from a Swedish study*. In D. Buckingham & R. Willett (Eds.), *Digital generations: Children, young people, and the new*

- media (pp.115-130). NY: Routledg.
- Pennington, R., Stenhoff, D., Gibson, J., & Ballou, K. (2012). Using simultaneous prompting to teach computer-based story writing to a student with autism. *Education and Treatment of Children, 35*(3), 389-406.
- Pianfetti, E. (2001). Teachers and technology: digital literacy through professional development. *Language Arts, 78*(3), 255-262.
- Rao, K., Dowrick, P., Yuen, J., & Boisvert, P. (2009). Writing in a multimedia environment: Pilot outcomes for high school students in special education. *Journal of Special Education Technology, 24*(1), 27-38.
- Rappolt-Schlichtmann, G., Daley, S., Lim, S., Lapinski, S., Robinson, K., & Johnson, M. (2013). Universal design for learning and elementary school science: Exploring the efficacy, use, and perceptions of a web-based science notebook. *Journal of Educational Psychology, 105*(4), 1210-1225.
- Retter, S., Anderson, C., & Kieran, L. (2013). Ipad use for accelerating reading gains in secondary students with learning disabilities. *Journal of Educational Multimedia and Hypermedia, 22*(4), 443-463.
- Shamir, A., & Korat, O. (2006). How to select CD-ROM storybooks for young children: the teacher's role. *The Reading Teacher, 59*(6), 532-543.
- Smith, B., Spooner, F., & Wood, C. (2013). Using embedded computer-assisted explicit instruction to teach science to students with autism spectrum disorder. *Research in Autism Spectrum Disorders, 7*(3), 433-443.
- Strangman, N., & Dalton, B. (2005). Technology for struggling readers: A review of the research. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *The handbook of special education technology research and practice* (pp. 545–569). Whitefish Bay, WI: Knowledge by Design.
- Street, B. (2003). What's "new" in new literacy studies? Critical approaches to literacy in theory and practice. *Current issues in comparative education, 5*(2), 77-91.
- Sugasawara, H., & Yamamoto, J. (2007). Computer based teaching of word construction and reading in two students with developmental disabilities. *Behavioral Interventions, 22*(4), 263-277.
- Vasudevan, L. (2006). Looking for angels: Knowing adolescents by engaging with their multimodal literacy practices. *Journal of Adolescent & Adult Literacy, 50*(4), 252-256.
- Weng, P., Maeda, Y., & Bouck, E. (2014). Effectiveness of cognitive skills-based computer assisted instruction for students with disabilities: a synthesis. *Remedial and Special Education, 35*(3), 167- 180.
- Whitcomb, S., Bass, J., & Luiselli, J. (2011). Effects of a computer-based early reading program (Headsprout) on word list and text reading skills in a student with autism. *Journal of Developmental and Physical Disabilities, 23*(6), 491-499.
- Wolfe, S., & Flewitt, R. (2010). New technologies, new multimodal literacy practices and young children's metacognitive development. *Cambridge Journal of Education, 40*(4), 387-399.
- Workforce Investment Act of 1998, Pub. L. No. 105-220, 112 Stat. 936 (1998).
- Yaw, J., Skinner, C., Parkhurst, J., Taylor, C., Booher, J., & Chambers, K. (2011). Extending research on a computer-based sight-word reading intervention to a student with autism. *Journal of Behavioral Education, 20*(1), 44-5.

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