Literacy 2.0: New Literacies in Culturally and Linguistically Diverse K-12 Classrooms

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Abstract

This paper is a review of the literature on the impact of demographic and technological changes on research and practice of literacy education of English Language Learners (ELLs) in American K-12 school settings. It is predicated on the question "Why technology?" and draws theoretical support from Vygotsky's (1978) sociocultural theory and Krashen's (1992) Monitor Model. It highlights the tension and challenges associated with classroom diversity and investigates research that addresses the complexity of diversity-related issues with different aspects of technology across learning contexts. It then examines the findings of the research surveyed against the aforementioned theoretical framework to advocate the effectiveness of technology. With the niche of technology underlined, the study continues to argue for the integration of technology into print-based curriculum and discuss the implications of such integration for ELLs. It also reveals the lack of assessments for new literacy skills and states why these assessments are necessary for the move towards non-print-based curriculum. Finally, based on its findings, this study will identify gaps in literature and suggest directions for future research.

Keywords: new literacies, technology, 21st Century Skills, assessment

Literacy 2.0: New literacies in culturally and linguistically diverse K-12 classrooms

The United States is becoming more culturally and linguistically diverse (CLD) every day (Echevarria, Vogt, & Short, 2008). Changing immigration patterns have led to greater diversity in K-12 classrooms (Herrera, Cabral, & Murry, 2013). Consequently, classroom teachers are facing the challenges of supporting an increasing CLD student population usually characterized by high poverty levels, diverse linguistic dynamics, and poor academic achievements (Herrera et al., 2013).

Meanwhile, technology has changed the definition of literacy in the 21st Century. Being literate no longer simply means being able to read and write (Ajayi, 2009). Some scholars (Ajayi, 2009, Gee, 2003, Kress & van Leeuwen, 1996) now view literacy as the ability to interpret and construct meanings from varying textual forms, such as images, sounds, and videos, from a wide range of domains, such as websites, video games, and social networks. The definition of text is also expanded beyond traditional print media to include photographs, text messages, and visual graphics accessible across multiple media through digital technologies (Ajayi, 2009). What does this move towards new media literacies mean to today's increasingly CLD classrooms?

In this literature review I study technology in CLD K-12 literacy classrooms. My guiding question is "Why technology?" More specifically, I try to find out the advantages of using technology to support the literacy development of English Language Learners (ELLs) in K-12 settings. To answer my question, I will first establish my theoretical framework and define the learners I focus on in this study. Then, based on the research I conducted for EDUC 3590 in Fall 2013, I will survey literature on technology and ELL education and analyze why technology supports ELLs in different educational contexts against my framework. I will also discuss

implications for changes in curriculum, instructional approaches and assessments. Finally, I will sum up my findings and suggest directions for future research.

It is necessary to first define some of the terms I use in this study. The term *technology* refers principally to digital technology or new media technology, such as computers, tablets, and smartphones. Scholars have also used *multiliteracies*, *new media literacies*, and *digital literacies* interchangeably with *new literacies*. I use all these terms refer to "the skills, strategies, and insights necessary to successfully exploit the rapidly changing information and communication technologies that continuously emerge in our world" (Leu, 2002, p.313).

Theoretical Framework

I draw theoretical support mainly from Vygotsky's (1978) Sociocultural Theory (SCT) and Krashen's (1992) Monitor Model. SCT views learning as socially constructed activities between individuals. The term *Zone of Proximal Development* (ZPD) is used to refer to the distance between the levels of achievement an individual can reach alone and the levels of achievement the same individual can potentially reach in collaboration with the others:

> The distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers (p.86).

Vygotsky views adult or peer guidance as an important factor that elevates learners within the ZPD. This view has revolutionized how Second Language Acquisition (SLA) is reviewed. Ohta's (2001) views ZPD for SLA as "the distance between the actual development level as determined by individual linguistic production, and the level of potential development as determined through the language produced collaboratively with a teacher or peer" (p. 9). The

teacher or peer usually serves as an *interlocutor* (Lightbown and Spada, 2006, p. 47), who makes the linguistic input or concepts more accessible to the individual.

Krashen's (1992) Monitor Model consists of five hypotheses on SLA. More relevant to my study are his Input Hypothesis and Affective Filter Hypothesis. The former suggests that language acquisition occurs only when input is comprehensible. The latter accentuates that the learners' psychological and emotional factors can significantly influence language acquisition.

Both SCT and Monitor Model suggest that instruction must make sense in a low-risk environment for learning to take place (Echevarria et al., 2008). In other words, instruction should be *meaningful*. This is especially important in CLD classrooms where learners require different levels of support for instruction to be meaningful. In the following section I will identify my learners as well as the varying levels of support that they require.

Learners

I define my learners as ELLs in CLD K-12 classrooms. According to Echevarria et al. (2008), this population of students is characterized by the extreme heterogeneity in their educational, cultural, and linguistic backgrounds. They come to school with varying degrees of proficiency in English as well as with approximately 180 native languages. There is also diversity in their "educational backgrounds, expectations of schooling, socioeconomic status, age of arrival, personal experiences while coming to and living in the United States, and parents' education levels and proficiency in English (p.7)."

Echevarria et al, (2008) categorize this diverse ELL population into three subgroups. At one end of the spectrum, there are immigrant students who come to the United States with strong academic backgrounds that are "above equivalent grade levels in the school's curricula (p.7)." They are literate in L1, and once they gain proficiency in English, they can transfer what they

already know to the courses they take in the United States. At the other end of the spectrum are immigrant students that have little formal schooling and are not literate in their L1 and are most at risk for failure in their education in the United States. In between these students are second- or third-generation immigrants who grew up in the United States but speak a home language other than English. Again, they vary in their literacy in L1 and L2 and require different levels of support to succeed academically.

Research also shows that CLD students are also more likely to suffer from poverty. According to the Population Reference Bureau (PRB), approximately 25% of the children living in poverty are from immigrant backgrounds (Mather, 2009). Marzano (2004) believes that poverty could lead to other factors that impact the students' academic achievement, such as low self-esteem, family isolation, and frequent moves from one place to the other.

Despite the extreme diversity of the ELL population and the varying types and degrees of support that they require, researchers agree that ELLs need to be integrated into the mainstream classrooms and study with their native English-speaking peers. Valdés (2001) shadowed and studied four ELLs in separate ESL programs in a school in California. She found that specialized but segregated ESL programs with an emphasis on language acquisition and reduced content do not necessarily develop ELL students' language proficiency or content area knowledge. On the contrary, the social and linguistic isolation created by these programs prevents ELLs from interacting socially with their peers and learning from them. Thus, according to SCT (Vygotsky, 1978), this program model does not promote linguistic or content knowledge development. Lee, Quinn, and Valdés (2013) also encourage the placement of ELLs in mainstream science classrooms instead of giving them isolated linguistic support. These

studies provide strong rationales for me to consider integration as the optimal model for supporting ELL students under the push of English-Only movements and NCLB (Garcia, 2005).

Learning Context

In this section I will synthesize findings from a previous research and analyze why technology successfully supports ELLs' development of literacy in different educational settings. I will use information that I included in a final paper for EDUC 3590 to highlight two lines of research that look at technology use in and out of classroom contexts. First, I will introduce the classroom use of Improving Comprehension Online (ICON), an online reading environment, to improve the acquisition of vocabulary and the comprehension of texts in English Language Arts (ELA) (Proctor, Dalton, & Grisham, 2009, Proctor et al., 2011). I will then present Black's (2005, 2006) studies on how ELLs develop writing skills and construct identity out of classroom within an online fanfiction community. At the end of each section, I will analyze why technology is successful in each learning context against my theoretical framework.

Improving Comprehension Online (ICON)

ICON (http://psi.cast.org/icon3/demo/) is a Universal Literacy Environment (ULE) developed by Center for Applied Special Technology (CAST). The design of ICON follows the framework of Universal Design for Learning (UDL). UDL recognizes that every learner is different: "individuals bring in a huge variety of skills, needs, and interests to learning," and advocates "flexible approaches that can be customized and adjusted for individual needs (CAST, 2013)." The Framework is governed by three principles. First, learners have different recognition and perception networks which necessitates the need for multiple ways of representing information and content. Second, learners also have different problem-solving strategies and approaches, so multiple means of action and expression should be allowed. Third,

learners also respond to a variety of means of engagement because of their diverse interests and motivations. These principles are especially meaningful for the education of ELLs because of their diverse needs and interests that are deeply rooted in their cultures.

Figure 1. The User Interface (UI) of ICON

Guided by the principles of UDL, ICON boasts a wide range of flexible designs to support different types of learners, including ELLs. Figure 1 shows the user interface of ICON. The students are free to choose from four informational texts and four narrative texts whose readability scores range from 4.8 to 7.2. In choosing each text, the students can also select the degree of support they require (from Level 1 to Level 5). Whichever text they choose, a strategic coach in the form of a cartoon character will appear on the screen and guide them through the entire reading process. Mainly three types of support are available to students: 1) hyperlinked scaffolding of vocabulary, 2) pre-post reading strategy support, and 3) Test-To-Speech (TTS) engine to read the text aloud and decrease the demand for decoding. Besides, all the texts and

instructions are available in Spanish to provide L1 support for Spanish-English bilinguals (Proctor et al., 2011).

To assess the effectiveness of ICON, Proctor et al. (2007) conducted an initial research in a school district in southern California. Of the 30 fourth-grade students who received ICON intervention, 16 spoke Spanish as their L1, and 14 were English-only (EO) students. Most of the participants had reading comprehension performance scores close to the 30th percentile. During the classroom use of ICON, the researchers measured general vocabulary knowledge and reading comprehension and tracked the frequency of the use of support. They found an overall positive correlation between the use of support and pre-post comprehension gain, which reflects positive effects of ICON intervention on the students' comprehension.

However, while the findings provide certain evidence of the effectiveness of ICON, Proctor et al. (2009, 2011) admitted to the flaws of this initial study, including its lack of a control group and its short duration. To address these issues, they improved their methodology in a larger-scale research study in 2011. They selected 240 students from 12 classrooms in four schools in three northeast metropolitan school districts with large Spanish-speaking populations. Of the number of participants, 129 received ICON intervention while 111 were taught in the traditional literacy curriculum. About 49% of the students spoke Spanish at home while the rest had English as their L1. Vocabulary received more focus in this follow-up research. Before reading each text, the students were required to learn five *power words* or vocabulary crucial to the comprehension of the text. This study generated more interesting findings. On the one hand, the group that received ICON intervention scored higher in terms of vocabulary than the group that did not. On the other hand, there were not significant differences in the reading

comprehension scores between these two groups. I will look at this non-significant correlation between vocabulary performance and reading comprehension more closely in the next section.

Proctor et al. (2009, 2011) showed encouraging evidence of the effectiveness of technology, especially with respect to vocabulary, in classroom settings. In this learning context, ICON plays the role of an adaptive tutor (Kern, 2006). It uses images, sound (pronunciation and read aloud), videos, and Spanish-English translation to make vocabulary meaningful, especially to ELLs. The use of multimodal scaffolding is congruent with Brandl's (2007) finding that multisensory input improves the acquisition of vocabulary. ICON's ability to adapt to learners' levels also makes reading strategies meaningful to the students. For example, for lower levels of readers, post-reading strategy supports are more likely to be multiple choice questions whose cognitive demands are lower than the short-answer questions for more advanced readers. Moreover, in multiple means ICON tries to reduce learner anxiety, such as using cartoon characters as strategy tutors and culturally relevant texts, thus minimizing affective filters.

Online Fanfictions

This section will focus on Black's (2005, 2006) observation on how ELLs wrote and shared fanfictions and interacted with other ELLs and English-speaking peers on an online fanfiction community (http://www.fanfiction.net). I will begin with an introduction to fan culture and this particular fanfiction community. Then, based on Black's findings (2005, 2006), I will discuss why technology is effective in bridging students' school and private lives.

The widespread popularity of Japanese video games and animations, or animes, has cultivated a blooming fan culture (Black, 2005). To support the franchises (video games or animes) that they enjoy, followers worldwide buy and collect peripheral products (such as miniatures of anime characters, T-shirts with anime characters, etc.), create posters and painting

based on their favorite characters, and build fan websites (Lam, 2000). One of the most common "fan phenomena" is fanfiction, creative writings created by fans that tell lines of stories of the characters in video games and animes. The Internet has provided a platform for fans with the same enthusiasm in the same franchise to share, review, and critique each other's works of fanfiction. Black's longitudinal research is situated on one fanfiction website called fanfiction.net, a large fanfiction community whose users can create, share, and review fanfictions under many titles (such as Final Fantasy, a popular franchise of Japanese video games). Many of these users are non-native English speakers.

Black's (2005) initial research on fanfiction.net focused on the discursive exchanges between users of this community. For over a year, she observed the participants' daily interactions and literacy-related practices, paying special attention to ELLs' interactions with other participants in their public posts. Of special interest is her finding that the strong emphasis on proof-reading and peer-reviewing on this website fostered a type of meta-talk that help participants "become more metacognitive about their compositions" (Chandler-Olcott & Mahar, 2003, p.564). Black specifically noted the strong emphasis on encouragement and positive feedback among reviewers, who do not dwell on grammatical or spelling errors, but *recast* sentences with more effective uses of grammatical structures (p. 126). For example, she observed that one reviewer of one of the fanfictions created by ELLs rewrote a few paragraphs of that piece to model correct usage of grammatical structures rather than pointing out the errors in the original paragraphs. Thus, she claimed that "peer review, constructive criticism, and collaboration within the community scaffolds ELLs toward more sophisticated literacy and provides them with safe and unintimidating access to the many resources of this writing community (p.126)."

Black's follow-up case study in 2006 focused on how ELLs constructed their identity on fanfiction.net. She closely observed the activities of one ELL named Nanako, a native speaker of Mandarin who moved with her parents from Shanghai, China to a large city in Canada in 2000. She was 11 years old then and did not speak any English. According to Nanako, writing fanfictions on the website was a means for her to not only participate in the fan culture but also improve her written English. In her early posts written in English only, she clearly stated her identity as a non-native English speaker and requested that other readers be more tolerant towards her grammar and spelling errors. The readers in turn offered constructive criticisms for her to improve English, and this community became a safe place for her to practice and experiment. As her English improved along with her confidence, she started incorporating Mandarin and Japanese into her works, integrating her Asian cultural background into her identity. The positive feedback prompted by her use of multiple languages reinforced her "Asian pride," and motivated her to include more information about Chinese actors and Japanese movies in her online discussions (Black, 2006).

Black (2005, 2006) views technology innovatively from different angles. First, she believes that technology bridges ELLs' formal literacy and language learning experience at school and their private lives. ELLs were able to write in English on pop culture subjects that they truly enjoyed and consequently to receive constructive feedback from their peers who share their interests. They were not only able to use the English language in meaningful ways but also to communicate meaningfully with the others as well as to think metacognitively on their language use. Second, the use of multimodal presentation, such as using images and sounds in their composition, also supported meaning-making. Third, the shifts in Nanako's identity demonstrate how a supportive online community could help empower ELLs and reinforce their

cultural identities. Bourdieu (1998) and Gee (2001) posit that those in power could manipulate social rules, laws, and traditions to establish a type of identity that secures their power. This could manifest in schools, where many ELLs are viewed from "a deficit perspective, and their first languages are viewed as a hindrance to learning English and not taken into serious consideration as an additive element for participation and meaning-making in classroom activities." (Black, 2006, p.182). However, on fanfiction.net, Nanako's identity as an ELL was not viewed negatively. On the contrary, her Asian cultural background was actually a positive attribute in a community where Japanese animes are highly regarded. All these factors translated to high motivation and low anxiety for Nanako to experience different genres of writing and develop her proficiency in English.

Curriculum and Instructional Strategies

The previous discussion highlighted the niche of technology in providing universal support to varying types of learners and in cultivating a secure and supportive environment for meaningful interactions between ELLs and their like-minded peers across different educational contexts. I will begin this section by revisiting the findings of Proctor et al. (2011) and arguing that digital literacy skills are the prerequisite to taking full advantage of technology. Based on this argument, I will discuss why integrating technology into current print-based curriculum has important implications especially for ELLs.

Proctor et al. (2011) found that students who received ICON intervention exhibited observable increase in vocabulary scores but unexpectedly not in reading comprehension scores. I attribute this to the different cognitive processes and comprehension skills required by reading hyperlinked texts on the Internet (Coiro, 2003a, 2003b, 2005; Coiro & Dobler, 2004). To understand online texts, learners need to be able to a) predict what is hidden behind the

hyperlinks, b) navigate through websites, c) discern the validity of information on the Internet, and d) synthesize information without copying (Coiro 2005). Proctor et al. (2007) also suggest that *learner control* was one key to the success of ICON. Learners need to consciously *pull* information hidden beneath the highlighted hyperlinks to access the scaffolded vocabulary support. By clicking on these links, learners are constantly navigating back and forth between webpages when reading the texts. The same non-linearity also happens when learners navigate through the huge archive of Fanfiction.net to locate postings of their own or from the others. Thus, reading online texts differs from reading traditional print-based texts. Unfortunately, for less skilled readers who lack the knowledge about interacting with online texts, these additional demands tend to acerbate their difficulties in reading (Coiro & Dobler, 2004). Therefore, as people increasingly rely on reading online texts for information, the skills and strategies involved in reading online texts should be explicitly taught in schools (Coiro, 2005).

The ability to process digital texts represents a set of new literacy skills that are gaining momentum as skills crucial to success in the 21st Century workplaces. The Common Core State Standards (2012) already recognize these skills as crucial for students to become college- and career-ready:

> Students employ technology thoughtfully to enhance their reading, writing, speaking, listening, and language use. They tailor their searches online to acquire useful information efficiently, and they integrate what they learn using technology with what they learn offline. They are familiar with the strengths and limitations of various technological tools and mediums and can select and use those best suited to their communication goals (Common Core State Standards).

Partnership for 21st Century Skills (2014), a coalition of business, educational, and governmental organizations founded to advocate 21-century readiness, uses the term *21st Century Skills* to refer to those necessitated by the constantly evolving globalization. Central to these skills is also proficiency in technology:

> People in the 21st century live in a technology and media-suffused environment, marked by various characteristics, including: 1) access to an abundance of information, 2) rapid changes in technology tools, and 3) the ability to collaborate and make individual contributions on an unprecedented scale. To be effective in the 21st century, citizens and workers must be able to exhibit a range of functional and critical thinking skills related to information, media and technology. (Partnership for 21st Century Skills)

As digital literacy skills are gaining attention as important 21st Century Skills, the literacy curriculum, however, is not ready to cultivate them. Researchers (Alvermann, Moore, Hinchman, Phelps, & Waff, 1998; Hagood & Skinner, 2008) concur that school literacy curriculum and instruction is largely based on print. Davies (2006) also notices a disconnection between this print-based literacy curriculum and the multimodal nature of adolescents' literacy practices. These findings suggest that the print-based literacy curriculum is lagging behind the rapid technological and demographic changes. As the New London Group (1996) aptly puts, the "revolutionary changes and technology and the nature of the organizations" fueled by the fast trend of globalization have produced a new language of work" (p. 66). "The old, monocultural, nationalistic sense of 'civic'" (p. 69) has given way to cultural and linguistic diversity. The invasion of media into private lives has created opportunities for voices from multiple "lifeworlds" to crash and clash. Consequently, "educators must begin to think differently about literacy and language arts instruction that addresses 21st Century needs" (Albers, 2006, p. 97).

How are education researchers rethinking about the print-based literacy curriculum, and how is this relevant to ELL literacy education? One direction researchers are headed in is to introduce multimodality and multiliteracies into the classroom. Apart from the effort of Proctor et al. (2009, 2011) to use multimodal scaffolding to improve vocabulary comprehension, Skinner and Hagood (2008) and Ajayi (2009) studied ELLs' multimodal composition. The former examined the digitally composed stories of two emergent bilingual students, and the latter inspected a group of junior high school ELLs' graphic interpretations of a cellular phone advertisement. Both studies revealed multiple dimensions in the students' works. First, these multimodal works demonstrate a continuum between ELLs' traditional literacy skills and digital literacy skills. Second, ELLs were able to infuse their social, cultural, and linguistic identities into their compositions. Third and the most important, multimodal composition moves the emphasis away from language to meaning. They give the ELLs extra tools to make sense of the world and to express themselves. As important as language is as a psychological tool (Vygotsky, 1986), "meanings are made, distributed, received, interpreted and remade in interpretation through many representational and communicative modes – not just through language whether as speech or as writing" (Jewitt and Kress, 2003, p.1). For ELLs whose literacy in one or both of their languages is still developing, this means additional channels for instruction and communication to be meaningful (Echevarria et al., 2008).

From the standpoint of educational equity, the move of curriculum towards mululiteracies and multimodality also has implications for ELL education. It gives ELLs, especially those from lower SES backgrounds, access to important skills relevant in today's workplace. As the New London Group (1996) aptly points out, "the changing technological and organizational shape of working life provides some with access to lifestyles of unprecedented affluence, while excluding

others in ways that are increasingly related to the outcomes of education and training" (p. 61). The uneven access to educational resources that support the development of crucial workplace skills, such as proficiency in digital technology, limits ELLs' chances to secure jobs and improve their SES status, resulting in the increasing incoming gap in the United States.

Assessment

Despite the growing body of research on new literacy pedagogies, literature on the assessment, especially formal assessment, of new literacy skills is still lacking. This is partly because standards and public policies failed to include new literacy skills, making it difficult to design and develop assessment according to a set of norms. Leu et al. (2008) report that the National Assessment of Education Progress (NAEP) Reading Framework (National Assessment Governing Board, 2004, as cited in Leu et al., 2008) constructed recently omitted online reading comprehension skills. The NCLB legislation (U.S. Department of Education, 2002, as cited in Leu et al., 2008) also focuses principally on reading print-based text instead of online text. In a more recent study on the Common Core State Standards, Leu et al. (2011) found that "online reading comprehension skills appear more systematically in the Common Core State Standards for writing than they do for reading". More surprisingly, most states are not assessing skills and strategies necessary to comprehending text online and are not ready to do so in the near future (Leu, Ataya, & Coiro, 2002).

Nevertheless, researchers have been experimenting measures to assess online reading comprehension. Leu et al. (2008) designed challenges to find information connected to particular theme or objective that required online reading comprehension skills. These challenges included "a Wikipedia activity that challenged students to share information" (p. 332), and "an informational website challenge designed to prompt prediction and wide audience" (p. 332).

They found these measures "can be effectively integrated into authentic classroom literacy activities and aligned to grade-level objectives in reading, language arts, and content area curricula "(p. 332). Coiro and her team developed a performance-based assessment called Online Reading Comprehension Assessment (ORCA) (Coiro, 2009). They asked the students to "search for, locate, critically evaluate, synthesize, and communicate solutions to online information requests using instant messaging, email, and blog technologies (Leu et al., 2008, p. 333)." Data from their research indicate that this type of measurements can also evaluate the students' online reading proficiency levels.

Other studies have shed light on some interesting means of informal assessments not available within a traditional print-based literacy framework. First, ICON's digital feature use tracker (Proctor et al, 2007) provides data, which students do not usually volunteer while doing traditional reading assignments, for teachers to assess the students' use of cognitive and metacognitive strategies. Whenever learners click on a hyperlink for vocabulary definitions, add vocabulary to *My Glossary* list, or use strategic coach supports, the server will record these activities and maintain the data in an event usage log. For example, Jasmine, when posting the word *concentrated* on her glossary list, wrote "I chose this word because I didn't know what it ment (meant) so when I see it again I will look it is (up) in my glossary" (p.14). This shows the teachers that she is metacoginitvely thinking about her comprehension and strategies. This type of data provides new insights into the students' cognitive processes. Second, ELLs' multimodal composition also offers teachers new lenses to examine the construction of ELLs' social and cultural identities. Both Ajayi (2009) and Skinner and Hagood (2008) found that the ELLs they observed were able to produce multimodal writings that reflected personal interests shaped by social and cultural experiences. Teachers can learn more about the students' biopsychosocial,

education, and linguistic histories (Herrera et al, 2013) and make instructional decisions accordingly. Third, Black (2005) demonstrates that fanfiction communities on the Internet can provide ELLs a safe environment for their works to be assessed by their peers. This supportive environment lowers their affective filters and encourages ELLs to take risks and experiment new genres of writing.

Unfortunately, informal assessment cannot replace formal assessment, despite all their merits. The next section will summarize the findings of this study and analyze what the lack of assessments means for future studies on new literacies and ELL literacy education.

Findings

So, why technology? The answer is two-fold. First, the meaningful integration of technology into the curriculum fosters the development of new literacy skills required by the 21st Century workplace. An emphasis on digital literacies at the curriculum level also gives students equal access to these important 21st Century Skills, thus promoting educational equity. Second, instructional approaches built upon technology have the potential of effectively addressing cultural and linguistic diversity in K-12 literacy classrooms. As research shows, technology can address plurality directly with the flexibility and adaptability of digital scaffolding tools. ICON, for example, offers highly customizable levels of scaffolding that is meaningful to different learners. Technology also makes possible multimodal composition and representation that overcomes the linguistic barrier and allows ELLs to convey meanings through images, sound, and video (Skinner & Hagood, 2008, Ajayi, 2009). Furthermore, technology is capable of bridging in-school and out-of-school learning contexts and the students' academic and private life. It cultivates the social interaction that allows ELLs to develop English proficiency and construct cultural identity in low-risk environments (Black, 2005, 2006).

Unfortunately, despite a growing body of interest in new media literacies, there is a lack of research that specifically looks at the implication of new literacies on ELL education. As Proctor et al., (2007) claim, "although the research base for the use and effectiveness of digital reading environments with English-speaking student is growing, interventions specifically targeting non-native English speakers are almost non-existent" (p.5). Indeed, apart from ICON, my research discovered few applications dedicated to the need of ELLs. Even ICON is somewhat limited in this aspect. While it does offer a selection of culturally relevant texts and L1 support in Spanish, these measures are less relevant to non-Spanish-speaking ELs. Future research should explore how technology can best tap into ELLs' knowledge about their L1 and transfer this knowledge to facilitate their learning of English (Jiménez, García & Pearson, 2005, 2006). Moreover, Black (2009) also mentions that although there has been enlightening research on adolescents' out-of-school activities mediated by technology, the center of attention has seldom been ELLs. Future research should fill in this gap and study how technology specifically helps ELLs develop language proficiency and academic aptitude in their extracurricular activities.

However, I had great difficulty finding literature and research on the assessments of new literacy skills. Few assessments measure the students' gain in their ability to search for information using search engines. They seem to pay more attention to developing instructional approaches with technology but less attention to developing assessments that directly measure new literacy skills. Some try to prove the effectiveness of their approaches by measuring the growth of the students' traditional literacy skills (Proctor et al, 2007, 2009). Others tend to study the implications of new literact approaches for teachers to make instructional decisions (Ajayi, 2009; Skinner & Hagood, 2008). Indeed, under current assessment framework based on print,

there is no standard or framework that would guide the development of assessments that measure these skills. However, the cognitive processes involved in processing print and digital texts are not always comparable, a factor which causes difficulties in measuring the students' progress of their traditional literacy skills under new literacy approaches. For this same reason, new literacy approaches do not seem more preferable than traditional approaches proven effective in developing traditional literacy skills. Under the accountability push of NCLB, teachers would remain skeptical and hesitate to adopt new literacy approaches, knowing that they are not necessarily more effective than traditional approaches. This, unfortunately, is the situation facing researchers of new literacies.

Recommendations

Future research should resolve this dilemma by developing a set of standards that quantify the measurement of digital literacy skills. CCSS already recognizes the importance of these skills for students who are both college and career ready.

The International Society for Technology in Education (ISTE) Standards for Students also argue that the "today's students need to be able to analyze, learn, and explore" (ISTE Standards for Students). However, neither standards tie the development of certain skills to grade levels, as does CCSS with traditional literacy skills. Admittedly, the standardization of new literacy skills might sound daunting at present, as many states still report their lack of resources to integrate technology into classrooms (Kober & Rentner, 2012). However, as digital devices become more affordable and as digital literacy skills becomes increasingly essential in today's society, this push might direct more public attention to the lack of access to technology in some districts and ultimately give all students access to new literacy skills.

The quantification of standards will provide researchers with guidelines to develop instructional approaches and assessments of digital literacy skills. While continuing with their exploration of instructional approaches using new literacies, researchers should also become more explicit about what type of new literacy skills these approaches cultivate and how to measure achievements in these skills. Particularly, with CLD student population, researchers need to be mindful of the cultural-specificity of digital technology (Kern, 2006). For example, according to Dragona and Handa (2000, as cited in Kern, 2006), the navigational process of hypertext might be counter-intuitive to people of some cultures. This poses extra challenges for the development of culturally neutral assessments that measures digital literacies skills independent of cultural or linguistic backgrounds.

It is easy to suggest that scholars keep up-to-date with the latest technology and integrate it into classrooms. However, a more realistic recommendation might be to examine existing technologies carefully and use them masterfully. Even today's technological inventions, such as Internet, wikis, blogs, search engines, instant messaging, email, and online gaming have not all been integrated into daily instructions in meaningful ways (Leu et al, 2007). According to Kern (2006), "It is not the technology per se that affects the learning of language and culture but the particular uses of technology (p.200)." Research should focus on the same question that guides this study – "Why technology?" and strive to use technology most effectively in classrooms. As Shirley (2013) points out, any use of technology should be subjected to scrutiny before being introduced into the classroom. His theory of *Mindful Teaching Using Technology* suggests "beyond endorsing technology, questioning it, or sheltering students from it, we can see before us a rich and abundant new terra incognita for educational change."

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