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Abstract

The increasing digitization of information and communication has undoubtedly impacted the ways in which people in the United States access and interpret health information. Although the traditional emphasis of health literacy research has been the comprehension of health-related texts such as patient information forms, prescriptions, and medicine labels, the increased use of electronic means to locate health information requires more critical engagement with texts beyond basic comprehension. In accessing electronic health information, patients need to be able to navigate the vast amount of online health information and to interpret and synthesize health information across multiple sources (i.e. websites) while also evaluating the credibility of these sources. Recent health literacy research has examined the increased role of the media literacy in influencing health behaviors (Bergsma & Carney, 2008) and the role of increased access to computers (Salovey et al., 2009), but little (if any) research to date has provided recommendations for *best practices* related to meeting the health literacy demands required by digitization. This article attempts to fill this gap by exploring the use of the internet as a key source of health information and by looking at best practices in teaching digital health literacy. It describes the development of a digital literacy component within a community-based health literacy/ESL curriculum funded by the National Institutes of Health and implemented on the US-Mexico border.

Introduction

One critical aspect of globalization has been the explosion of technology, which has led to a more fluid movement of information and communication across geographical and linguistic borders. In the realm of health care, the increased digitization of information has transformed the ways in which people in the United States access and interpret health information. While the traditional emphasis of health literacy research has been the comprehension of health-related texts such as patient information forms, prescriptions, and medicine labels, the increased use of electronic means to locate health information requires more critical engagement with texts beyond basic comprehension. In accessing electronic health information, patients need to be able to navigate the vast amount of online health information, and to interpret and synthesize health information across multiple sources (i.e. websites) while also evaluating the credibility of these sources.

Recent health literacy research has examined the increased role of the media literacy in influencing health behaviors (Bergsma and Carney, 2008; Pinkleton et al., 2007; Pinkleton, Austin, Chen, & Cohen, 2012); the role of increased access to computers (Salovey et al., 2009; Neter & Brainin, 2012; Samal et al., 2010), but little research to date has provided recommendations for *best practices* related to meeting the health literacy demands required by the increased digitization of the globalizing world. This article attempts to fill this gap by exploring the use of the internet as a key source of health information by Spanish-speaking immigrants on the U.S.-Mexico border, a place where globalization is felt on an intense scale. The article focuses specifically on the incorporation of digital literacy into a health literacy/English-as-a-Second-Language (ESL) curriculum and explores best practices for integrating digital health literacy into health literacy curricula.

The first part of the article examines the literature on health literacy and digital literacy. We then describe the integration of a digital literacy component within a community-based health literacy/ESL curriculum funded by the National Institutes of Health and implemented with immigrant learners on the US-Mexico border. We conclude with "lessons learned" from the process of incorporating digital literacy into a health literacy curriculum within an adult education context.

Digital Health Literacy in Context

Over the past decade, the field of health literacy has become increasingly interdisciplinary, drawing on research from health education and promotion (Ratzan, 2001), medicine and patient care (Berkman, Sheridan, Donahue, Halpern, and Crotty, 2011; Ryan et al., 2008), as well as research in adult education (Diehl, 2011; Nutbeam, 2008; Quigley, 2007; Schecter and Lynch, 2011) and literacy studies (Shohet, 2004; Papen, 2009). Although there has been a relative consensus in the literature about the association between *low* or *limited* health literacy and poor health outcomes (Berkman et al., 2011), there is considerable debate about the meaning of health literacy itself and ways to document and assess it in patients. In health-based fields, health literacy has been defined as "the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (U.S. Department of Health and Human Services, *Healthy People 2010*).

Widely-used health literacy assessments such as the Test of Functional Health Literacy in Adults (TOFHLA) evaluate three dimensions of health literacy (prose, document, and numeracy) (Parker, Baker, Williams, and Nurss, 1995), which derive principally from the National Assessment of Adult Literacy (NAAL) sponsored by the National Center for Educational Statistics. Importantly, neither the NAAL nor official definitions and assessments of health literacy include a digital component (Hull & Nelson, 2005); in other words, the prevailing notions of health literacy have tended to overlook the increasingly powerful role of media and digital technology as one critical source of health information, misinformation, and awareness for patients and health care consumers.

Infusing the prevailing notions of health literacy with the *digital* would not be without precedent. In recent decades, interdisciplinary research on multi-modal literacies, *new* literacies, and *multiliteracies* (New London Group, 1996; Kress, 2003; Lankshear & Knobel, 2003) has drawn attention to the ways in which technology has transformed print-based communication across time and space. Kress (2003) argues that the present "age of the screen" has broken down the traditional distinction between writers and readers as producers and consumers of printed text, as "the new technologies of information and communication…bring together the resources for representation and their potential with the resources of production and the resources of dissemination" (p. 23). Digital literacy, in this context, has been defined in a range of ways. Building on the work of Kress, Merchant (2007) defines digital literacy as "the study of written or symbolic representation that is mediated by new technology" (p. 121). Working within a similar tradition, Lankshear and Knobel (2008) offer a more comprehensive view, defining digital literacy as "the myriad social practices and conceptions of engaging in meaning making by texts that are produced, received, distributed, exchanged, etc., via digital codification" (p. 5).

Building on the definitions presented above, *digital health literacy* refers to meaning-making with health texts mediated by new technologies. This article is focused on one attempt to integrate digital health literacy into a health literacy/ESL curriculum within the context of adult education. This context is significant because adult ESL education in the United States has historically mirrored immigration patterns, and demand for ESL classes continues to be robust, even in spite of harsh anti-immigrant policies in some states (Ullman, 2010). In recent years, adult education classes have also become an important site for integrating health content as a medium to teach English literacy, based in part on Department of Health and Human Services' *Health People 2010* document, which highlights the need to "augment students' abilities to access and navigate the difficult pathways of health information for themselves, their families, and their communities" (Rudd, 2004, p. 7). Moreover, while the traditional focus of adult ESL has been print literacy, in recent decades, the integration of technology into ESL classrooms has become imperative, as "information technologies [have] transformed notions of literacy, making on-line navigation and research, interpretation and authoring of hypermedia, and synchronous and asynchronous on-line communication critical skills for learners of English" (Warschauer, 2000, p. 511).

The next section describes the process of integrating digital health literacy into an adult health literacy/ESL curriculum in detail, with an emphasis on findings from focus groups conducted prior to curriculum development and examples from the health literacy curriculum itself.

The Internet as a Key Source of Health Information

In this section, we provide background about the development of the health literacy curriculum designed specifically to be part of an English-as-a-Second-Language (ESL) class for adults on the US-Mexico border. We then present focus group findings from an earlier pilot study on health literacy in adult education, where participants emphasized the use of the internet as one key source of health information. Those findings, in turn, influenced the development of the health literacy curriculum, which included a technology component as part of all twelve of its units. We include examples of how digital literacy was integrated into the curriculum as well as challenges faced in implementing the digital literacy instruction in adult education classes. We then present lessons learned from the curriculum development and implementation process.

Background and research context

The health literacy curriculum that is at the center of this inquiry is part of a larger two-year intervention study (2009-2011) funded by the National Heart, Lung, and Blood Institute (NHLBI)[i], part of the National Institutes of Health (NIH). The primary purpose of the project, known as "Health Literacy and ESL: Integrating Community-Based Models for the U.S.-Mexico Border Region," was to evaluate the use of adult ESL instruction as a medium for improving health literacy among Spanish-speaking immigrants. One critical component of the study was the development, implementation, and evaluation of a health literacy curriculum to be delivered in conjunction with an existing adult ESL curriculum. The larger study compared pre-test/post-test results on English and health literacy assessments from participants in control and intervention groups over two iterations of the curriculum, one in fall 2010, and the other in spring 2011. In addition to results from standardized assessments, the research team conducted focus groups with participants during both iterations of curriculum implementation (Fuentes et al., 2011).

The curriculum development process occurred during the first year of the two-year project (2009-2010). The process involved a collaborative partnership between researchers from the fields of health education, professional communication, and literacy studies and adult education practitioners from a local community college that offers community-based ESL and GED classes for adults. The two principal developers of the curriculum were a graduate research assistant who had several years of experience as a bilingual education teacher and an adult educator who had more than twenty years of experience in the field. Their work on the curriculum was complemented by input from the above-mentioned researchers at monthly project meetings as well as informal feedback sessions. Notes were taken at each of the monthly project meetings, with detailed minutes serving as one source of data to analyze the curriculum development process. The curriculum was piloted during the summer of 2010 and formally implemented in fall of that year as part of an adult education class created specifically for the study and sponsored by the local community college. A parallel community college-sponsored adult ESL class (control group) was also offered at the same time.

Although data sources for the larger study included participants' pre-/post-test scores on several health literacy assessments, this article focuses on the qualitative data that were collected. These data sources included focus groups with participants in both the control and intervention groups, both before and after the intervention, and observations of the curriculum implementation

Rhetoric, Professional Communication, and Globalization
December, 2012, Volume 3, Number 1, 162-174.

Page 165

throughout the intervention. Prior to the intervention, members of the research team also collected pilot focus group data in spring 2009 with participants in community-based adult education classes similar to the ones that later underwent the intervention. All focus groups–from the pilot study as well as the intervention study–took place in Spanish, and all were transcribed by bilingual graduate research assistants. Focus group data from both the pilot and intervention studies were then coded for thematic patterns. This process began with *open coding*, where as many themes as possible were identified, and then more *focused coding*, which included a more detailed analysis of selected segments from the transcriptions (Emerson, Fretz, & Shaw, 2011). While some preliminary codes included *changes in health practices*, *multiple literacies*, and *health awareness*, one key overriding theme that emerged early on in the coding process was the use of the internet as a key source of health information. This theme is explored in detail in the next section.

The use of the internet by adult immigrant learners in search of health information

As mentioned above, during spring 2009, members of the research team conducted a pilot study on the integration of health literacy instruction into adult education classes on the US-Mexico border. This pilot study looked specifically at the integration of Spanish-language health literacy content and instruction into Spanish-language GED classes for adults. As part of the study, the research team conducted focus groups with adult learners, the majority of whom were recent immigrants from Mexico, both before and after the health literacy intervention.

Several themes emerged in these focus groups, including variable access to health care in the US, the use of health services on the Mexican side of the border, and *remedios caseros* (home remedies) for illnesses and injuries. When asked about where they looked for information if they had a health-related question or a problem, participants in eight out of nine focus groups mentioned the internet as a source of health information. In one focus group, one female participant commented on an experience with using the internet to find health-related information, saying "…in [Mexico] I had a hysterectomy, and there were things that I did not understand with the medical vocabulary. So I went to the internet to get a lot of information to be sure about what they were going to do" (EA Focus Group, 9 March 2009).

With follow-up questions, it became clear that the participant looked for information in Spanish about her upcoming surgery, and that she was able to find clarification on unfamiliar medical terms in her native language. Importantly, the use of the internet in this case did not involve proficiency in English as an additional language; it did, on the other hand, require that she know in very basic terms how to use a computer, navigate an internet browser, and locate credible websites and trustworthy information. In other words, the reliance on the internet as one source of information involved particular demands on this participant as an internet consumer (Schmar-Dobler, 2003), including navigating large amounts of textual information as well as images and graphics, strategically evaluating which sites would be most useful, and understanding the organizational structure and vocabulary of internet-based texts, which are most often expository texts.

In another focus group, one participant mentioned using the internet to find doctors that were part of her husband's insurance plan. In this case, the information was also in Spanish (DD

Rhetoric, Professional Communication, and Globalization
December, 2012, Volume 3, Number 1, 162-174.

Page 166

Focus Group, 9 March 2009). Another female participant in the same group also mentioned
using the internet to find information related to illnesses. She discussed using the internet for two
different reasons:

> My father has diabetes and last night he got very, very sick. He was pale, I think
> he had a drop in blood pressure. And I got on [the internet] to see if these were
> symptoms of low blood pressure or diabetes, and yes, it was both. And also when
> I had depression, the symptoms and to find out how to help myself. I mean, any
> doubt I have, I go to the internet [DD Focus Group, 9 March 2009]

In this comment, the participant describes using the internet to find information on illnesses
affecting both her father and herself. In this instance, the use of the internet is a high-stakes
endeavor, as both of the illnesses mentioned–diabetes and depression–can have potentially
serious consequences if left untreated. Locating credible information from reliable sources is
critical in this situation; whether or not this participant had experience or training in evaluating
the credibility of internet sources is unknown, but the integration of these skills into adult
learning would aim to strengthen participants' capacity to identify, critically evaluate, and
interpret health information from a range of online sources, all of which are considered 21st
century literacy skills (Center for Media Literacy, 2003).

The next section of the paper details a preliminary attempt to address digital health literacy in
adult education by looking at the integration of technology use into a health literacy/ESL
curriculum designed for and implemented with Spanish-speaking adults learning English on the
US-Mexico border.

Examples of digital health literacy within the health literacy curriculum

As mentioned above, the health literacy/ESL curriculum was developed as part of a larger
project examining the impact of integrating health literacy into an existing adult ESL curriculum.
In this case, the ESL curriculum was based on a McGraw-Hill textbook, *Excellent English*
(Forstrom, Pitt, Vargo & Velasco, 2008). The health literacy component of the curriculum,
which was developed by members of the university-based research team in conjunction with the
community partner, consisted primarily of the three dimensions of literacy included in the
National Assessment of Adult Literacy: prose, document, and numeracy (U.S. Department of
Education, 2006). Each unit was framed by language objectives related to ESL and health
literacy, as well as Texas Adult Education ESL standards, and each unit contained detailed
procedures for implementing the lessons, including timeframe, educational materials, supplies,
and equipment.

While the principal emphasis of the curriculum was on prose, document, and quantitative
literacy, as per the primary assessments used in the study, there was also a digital component
incorporated into all 12 units comprising the curriculum. The digital component came in the
form of "technology tips" for activities that learners could do outside of class, and "technology
integration," where participants spent in-class time learning how to use some aspect of
technology.   Unit 2, for example, required that the teacher use a projector in class to demonstrate
to students how to navigate the internet for information on health resources and health issues. As

part of the lesson, students were then asked to form small groups to do a search on a particular health topic and to report back to the large group not only what they found but also their interpretation of what they found.

Although the digital literacy aspect of the lesson seemed straightforward in the curriculum, the implementation proved more complicated. First, there was an issue of accessing laptop computers and a projector for use during class time. Although the classes took place at a local community college campus, they were not part of the regular semester coursework. Because the participants were not formally enrolled in the community college and the instructors were not community college employees, the equipment had to be reserved weeks in advance via the site coordinator for the health literacy/ESL project, who was a community college employee. In addition, not enough laptops were available for all students to use individually; hence, groups were formed as part of the classroom activity, with two or three students per computer. Finally, teachers reported difficulty with accessing wireless internet during the class sessions, since the internet was password-protected and available only to community college students and employees. These logistical obstacles made it difficult to incorporate technology use, and hence digital literacy activities, into every learning session.

Classroom observations of the lessons indicated that participants demonstrated a range of experiences with technology, often times with younger participants showing more familiarity than older students, a finding not out of sync with research on this topic (Prensky, 2001). One observation of the implementation of Unit 2, in particular, noted that "there were students who were not familiar with the computer but they supported one another working in groups" (22 September 2010).

In addition to the in-class demonstrations of technology use to find health information online, each of the twelve units also contained technology tips, where learners were encouraged to use the internet to locate specific kinds of health-related information. In the same Unit 2, for instance, learners were provided with the address for the Healthy People 2010 website from the National Institutes of Health and were encouraged to navigate the site to find information of interest. In Unit 6, which focused on heart disease risk factors, participants were asked to locate a diagram of the circulatory system in order to complete a homework assignment asking them to write a paragraph about its importance. In Unit 7, which focused on diabetes, students were given the "tip" to locate the Diabetes Association website in order to learn more about diabetes prevention, diagnosis, and treatment. Units 10 and 11 dealt with nutrition, and the "technology tips" for these units asked participants to find nutrition information on the U.S. Department of Agriculture website and to request a personalized menu on http://www.MyPyramid.gov.

Even though the integration of digital literacy was limited by outside factors such as technology access, there was a difference between the control and intervention groups in participants' perspectives regarding use of technology. In the focus groups conducted with classes that received the health literacy curriculum in conjunction with their ESL curriculum (i.e. the intervention group), participants made reference to the internet as a source of health information, while participants in classes that received no health literacy instruction made no reference to using the internet as a source of health information. One participant from the Fall 2010 health

literacy/ESL class, for example, mentioned a change in her perspective on using the computer to find health-related information as a result of her participation:

> Yo soy una persona que a mí me no me gustaba para nada, pero para nada. Yo miraba la computadora y yo así no no es que no no quiera ni prenderla no me gusta. Y con este programa, con las páginas que nos dieron, con las sugerencias que nos dio la maestro, como que se le está agarrando el saborcito rico de estar investigando, estar entrando de ver…y se olvida eso de que…para mi fue muy bueno eso porque ahora si me interesa no nomas quitarle el polvo a la computadora…ahora si me interesa ir a prenderla.

> I'm a person who never liked [the computer]. I looked at the computer, and I was like, "I don't want to turn it on, I don't like it." And with this program, with the websites that they gave us, the suggestions that the teacher gave us, it's like I'm just now getting the flavor to be researching, to be entering [the internet] to see…and I'm forgetting this [feeling of] "ay, no, no." For me, it was very good because now I am interested not only in brushing the dust off of the computer…now I'm actually interested in turning it on [Focus Group, 28 October 2010]

In this instance, the incorporation of a digital health literacy component into the adult education curriculum impacted this participant's view of computers. She expressed a dramatic shift in perspective from not using computers at all to now using them for *research* purposes; importantly, she attributes this shift to the health literacy/ESL class, where she was exposed to websites and technology demonstrations by the teacher. In this way, the digital literacy activities included in the curriculum served as a spark for this student not only to overcome her apprehension of computers but also to use the internet to find health-related information. In this instance, the integration of digital literacy into the curriculum influenced the participant's practices outside of more than within the walls of the adult education classroom.

Lessons learned: Integrating digital health literacy into adult education

The previous section described a preliminary attempt to include a digital health literacy component into a health literacy curriculum that primarily emphasized prose, document, and quantitative dimensions of health literacy. In this section, we summarize some of the key lessons learned from this process and we make suggestions for best practices on integrating digital.

Persistence of *digital inequality* in adult education

One of the key issues facing the inclusion of a vibrant digital literacy component in the health literacy curriculum for adults was the difficulty in accessing technology. The adult education classes that formed part of this project, like many adult education classes, were not sponsored by formal educational institutions; rather, they were independent, not unlike many classes sponsored by community-based adult education programs. This lack of institutional affiliation meant that the teachers and students could not easily obtain computers and internet access, limiting what could be done in the classroom. The challenges of accessing technology in this particular adult education program mirrored challenges faced by adult education programs nationwide, where

Page 169

Rhetoric, Professional Communication, and Globalization
December, 2012, Volume 3, Number 1, 162-174.

limited resources and inadequate infrastructure are more common than not. Not coincidentally, adult education programs tend to work with the most marginalized social groups in the most economically depressed areas of the country; these same groups often have the least access to new technologies (Kalyanpur & Kirmani, 2005; Gorski, 2005), leading to the persistence of *digital inequality* among different racial, ethnic, and economic segments of the population in the United States, and particularly among Hispanic immigrants (Ono & Zavodny, 2008).

Going beyond technological integration to emphasize critical digital health literacy

This health literacy curriculum represented a first step in providing adult learners with the opportunity to learn about the use of the internet as a key source of health information. Based on what emerged in at least one observation of curriculum implementation as well as focus group comments, some participants in the program did not initially feel familiar or comfortable with computers. The technology integration aspects of the health literacy lesson paved the way for some participants to become more comfortable with computers, as indicated in focus group comments. One important aspect of this curriculum implementation was the explicit instruction that took place around the use of computers; the teacher led participants step-by-step through the process of navigating the internet in search of health information.

While helping adult learners, particularly those who are "digital immigrants" (Prensky, 2001), become more comfortable with technology is a valuable endeavor, it represents *computational literacy* more than digital literacy as defined earlier in this article. Efforts to enhance digital health literacy, then, need to focus on both technological access and digital navigation and information retrieval skills (Stellefson, Chaney, & Chaney, 2008; Viswanath & Kreuter, 2007). Moreover, adult learners should have the opportunity to engage critically with online health information, and to ask questions about who produces such information, for what purposes, and what counts as legitimate health information for whom (see Freire, 1970); in other words, they should have opportunities to learn about and engage in critical health literacy (Nutbeam, 2000; Chinn, 2011).

Need for additional training and professional development for adult educators

Moving towards a framework of digital health literacy in adult education necessitates changes in the adult education infrastructure. Not only does technology need to be more prevalent in adult education programs, there also needs to be more training and professional development for adult educators in both integrating technology into the curriculum and encouraging students to engage critically with online information, in this case, online health content. We know that adequate training and professional development in technology integration is lacking in the K-12 arena (Lawless & Pelligrino, 2007); in adult education, which operates of the margins of the educational sector in terms of resources, implementing advanced trainings and professional developments for teachers on technology integration and digital literacy is even more of a struggle (Kotrlik & Redmann, 2003). The preliminary findings presented here from the implementation of a health literacy curriculum in adult education show that including instruction in information retrieval skills can impact learners' beliefs about technology and about digital sources of health information. If more training were provided on how to engage learners with digital technologies in critical ways, teachers would likely feel not only more qualified but also empowered to use digital technologies in adult education settings.

Conclusion

This article explores the process of integrating digital health literacy into a health literacy/ESL curriculum for adults on the US-Mexico border. The rationale for including a digital literacy component derived in part from focus group sessions where recent immigrants in adult education classes indicated that they relied the internet as one primary source of health-related information. Within the health literacy curriculum itself, there were preliminary attempts to incorporate digital health literacy through technology integration lessons, particularly in the second of twelve units, and through "technology tips," which provided instructions for learners to use the internet to locate health information outside of the classroom setting. We also reported on comments from participants on their experiences with technology as part of the health literacy classes. Finally, we presented some lessons learned from the process of curriculum development and implementation.

Based on these findings, we have identified some important areas of potential investigation in the health literacy/adult education arena. One relates to the reasons for and continued prevalence of *digital inequality* among different segments of the population, and particularly among Spanish-speaking immigrants (Ono & Zavodny, 2008); while it is known that disparities in access to technology and digital literacy skills persist among the most vulnerable populations, we need to know more about the connection between these informational access disparities and disparities in health access and outcomes. Furthermore, the findings presented here showed that adult learners–when they had access–tended to navigate Spanish-medium websites to locate health information. More research is needed on the relationship between the digital literacy practices of learners and their language development in English as an additional language. Finally, more research is needed on how adult education and health promotion programs conceptualize and implement digital health literacy as part of their outreach efforts. Research in these areas would help to strengthen the overlapping fields of health literacy and adult education, and potentially lead to improved health outcomes for all segments of society, but particularly for the most vulnerable groups.

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Rhetoric, Professional Communication, and Globalization
December, 2012, Volume 3, Number 1, 162-174.

Page 173

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