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# Designing for Practice Development in a Social Learning System: Communicating Norms and Vicarious Experience

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# Designing for Practice Development in a Social Learning System:

## Communicating Norms and Vicarious Experience

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Dedication

With love and respect for my parents Lee and Hardy Loe who taught me to care about others and strive to contribute to a better world. I can only hope to make half of the impact on others as they have.

Acknowledgements

This dissertation not only documents my research but also my journey to being an informaticist. While any faulty reasoning is all mine, the work could not be accomplished without the support of many. First of all, I want to thank the Community Health Workers who participated in this research. Without them, none of this would be possible. Many introduced me to and provided access to the CHW world in Houston: Ron Cookston and Karin Dunn at Gateway to Care, Inc.; Nancy Crider, Rosalia Guerrero, Angie Cummings, Jessica Uriarte and Linda Lloyd of the Texas Public Health Training Center; and Denise La Rue and her staff at Harris Health System.

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Abstract

Over the past quarter century, the United States has experienced an increase in demand for health services. Expanded use of community health workers (CHWs) has been identified as a strategic response for more effective distribution of healthcare resources by alleviating pressures on clinical personnel and infusing prevention education into the community-to-clinical care continuum. Expansion of the CHW workforce poses many challenges. For CHWs to effectively reduce costs and pressures on the healthcare system, 'expansion' implies not only increasing their numbers, but also assuring a workforce that has the capacity to perform in diverse settings. I propose a theoretical framework for practice development in a healthcare workforce and use the framework as a guide to test whether system design can motivate specific types of communications in an online social learning system. The results have important implications for 1) system design for development of a diverse healthcare workforce like CHWs, 2) designing for specific types of learning communications, and 3) the theoretical support for practice development. We successfully designed a social learning system to motivate what we believe to be norm affirming and self-efficacy developing communications. Further studies will determine whether this supports practice in healthcare as proposed by the theoretical framework.

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Salas, R., Steele, K., Lin, A., **Loe, C.**, Gauna, L., & Jafar Z Nejad, P. (2013). Playback Theatre as a tool to enhance communication in medical education. *Medical Education Online*, *18*(0). doi:10.3402/meo.v18i0.22622

## Field of Study

Health Information Sciences

Table of Contents

List of Tables

List of Figures

## Chapter 1: Introduction – An Informatics Approach to Designing for Expansion of the Healthcare Workforce

Over the past quarter century, the United States has experienced an increase in demand for health services. Rising morbidity and mortality from chronic disease, an aging population and the recent expansion of health coverage through the Affordable Care Act, have lead policymakers to recognize that some communities will experience shortages in the health care workforce in the near future (U.S. Department of Health and Human Services [HHS], 2014). Expanded use of community health workers (CHWs) has been identified as a strategic response for more effective distribution of healthcare resources by alleviating pressures on clinical personnel and infusing prevention education into the community-to-clinical care continuum (Balcazar et al., 2011; Committee on Quality Health Care in America, Institute of Medicine [IOM], 2001; HHS, 2014; Rosenthal et al., 2010).

Expansion of the CHW workforce poses many challenges including those around recruitment strategies, establishment of long-term funding mechanisms as well as the development of the occupation through training and association (U.S. Health Resources and Services Administration [HRSA], 2007; Rosenthal et al., 2010). This dissertation addresses the latter challenge: for CHWs to effectively reduce costs and pressures on the healthcare system, 'expansion' implies not only increasing the numbers of CHWs, but also assuring a workforce that has the capacity to perform in diverse settings. I propose a theoretical framework for practice development in a healthcare workforce and apply the

tools of cognitive informatics, from the pragmatic–user analysis, User-Centered Design and usability testing–to the theoretical–Activity Theory, Situated Learning, and Social Cognitive Theory– to test the viability of the framework as a guide for designing for specific types of communications in an online social learning system. We believe this approach has implications for the design of health information technologies for learning in general and for the development of other sectors of the healthcare workforce.

## Developing the Community Health Worker Workforce

### Who are Community Health Workers?

A recent report by the U.S. Health Resources and Services Administration (2007) defines CHWs as

> "…lay members of communities who work either for pay or as volunteers in association with the local health care system in both urban and rural environments …[who] usually share ethnicity, language, socioeconomic status and life experiences with the community members they serve." (p. iii)

Although CHWs are not clinically trained, they provide services that extend the reach of health care into communities. The role of the CHW is to help individuals overcome barriers to good health and medical services (Lewin et al., 2009). They ease access to care and education for people faced with risks for poor health and the complex health care marketplace. CHWs encountered during the current research performed jobs as diverse as helping people complete documentation needed to receive county health services, educating and recruiting women at a health fair to receive well woman checks on site, and acting as Patient Navigators in a local hospital Emergency Department to connect people with non-emergent needs to a primary care 'medical home.' Documented

impacts of CHW programs include improved health outcomes (Fernández et al., 2009; Lewin et al., 2009) as well as cost savings from receiving preventive and timely care (HRSA, 2007; Whitely, Everhart & Wright, 2006).

**Training and Development for CHWs**

Traditionally, CHW programs have filled their staffing requirements by identifying and recruiting natural helpers from the communities to be served and providing training specific to a program's goals. (Brownstein, Hirsch, Rosenthal, & Rush, 2011; HRSA, 2007; Kash, May & Tai-Seale, 2006). For example, a clinic may recruit community members to act as CHWs and deliver a diabetes self-management program to their clients with diabetes. The CHWs are likely to be trained on the topic – diabetes – and on the processes specific to that clinic. Expanding the workforce suggests a need for more generalized training while supporting the natural helper skills CHWs bring to the work. Some have identified core competencies as a base set of skills and knowledge domains for all CHWs (Calhoun et al., 2008; HRSA, 2007; Rhodes et al., 2007; Rosenthal, 1998). The Texas Department of State Health Services Promotor(a) or CHW Training and Certification Program (n.d., https://www.dshs.state.tx.us/mch/chw.shtm) recognizes eight core competencies:

- Communication skills
- Interpersonal skills
- Service coordination skills
- Capacity building skills
- Advocacy skills
- Teaching skills

- Knowledge base

Two national surveys of CHW programs (HRSA, 2007; Kash, et al., 2007) and a systematic review of the literature about CHW programs serving Hispanics/Latinos found that training is often delivered in a classroom setting including both lecture and skill-building techniques such as role playing. Kash et al. (2007) reported that CHWs also are trained through mentoring, but they did not define what they meant by mentoring and who the mentors were (other CHWs, trainers or other staff) and how it was delivered (e.g. job shadowing, one-on-one meetings). Little is known about the availability and effectiveness of training for CHWs.

**Barriers to training and development for CHWs.** The CHW workforce represents a diverse, dispersed and, often, informally educated group of workers with duties that span a spectrum of settings, goals and skillsets (Arvey & Fernandez, 2012; Parker et al., 2010; Rhodes et al., 2007; Rosenthal et al., 2010). These characteristics pose unique challenges for training and development of shared practices among CHWs. CHWs may have limited time for training and local training resources are not always available which requires an investment in transportation. At the same time, opportunities for face-to-face mentoring may not exist as a CHW is often the only one in his or her agency or spends time in communities working alone (Kash, May & Tai-Seale, 2006; Parker et al., 2010). Demands outside of work including working multiple jobs or caring for children may also limit CHWs access to training. Arvey and Fernández (2012) note that some potential CHWs may not be able to participate in training opportunities if they

are intimidated by formal education venues and teaching methods.[1] One of the four principles Rosenthal et al. (2010) suggest should be followed when developing policies about CHWs is:

> "minimize barriers to training and employment of the workers related to language, education level, citizenship status, and life experience (there is no reason why recovering addicts, for example, should not be community health workers in substance abuse programs)" (p. 1340-41).

While some have suggested the use of distance learning technologies for training CHWs may overcome barriers of time and distance (Bolinger, McKenzie-White, & Gupta, 2011), no examples exist in the literature. Research is needed to identify training mechanisms that can make training equitably available to new and current CHWs.

**Online Technologies, Knowledge Management and Workforce Development**

In today's world, the use of online technologies for learning and workplace development is common. The anthropologists Jean Lave and Etienne Wenger (1991) identified a model of learning through social interactions that they termed a 'community of practice'. Now, online or virtual communities of practice (VCoPs) are ubiquitous, particularly in large companies, but the concept developed from the observation of apprenticeships. Through ethnographies of tailors, butchers and others around the world, Lave & Wenger (1991) recognized that the basic form of apprenticeship for learning a trade is pervasive in human community. They proposed that, in fact, we (as humans) gravitate to this type

[1] Some have suggested that current efforts at CHW training such as courses offered through community colleges and certification criteria that must be achieved before a job is attained create barriers to otherwise good candidates for the CHW role (Arvey & Fernández, 2012; Rosenthal et al., 2010).

of learning in community whether we find others to knit with, to discuss movies with or to chat online with about our profession. Key to the model is the interaction among experienced and inexperienced alike. The idea of learning in association with others who are involved in the same practice is said to create the norms for that practice and the basis of the community itself (Wenger, 1998). In VCoPs, members use online technologies and social media to interact. In this way, Internet and mobile technologies have provided ways "for making togetherness more continuous in spite of separation in time and space" (Wenger, White, Smith & Rowe, 2005, p. 2).

Many organizations use online technologies such as intranets, knowledge management systems and variants of VCoPs to support communication among workers who do the same job, but are otherwise distant from one another (Ardichvili, 2008; Ardichvili, Maurer, Li, Wentling & Stuedemann, 2006; Jennex, 2005; Sherer, Shea and Kristensen , 2003). Despite the term 'practice' in the name, these systems are typically intended for knowledge sharing and not practice development per se. Some maintain the design of these systems does not support group learning and interactions (Kienle, 2006; Strijbos, Martens & Jochems, 2004) nor are they tailored for the identities of a specific set of users (Kienle, 2006; Osterloh & Frey, 2000; Strijbos, Martens & Jochems, 2004). Rather, VCoPs are a strategy for knowledge management within a company; the focus is on sharing and documentation so that hard won knowledge is not lost. Consequently, the systems are neither intended for nor designed for developing practice. Knowledge sharing can be very valuable; for example, an expert lawyer's explanation of the intricacies of a new precedent in law may be useful in developing strategies for a case. However,

knowledge alone will not help a new lawyer know how to argue the case. That is, knowledge is not enough for practice.

**A social learning system for workforce development.** Learning a job such as that of a CHW involves both knowledge acquisition and skill development for practice. We proposed using a social learning system following design principles for User-Centered Design. Social learning systems have evolved from VCoPs. However, a social learning system is distinct in that it 1) might not be initiated by the community of users it serves and 2) users interact with other groups or individuals bringing in knowledge from other sources (Wenger, 2000, 2010).

An online social learning system for workforce development must be designed to motivate interactions that support development of practices relevant to the work to be done. The literature on practice development suggests both the need for individual agency in performing a task and a context of group norms for participating in the task. Specifically, Bandura's (1997) Social Cognitive Theory (SCT) suggests that self-efficacy, or one's confidence, for successfully performing a task predicts actual performance. At the same time, Lave and Wenger's (1991) Situated Learning Theory (SLT) focuses on the participation in the task and the communication of group norms and thus group identity related to the task. I propose a SCT-SLT Theoretical Framework for Workforce Development as the basis for design of the interface and content of the social learning system.

**Designing for Workforce Development**

In this dissertation, I discuss 1) the SCT-SLT Theoretical Framework for Workforce Development; 2) the design of a social learning system for health worker practice

development using User-Centered Design; and, 3) the evaluation of the system. In order to address the challenges of training and skill development for CHWs, we sought to tailor the learning environment to allow communication across time and space, motivate interactions to share experience and develop self-efficacy for specific practices, inspire communication of norms for practice, and deliver training content tailored to the CHWs in Houston, Texas. First, we hypothesized that current methods of user analysis could inform design of a social learning system for non-traditional healthcare workers like community health workers.

**Contributions to Biomedical Informatics**

The results provided important implications for 1) system design for development of a diverse healthcare workforce like CHWs, 2) system design that elicits specific types of learning communications that affect behaviors outside of the system, and 3) theoretical support for practice development.

**Implications for system design for a diverse workforce.** Our initial application of existing methods of user analysis yielded critical gaps in understanding and lead to limited access to the system among the intended users. Moving forward, user analysis must consider how concepts are defined. Specifically, even when the user analysis indicated "access" to computers and the Internet as measured by self-reports of technology in the home and work place and frequent use, barriers existed and needed to be further defined. Similarly, 'success' of an online learning community measured in terms of active participation is not always considered during the system design phase. Some successful systems have as many as 80 to 90 percent 'lurkers' or participants who neither donate nor ask for knowledge, but read others contributions (Nonnecke & Preece,

2000). For a system designed for workforce development, active participation of all users is needed for the intended outcome. Thus, the design must address the users' motivation to participate and the context of interactions. In addition, in the research context, the power relations of the researcher in relation to the users must be considered as a potential barrier to accessing the system and authentic knowledge exchange and new knowledge creation among the users. Research methods such as those of community-based participatory research should be considered by biomedical informatics researchers when working with research participants from marginalized communities.

**Designing for learning communications.** We successfully designed our system to motivate what we believe to be norm affirming and self-efficacy developing communications. Specifically, custom videos with discussion questions were more likely to produce these communications than unstructured discussion alone. We also identified other types of communications that may play a role in practice development. Furthermore, many studies of online groups focus on norms and behaviors for knowledge exchange within the online interaction space (Ardichvili, 2008; Herring, 2004). The learning communications in this research are posited to develop behaviors for practices in the workplace, i.e. outside of the online space. While this study was not able to confirm the development of practice, the ability to engineer particular types of communications for behaviors in the offline world has important implications for new areas of research in Cognitive Informatics.

**Theoretical support for practice development.** Finally, the central focus of this research is a proposed framework for development of group norms and individual skills for the development of practice in a workforce. The Social Cognitive Theory–Situated

Learning Theory Framework for Practice Development (Figure 2 in Chapter 2), combines concepts from two well-supported theories for development of an individual's agency to successfully perform a task (self-efficacy) (Bandura, 1997) within the context of the norms of a group of workers (Lave & Wenger, 1991). The SCT–SLT Framework has merits for both online and in-person practice development and should be further explored.

Rapid expansion of the community health worker workforce continues to be a subject of interest to leaders in health care reform as evidenced by a recent discussion paper issued by the Institute of Medicine entitled *Bringing Community Health Workers into the Mainstream of U.S. Health Care* (Pittman, Sunderland, Broderick & Barnett, 2015). The ideas here have implications for knowledge management and suggest that knowledge sharing and providing a knowledge repository, such as an intranet-based community of practice common in large businesses, may not be sufficient for the creation and re-creation of practice for some workforces and some practices. We believe this research contributes to the search for solutions for an expanded healthcare workforce needed to support healthcare reform.

## Chapter 2: Literature Review – Theoretical support for a social learning system for workforce development in healthcare

Theoretical support for the design of a social learning system to develop workplace practices among Community Health Workers falls within three domains: 1) development of workplace practices, 2) learning through communication interactions, and 3) interface design.

### I. Developing workplace practices

I am proposing a theoretical framework based on Social Cognitive Theory and Situated Learning Theory (Figure 1).

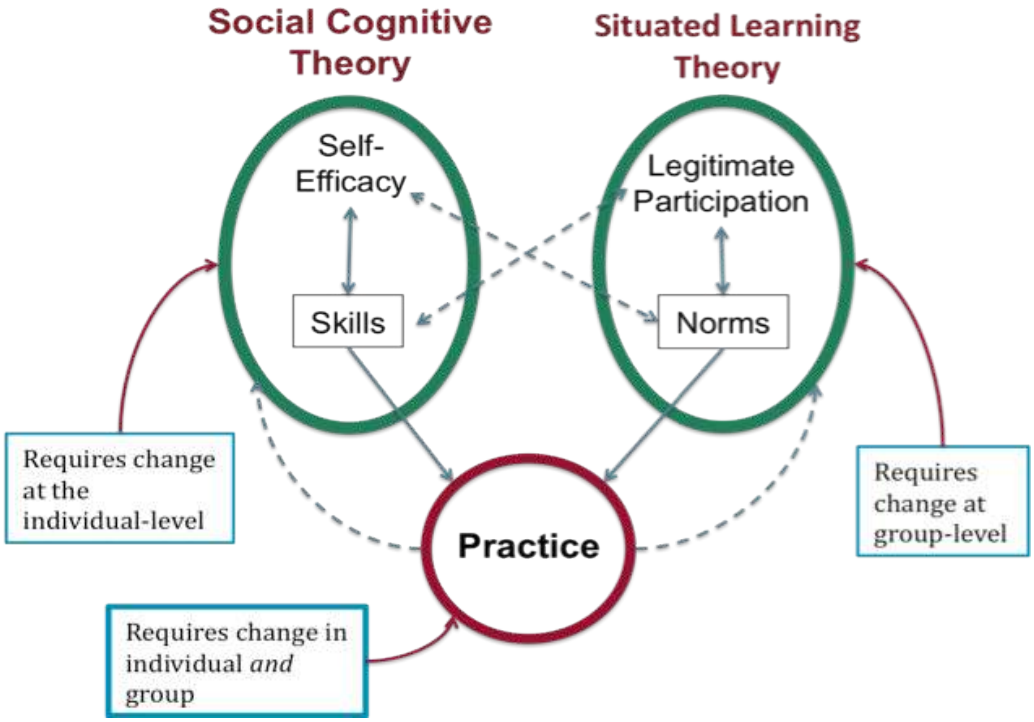



Figure 1. Developing Group Practice: A Social Cognitive Theory and Situated Learning Theory Framework

Situated learning theory describes the development of mastery through interactions that create group norms for behaviour. Social cognitive theory describes mastery through the development of individual self-efficacy. Both perspectives inform the development of a learning application for workforce development.

**Situated learning and communities of practice**

Lave and Wenger's (1991, 2002) theory of situated learning proposes that a practice, such as CHWs communicating with patients, emerges from participation in a community involved in the practice. While training has been the method for preparing CHWs that is recognized in the literature, (Calhoun et al., 2008; Duffy et al., 2004; Rao, Anderson, Inui & Frankel, 2007), situated learning theory suggests that being able to perform the practice in the workplace involves participation in the cultural world that creates norms for the practice. That is, it is not enough to just learn the mechanics of a task outside of its social, physical and organizational context. In their seminal work *Situated Learning: Legitimate Peripheral Participation,* Lave and Wenger (1991) propose that learning emerges from sanctioned participation of newcomers to a practice even as that participation is at the margins of practice. The keyword here –legitimate– refers to belonging and social identity conferred to newcomers by more experienced members. Legitimate participation, then, allows for access to the social and mechanical procedures of essential practices of the group. Being recognized as part of the community invokes *legitimacy*, but, for a novice, participation is *peripheral* or at the edges of the community as they perform duties that are less skilled and supportive of the central work of the master (Lave & Wenger, 1991; Wenger, 2000).

The relationships observed in formal apprenticeships can also arise in informal groups of people who share a practice (whether work-related or not). These groups, called communities of practice, often develop spontaneously as members of a community interact face-to-face or online (Wenger, 2006). Communities of practice allow individuals with a shared practice and identity and a range of experience and expertise to "develop a shared repertoire of concepts, tools, language, stories, and sensitivities that will embody the distinctive knowledge of the community and become a unique resource for further learning" (Wenger, 2000, p. 10).

Engeström, Virkkunen, Helle, Pihlaja and Poikela (1996) further elaborate that interactions of a community of individuals with varying levels of experience and expertise facilitate sharing of existing knowledge and creation of new knowledge, norms and practices. In this way, a community of practice adapts and perpetuates itself. This perspective contrasts with the philosophy of traditional education and training programs that often presume a novice status of the learners who are receptive of knowledge rather than contributing to it. A community of practice, however, should stimulate learning to emerge from interactions among novices, intermediates and experts and foster development of norms for the community (Lave & Wenger, 1991).

When an individual worker is isolated from other practitioners, a community of practice may be particularly important for novice and intermediate practitioners to become experts as well as for on going development of the practice through innovation (Engeström et al., 1996). Because any one CHW may be the only one in his or her setting (Calhoun et al., 2008), participation in a CHW community of practice could allow social and cultural interactions that cannot take place at work. In this sense, a community of practice can be

an intervention strategy to overcome barriers to *group* learning and the development of *group* norms for a practice.

**Social cognitive theory and the development of self-efficacy**

However, the development of norms for practice through association with others who do the same work does not seem sufficient for successful performance. Rather, successful practice has also been described as dependent on characteristics of the individual worker including knowledge, skills, emotional response, and self-efficacy to perform the required tasks (Bandura, 1997). Self-efficacy is a person's confidence in their ability to perform a task and attain the task goal given the context of the task. Research has shown that self-efficacy is highly predictive of task performance and that increasing self-efficacy for a task can improve performance (Bandura, 1997; Gist & Mitchell, 1992). Thus, the development of self-efficacy in an *individual* worker in concert with norms in a *group* of workers seems especially important to practice development.

Bandura's Social Cognitive Theory identifies strategies to address barriers to performance of a task within the individual through the development of self-efficacy for that task (Bandura, 1998).

Four types of experience are involved in developing self-efficacy: enactive mastery (personal experience), vicarious experience (modelling), verbal persuasion (feedback), and physiological arousal (e.g. enthusiasm or anxiety) (Gist & Mitchell, 1992). (See Figure 2.) Intervention strategies for increasing self-efficacy vary according to the type of experience they provide. Traditionally, training for CHWs is designed to support mastery by enhancing factual knowledge and specific skills (Calhoun et al., 2008; Duffy et al., 2004). However, modelling interventions that provide a vicarious experience may also be

**A Model of Self-Efficacy–Performance Relationship**

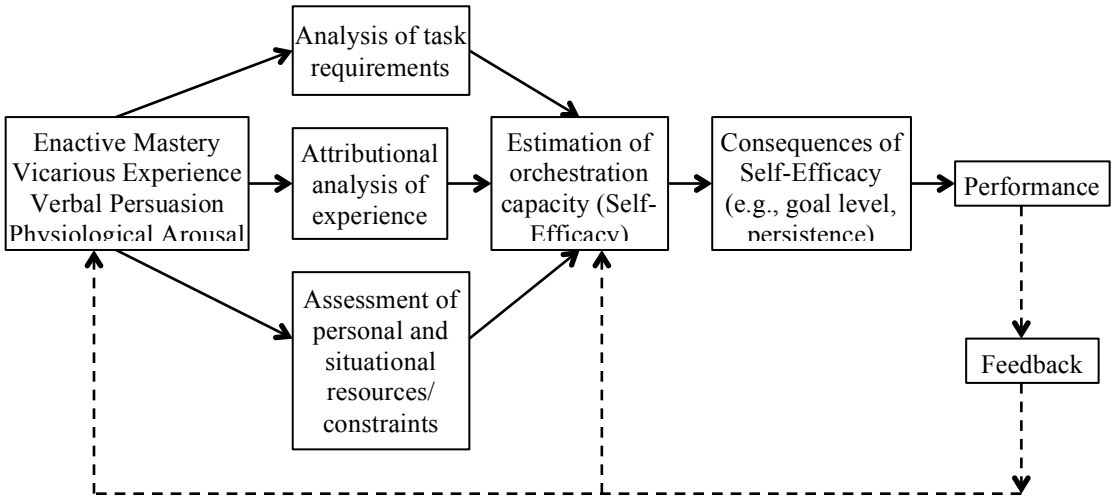



Figure 2. Gist and Mitchell's Model of the Self-Efficacy–Performance Relationship describing the different types of self-efficacy development and the path to performance. (from Marilyn E. Gist and Terence R. Mitchell, Self-Efficacy: A Theoretical Analysis of Its Determinants and Malleability, *The Academy of Management Review* Vol. 17, No. 2 (Apr., 1992), pp. 183-211 used with permission.)

appropriate for improving efficacy for the types of work performed by CHWs and the situations they encounter.

**A proposed theoretical framework for developing group practice**

Elements of Situated Learning Theory and Social Cognitive Theory suggest a framework for understanding the development of group practice for a profession or a trade. Situated Learning along with Activity Theory and Distributed Cognition are underlying theories of cognitive informatics today. However, the central concept of these theories–group participation and interaction–does not take into account the need for agency in one's practice. Self-efficacy as described by Bandura in Social Cognitive Theory contributes to a practitioner's agency to perform a task. I am proposing a theoretical framework (Figure

1) that shows 1) the development of self-efficacy for a practice as leading to skill in that practice and 2) legitimate peripheral participation in the same practice as contributing to the development of group norms for that practice. Together the two constructs create and renew the practice of a group. In developing a social learning system for practice development, we must consider how to motivate asynchronous communications that express both norms for the group and simulate the modelling of behaviour or experiences.

**Technologies to create participation and shared experience**

Computer technologies such as the Internet can provide both the tools and the environment for interactions when face-to-face meetings are not practical (Wenger, 2000). Computer technologies have been characterized as *persuasive technologies* because they can be used as tools, media and social actors to change attitudes or behaviour (Fogg, 2003). As tools, they increase the ability to make a targeted change. For example, by overcoming distance in time and space, Internet technologies facilitate interactions within a group like CHWs who work in different settings. Fogg (2003) explains that computer technologies can be used as media that provide experience through simulations. In turn, simulation makes cause and effect relationships explicit, motivates action and allows mental rehearsal of a task. Simulating interactions between a CHW and a patient provides an experience that may not otherwise be possible to view for reasons mentioned earlier. Finally, Fogg maintains that, as social actors, computer technologies create a relationship by engendering similarity or authority and thus credibility, providing feedback, modelling behavior or attitude, or providing social support (Fogg, 2003) all of which can elicit an affective response (Norman, 2008) such as

feelings of being in community with like others creating the basis for development of self-efficacy through the experiences of others.

Within communities of practice there is a range of Internet technology use and functions. Some communities mainly interact face-to-face, others use some online interaction (e.g. e-mail or listservs) in addition to face-to-face meetings and some *only* interact online. In recent years, virtual communities of practice that use persuasive technologies as their primary mode of interaction have gained popularity (Wenger, White, Smith & Rowe, 2005).Virtual communities of practice use Internet technologies that add tools for knowledge management and knowledge sharing (Ardichvili et al., 2006) to the formal and informal community building functions of a community of practice (Wenger, White & Smith, 2008). Some large, international businesses have organized online (Internet or Intranet) communities of practice among their workers as formal structures to support knowledge management, organizational learning and organizational memory (Ardichvili et al., 2003; Jennex, 2005; Stamps, 2000; van den Hooff & de Ridder, 2004; Wenger, 2000, 2006). Communities of practice also facilitate knowledge sharing between communities (Lave & Wenger, 1991; Wenger, 2000). For example, Sherer, Shea and Kristensen (2003), described the technologies and services included in a faculty learning community portal (Table 1) provided through discussion boards and forums, messaging between individuals or groups, chat, whiteboard, video conferencing, resource sharing/archiving, and links. The faculty participants were from different fields, but were able to share and collaborate across disciplines. Similarly, CHWs might focus on different health issues in their communities but share approaches to education and communicating others.

Table 1

*Services delivered by an faculty learning community portal*

| | |
|---|---|
| Question and Answer | Community Workspace |
| White Pages | Lessons Learned |
| Subject Matter Experts | Site Search Engine |
| Professional Development Activities | Community Management Tools |
| Library | Other Related Communities |
| Best Practices | |

Source: Sherer et al., 2003.

Wenger, et al. (2005) note, "One critical role of technology then is to provide new resources for making togetherness more continuous in spite of separation in time and space" (Wenger et al., 2005, p.2). This sense of togetherness in a virtual space can be said to emerge from authentic communication about real problems (Johnson, 2001).

Thus, persuasive technologies can facilitate development of social norms for CHW practices. They also allow the delivery of new, targeted content (Guile, 2002) such as for the development of self-efficacy through vicarious experience. For example, vicarious experience may be provided through videos of expert CHWs in realistic scenarios performing specific tasks. Discussion boards and chat functions can support both development of efficacy for a practice and community norms and meaning around the practice. Video content can be produced both from external sources and internally by the community of practice members. Interaction through a web portal allows synchronous and asynchronous interaction when time constraints and distance make face-to-face

interactions difficult. An online resource can also be accessed at any time and thus allows just-in-time learning (Fogg, 2003).

## II. Learning through communication

Participation in an online community involves interactions among community members using various modes of communication (blog, chat, discussion, video, link, etc). The development of norms and skills for practice within that community require that the communications create learning. Research on learning and communications provide some guidance for designing technology-based workforce development interventions for health care workers.

### Defining communication and learning

The terms 'communication' and 'learning' have broad meaning and application in research, and so require definition for the present purposes. Two often-used measures of learning are acquisition of new knowledge and reduction of misconceptions (Stacey & Gooding, 1998) suggesting that learning is the process by which a person acquires new knowledge *and* reduces inaccurate understanding. Marx et al. (2007) state, "To communicate is to transmit an idea so that it is satisfactorily understood and, typically, used to guide action" (p. 47). This definition of communication adds a dimension of evidence to learning such that the effect of a learning communication can be evidenced by an action that demonstrates the nature and level of learning. Engeström, Virkkunen, Helle, Pihlaja and Poikela (1996) maintain that work-related learning *also* involves creation of new knowledge. Relevant to these definitions is the common operationalization of communication in learning situations as 'interaction' (Curtis & Lawson, 2001; Stacey & Gooding, 1998; Webb, 1989). Thus, I will use these terms

within this context: *communication* involves interactions that transmit ideas to guide action and *learning* involves action that demonstrates acquisition and creation of new knowledge and reduction of misconceptions. To develop an online technology for CHW learning in community, the practitioner must understand the characteristics of peer communications for learning, the nature of cognitive processing and the motivations and context for participation in online learning.

**Peer communications for learning**

In the 1970s, educators began to explore the benefits of having learners work in groups in cooperative or collaborative problem solving (Freire, 2000; Sharan & Sharan, 1976; Slavin, 1980). In contrast to the usual teaching method of the teacher as the primary if not sole communicator, cooperative and collaborative techniques require the teacher to act as a facilitator who creates an environment that stimulates learning through interaction among students in small groups. Researchers have identified specific patterns of interaction in these groups and found some to be effective at stimulating learning and others ineffective (Stacy & Gooding, 1998; Webb, 1989). In a review of nineteen studies on learning mathematics and computer science in small group discussions, Webb (1989) identifies six conditions required for the help received by individual students in small group discussions to be effective (See Table 2.). Webb (1989) stresses that small groups are particularly suited to creating these conditions.

Table 2

*Conditions for help in small groups to be effective (Webb, 1989)*

| | |
|---|---|
| *The help must be:* | |
| 1 | Relevant to the particular misunderstanding or lack of understanding |
| 2 | At a level of elaboration corresponding to the level of help needed |
| 3 | Given at a close proximity in time to an error or question |
| 4 | Understood by the receiver of the communication |
| *The receiver of the help must also:* | |
| 5 | Have an opportunity to use the communication in problem solving |
| 6 | Use the opportunity to put the new knowledge into practice |

Webb's conditions focus on the learning of the receiver of communications. However, she and others also show that verbal behavior in small groups is linked to achievement not only for those receiving information but also for those sharing. Specifically, elaboration, or providing a detailed explanation, is associated with greater achievement (Webb, 1989, 1991).

Others have found that small group discussions create cognitive conflict that brings misconceptions out into the open, stimulating discussion and elaboration and allowing for reduction of misconceptions (Bell, 1993; Stacey & Gooding, 1998). In addition, relatively unstructured complex tasks stimulate higher achievement than highly structured ones possibly because they stimulate greater interactivity, elaboration and content-related discussion (Ross & Raphael, 1990). While most of the studies cited here pertain to small group discussions among children in formal learning settings,

conversation and group problem solving have been found to be effective (and some say essential) mechanisms for peer learning among adults as well (Freire, 2000; Wenger, 2007). For example, online collaborative college courses have been found to elicit the same interaction behaviors as face-to-face collaborative learning groups (Curtis & Lawson, 2001). While interactions are not as rich in online asynchronous communication as they are in person, effective interactions lead to learning when measured by either participants' perceptions (Wu & Hiltz, 2004) or more objective measures (Strijbos, Martens & Jochems, 2004; Tolmie & Boyle, 2000).

**Cognitive processing**

For learning about work practices to take place, learning environments should stimulate decision-making and problem solving about tasks, actions, and procedures in the real life workplace setting (Engeström, 2000; Wenger, 2007). However, these environments "in the wild" (Hutchins, 1996) often provide uncertain or incomplete information for decision-making and trigger specific types of cognitive processes. Learning for decision-making when the information communicated is uncertain or probabilistic differs depending on whether the communication stimulates experiential or analytic processes or both (Marx et al., 2007). Communication that evokes vivid images and strong feelings creates vicarious experience and learning through experiential processing. "Experiential processing relates current situations to memories of one's own or others' experiences" (Marx et al., 2007, p. 48). Experiential processing is said to be stronger or more immediate and can override analytic processing or probabilistic thinking. In such cases, experiential processing can lead to incorrect understanding. That is, communicating an intriguing case may not result in the correct or intended understanding of the probability

of that case for the decision to be made (Marx et al., 2007; Patel, Branch, Gutnik & Arocha, 2006). However, experiential processing can also work in concert with analytic when the probabilistic information is communicated in such a way that it links an intriguing case or cases to a representative outcome. In this way, communication can provide causal interpretation or causal schemas evoked by a vivid case description (Marx, 2007). The experiential information in essence contextualizes statistical probabilities.

Experiential and analytic processes are two types of cognition that warrant attention when considering environments that promote learning. Others are also relevant as they relate to the construction and use of knowledge in settings of group interactions (Greeno, Collins & Resnick, 1996). The field of computer supported collaborative learning (CSCL) has proposed processes involved in 'group cognition' (Stahl, 2005). According to CSCL researchers, 'meaning making' that develops through group cognition is distinct from individual cognitive processes and outcomes, though both are important in learning (Stahl 2000, 2005; Stahl, Koschmann&Suthers, 2006). The focus of much of the CSCL research is in formal learning settings (academic courses that use computer mediated communication technologies), however, CSCL research findings may also provide insight when applied to learning one's work either in face-to-face or computer-mediated contexts (Curtis & Lawson, 2001; Wu &Hiltz, 2004).

Group cognition processes have been illustrated by group interactions in which there is a breakdown of mutual understanding which causes the group to put the specific task of problem-solving on hold to discuss the object of the confusion until shared understanding is co-constructed when each individual agrees, at least to some extent, on the shared meaning (Stahl, 2007). "In this way, 'group cognition' is not something that exists

outside of the interaction, but is a gradually emerging accomplishment of the group discourse itself" (Stahl, 2007, p. 655).

Stahl (2007) proposes thirteen *pre-conditions* to consider when designing an environment for group learning. According to Stahl (2007), CSCL environments must provide for:

1. *intersubjectivity* – the willingness and ability of participants to interact with others as peers.
2. *an opening of interaction space* – a virtual world where interactions can take place and in which there is shared meaning shaped by context, symbols and words (deictic, semiotic, semantic).
3. *an object of activity* – a reason or motivation for interaction.
4. *shared intentionality* – agreed upon processes or goals to work toward together.
5. *an historical interpretive horizon* – shared "understanding of historically evolved meanings" (Stahl, 2007, p.660).
6. *shared background culture* – a shared language and symbolic and domain knowledge.
7. *member methods for social order* – shared ways of interacting.
8. *designed affordances of infrastructure* – the intended as well as creative use of technological features of a CSCL environment.
9. *dialogic inter-animation of perspectives* – the bringing together of diverse perspectives.
10. *creation & interpretation of group meaning* – the process of co-construction of meaning.

11. *group-regulation & group meta-cognition* – "methods for proposing, negotiating, discussing, adopting and reflecting upon [a] path of inquiry" as well as "methods for explaining [one's] work…"(Stahl, 2007, p.660).
12. *individual learning & interpretation* – individual reflection and participation in group co-construction of meaning.
13. *motivation and engagement* – social engagement of individuals as a community.

The descriptions above of each precondition are necessarily brief as a detailed discussion is beyond the scope of this paper. Nonetheless, the preconditions are presented here in their abbreviated form to convey that for a computer mediated communication-based learning environment to produce group cognition, it must be designed to create both context and motivation. That is, a social learning system for the development of practice in a community of CHWs must inspire content-relevant social learning communications.

**Context and Motivation**

Both macro elements such as organizational culture and structures (Fuller, Hodkinson, Hodkinson & Unwin, 2005; Sharples, Taylor & Vavoula, 2005; van den Hooff & de Ridder, 2004) and more micro elements including the content of communication interactions and the physical, social and technology-based space in which they take place have been considered when exploring context (Fuller et al., 2005; Kienle, 2006; Sharples, et al., 2005; Strijbos et al., 2004; van den Hooff & de Ridder, 2004). Sharples, et al. (2005) present an Activity Theory-based framework for analyzing mobile learning that includes macro-level context as a key factor. They describe mobile learning "…as a labile process of 'coming to know' through conversation in context, by which learners in

cooperation with peers and teachers construct transiently stable interpretations of their world" (Sharples et al., 2005, p. 8). As such, context is an emergent property of the learning activity system as people engage their surroundings including with other people and tools to create a learning environment.

When considering the learning of one's work, it is also important to explore the effect of the context created by organizational structures and power relations within the workplace. This organizational context has a direct effect on how and whether co-workers are involved in learning interactions such as group problem-solving (Fuller et al., 2005) or behaviors such as information hoarding that limit interactions and learning (Osterloh & Frey, 2000). In an online environment, organizational context is relevant to those involved in the environment, what roles people play online, and whether participation is required. Organizations also provide a context that can be more or less supportive of formal learning opportunities outside of the workplace (Fuller et al., 2005).

Establishing context has been recognized as an important determinant of learning in online communications especially when participants do not also interact in a face-to-face environment (Kienle, 2006; Wasko & Faraj, 2005; Wu & Hiltz, 2004). In computer-mediated communication environments, interpretation of context influences how each participant shapes content and understanding and, thus the types of interactions in which they participate. Communicators must have a sense of the context of their communications and part of the context is the knowledge held by their communication partner(s) (Kienle, 2006). Thus, an online environment for a CHW community must provide information about the experience or expertise of each participant.

Motivations can be either intrinsic (emanating from personal values or goals) or extrinsic (defined by an outside person or entity) to the individual. Intrinsic motivators such as altruism and personal goals are found to be more powerful than extrinsic for generating creativity and learning in workplaces (Osterloh & Frey, 2000). However, the research in online course discussions has found that instructor involvement (an extrinsic factor) is associated with motivation for students to participate (Strijbos et al., 2004; Wu & Hiltz, 2004). Researchers in business economics recommend that organizations stimulate both intrinsic and extrinsic motivations in the workplace to balance negative outcomes of either alone (e.g. misplaced effort to receive rewards or pursuing personal goals at the detriment of the organization's goals) (Osterloh & Frey, 2000).

Motivation to participate in a learning environment is closely linked with context. Institutional trust in the communication climate has been found to be an important motivator for participation in virtual communities of practice in business (Ardichvili, Page & Wentling, 2003; van den Hoof & de Ridder, 2004). Institutional trust is "based on the belief that necessary structures are in place which will ensure trustworthy behavior of individual members, and protect the members from negative consequences of administrative and procedural mistakes" (Ardichvili et al., 2003, p. 73). When individuals feel safe to participate, other factors have been identified as motivators for donating knowledge, seeking knowledge and collaborating to create new knowledge (Ardichvili, 2008; Ardichvili et al., 2003; van den Hoof & de Ridder, 2004; Wasko & Faraj, 2005; Wu & Hiltz, 2004).

Wasko & Faraj (2005) investigated motivation for participation in an online forum provided by a professional organization for its members. This case contributes to our

understanding of participation distinct from the research on groups where participants share an identity, norms and meaning based on close social ties (Wenger, 2007) such as in communities of practice among workers in the same organization (Ardichvili et al., 2003) or students working on collaborative problem-solving tasks (Stahl, 2005). In the community of practice and distance learning literature, interactions are understood to follow rules of social relations including developing and maintaining social status and reciprocal relationships (Wenger, 2007). In the networks of practice studied, Wasko and Faraj (2005) asked why individuals would participate with others *not* directly involved in one's social or professional circle and with few possibilities for reciprocal actions and no apparent consequences for not reciprocating. They found that developing one's professional reputation was an important motivator for those who responded to requests for information. Theories of social relations applied to the network, too. The development and management of social capital promoted knowledge creation and contribution in the network (Wasko & Faraj, 2005). Per Wasko and Faraj (2005), social capital develops out of cognitive capital (knowledge and shared meaning among participants), structural capital (social ties created in participation) and relational capital (positive relationships based on identity, trust, obligation, and norms). Cognitive capital is similar to two of Stahl's preconditions for group cognition: historical interpretive horizon and shared background culture (Stahl, 2007) and creates a context for participation. The development of structural capital–a measure of the connections created through posting and responding in the network–requires a critical mass of a core group of participants who post frequently. Communication interactions develop out of and create relational capital from which emerge learning and innovation (Wasko & Faraj, 2005). This study

suggests challenges for creating the context and motivation for participation in a social learning system for CHWs. First, CHWs work in diverse settings, on diverse health issues, and some, with culture-specific populations. It may be difficult to provide the precondition of a historical interpretive horizon or to presume a shared background culture. In addition, Wasko and Faraj (2005) studied a community of practice of a large organization and found a relative few core participants who posted with any frequency. The community of CHWs in Houston, Texas, is relatively small in comparison and may not provide the numbers to create a vibrant community. These barriers further suggest the need for careful attention to the design of the online system.

### III. Interface design

Development of one's skills and knowledge for performing in a job is both formally constructed and informally acquired. However, workplace environments are rarely designed specifically to support communications involved in learning. An increasing number of businesses are deploying online technologies such as intranets and knowledge management systems that include computer mediated communication functions to support learning of employees (Kienle, 2006). However, many of the systems used for organizational learning are designed as knowledge repositories rather than for learning purposes and their effectiveness for learning is not monitored by the organizations that implement them (Kienle, 2006; Strijbos et al., 2004). Furthermore, these implementations of technology generally do not have structured tasks and are not designed to provide either intrinsic or extrinsic motivations for participation (Kienle, 2006; Osterloh & Frey, 2000; Strijbos et al., 2004). Virtual communities of practice for workforce development have often been designed for function, but not knowledge creation, group cognition,

context, motivation and learning. A first step in designing for learning is to understand and design for the intended users of the application.

**User-Centered Design**

User-Centered Design (UCD) is a process to incorporate the user perspective and capabilities and the environmental constraints of the workflow into technology design (Mao, Vredenburg, Smith & Carey, 2005; Norman & Draper, 1986; Schumacher & Lowry, 2010). Through UCD, the designer applies established design heuristics while addressing user-specific characteristics and needs. UCD is an iterative process that involves engaging users at multiple points in the design process. The culture of the user affects how and, indeed, if a technology is used (Ardichvili, 2008; Ardichvili, Page & Wentling, 2003). Therefore, the design of a technological system must take into account not only the visual aspects of an interface, but what technologies are acceptable to the users and when and how users might access the system. UCD principles instruct developers to actively explore and incorporate the perspective of the intended users of a technology into the design process.

The TURF Framework is a UCD approach that focuses on assessing four components of the work domain in which the technology is to be deployed–tasks, users, representations, and functions. The goal is the development of useful, useable and satisfying systems (Zhang & Butler, 2007; Zhang & Walji, 2011). According to UCD principles, the interface for a social learning system for CHWs must be based on an understanding of their work and the social context of their current learning and interactions. The design of the system should motivate interactions that support norm development and self-efficacy for work practices.

## Summary

The design of environments to support learning can be informed by research in the education, cognitive science, computer-supported collaborative learning and knowledge management domains. From education research on small group discussions we know that conditions for learning involve interactions, elaboration and practice and that both givers and receivers of information derive gains in knowledge and skills from these interactions. Content is also important as the cognitive scientists describe the importance of fitting the type of communication content to shape understanding and action. Experiential and analytic processing together can produce a more accurate understanding of uncertain information. In CSCL environments (at least) group cognition is supported by and stimulates learning at the individual level, but requires preconditions to establish context and motivation to participate in the learning environment. The research on CSCL has focused on course work that is at least minimally extrinsically motivated. Computer-mediated communication applications in the workplace, in contrast, often are not designed for motivation, but rely on large pools of employees from which a relatively small proportion can create a lively, effective discourse. The implications for developing environments that support learning communications among smaller profession or trade cohors or across communities of practitioners that are few and dispersed are not clear. Little is written about the development of content and resources in conjunction with stimulating unscripted, intrinsically motivated interactions for workplace learning. However, research on the communication of probabilistic information for improving decision-making suggests, well-designed content that evokes accurate causal schemas may have a place in workplace learning.

A social learning system can create the conditions for learning through communication. Social networking technologies that allow communication across time and space among CHWs who do the same work/perform the same practices can create conditions for norm development through legitimate peripheral participation. Externally created content that simulates a shared practice and stimulates interactions can create conditions for the development of self-efficacy and the skills for that practice. Ultimately, the development of the practice emerges from change at both the individual and group levels. (See Figure 2.)

The online social learning system proposed by this research should stimulate learning communications for knowledge sharing, creation of new knowledge and reduction of misconceptions among a community of CHWs requires attention to many factors of the context of the work. Key prerequisites include:

- institutional trust in the communication climate,
- CHW opportunities to interact in the community,
- rich content relevant to the knowledge needs of CHWs,
- frequent valued interactions by a stable core of participants,
- shared identity, norms, and meaning,
- opportunities for individuals to build their reputation and further personal goals,
- opportunities for individuals to work toward workplace goals.

Use of a moderator should be considered as a figure similar to the instructor in education settings that provides extrinsic motivation for participation. However, careful selection of the moderator is warranted to maintain the context of institutional trust.

Much of the research presented here has been with academically accomplished and technically comfortable populations in large companies where communities of like practitioners exist in large numbers. Research is needed to explore how these requirements for workplace learning environments apply to vocational and paraprofessional workers or for those who must look across organizations for community.

## Chapter 3: Preliminary studies – Designing a Social Learning System for Community Health Workers in Houston, Texas

The purpose of the research project was to advance our understanding of designing Internet technologies for workforce development in health care. Specifically, we wanted to answer the question:

- Can a social learning system designed following User-Centered Design principles motivate learning interactions for practice development among community health workers?

The research was conducted in four stages: 1) user analysis, 2) system design, 3) user testing and 4) pilot study. The formative research followed an iterative User-Centered Design approach. We completed a user analysis to determine characteristics of CHW work, training and use of mobile technologies. The system was then designed for CHWs in Houston, Texas including customized content and elements in the system interface. Usability tests identified barriers to the system, which was then re-designed accordingly. Summative research was conducted in the form of a pilot test to identify whether the system design could motivate the types of communications we hypothesized are necessary for practice development. This chapter describes the first three stages of the research. The pilot is described in Chapter Four.

### I. User Analysis of CHWs in Houston, Texas

The goal of the user analysis was to describe CHWs in Houston, Texas with regards to relevant aspects of their work life, training and technology experiences. The user analysis

was comprised of three parts each designed to provide detail about a specific area of the CHW work:

1. CHW literature review – the literature provided context and background by answering the questions: What is known about the work CHWs do, what is their role in the health system, and how are they trained?
2. CHW Questionnaire – the questionnaire gathered details of the experiences of the intended users–*local* CHWs–by exploring the questions: What training content is of interest to local CHWs? How are local CHWs trained? What information and communication technologies do they use in their work and at home? And, How do they communicate with other CHWs to learn the job?
3. Ethnographic observations – observations added context to data collected with the questionnaire. The observations were used to answer the questions: What technologies are used during the day-to-day work of CHWs? Do they communicate with other CHWs during the workday? What types of tasks do they do, in what settings and with what populations?

**CHW literature review**

Articles for review were obtained through a search of PubMed and Google Scholar using the MeSH term 'community health worker' and key words 'patient navigator' and 'lay health advisor' in combination with 'training' 'workshop' and 'workforce development'. The articles were used to develop the following description of CHW practice and training.

**Who are CHWs and what do they do?** Community Health Workers are community-based, lay people who assist others in their community in overcoming

barriers to good health and health care services (Calhoun et al., 2008; Lewin et al. 2009; Marr et al., 2008). They have been recognized by the Institute of Medicine (Richardson et al., 2001; Smedley et al., 2003) as an important bridge between health information resources and communities that experience an excess burden of disease. A recently updated Cochrane review documented the effectiveness of CHW programs for increasing immunization uptake, promoting breastfeeding, improving TB outcomes, and reducing morbidity and mortality due to childhood illnesses (Lewin et al., 2009). Clearly, CHWs are enlisted for a wide range of programs for community health improvements. CHW programs have been shown to improve diabetes control in Mexican American individuals with type 2 diabetes (Lujan et al., 2007; Thompson and Flores, 2007), and to increase cancer survival rates through more timely screening, diagnosis and/or treatment in communities that experience disparities in cancer outcomes (Dohan & Schrag, 2005; Fernández et al., 2009; Parker et al., 2010; Percac-Lima et al., 2009). In addition, CHWs have been employed to reduce inappropriate use of emergency rooms by linking people to medical homes (Griswold, Homish, Pastore & Leonard, 2010; Marr, Pillow & Brown, 2008).

**What is the CHW role in the health system?** The Institute of Medicine and other health services experts have recognized community health worker interventions as a strategy for reducing health disparities and improving the cultural competency of health systems (Brach & Fraser, 2000; Smedley, Stith, Nelson & Care, 2003). The evidence for community health worker programs in reducing health disparities is compelling (Lewin et al., 2009; Rhodes, Foley, Zometa & Bloom, 2007). Health disparities have been attributed not only to differences related to health care access, but also to poorer quality

of care (US Department of Health and Human Services, 2005), discrimination (Smedley et al., 2003) and low health literacy (Committee on Health Literacy, 2003). Research suggests that successful community health worker practice leads to improved patient-centered care in health care settings (Heisler et al, 2009; Naar-King, Outlaw, Green-Jones, Wright, & Parsons, 2009). Brach and Fraser (2000) describe the community health worker intervention as a technique for improving the cultural competency of health systems and reducing health disparities for minority populations.

**What type of training do CHWs need and receive?** In 2003, the American Association of Diabetes Educators (AADE) published a position statement on the inclusion of community health workers on the Diabetes Self-Management Education team. They recognized the important role the diabetes community health worker (DCHW) plays both in communicating with community members about diabetes care and with medical staff about the community and family. The statement put forward eight recommendations for creating a process that supports DCHWs (AADE, 2003). Two of the eight recommendations relate directly to supporting the DCHWs needs for development of shared knowledge and skills for their job:

- "Support opportunities for core skills and competencies training, and continuing education for DCHWs
- Establish mechanisms to facilitate networking among diabetes educators and DCHWs to learn from their shared experiences and expertise" (AADE, 2003, p. 822)

While the focus of interest in this statement was diabetes, the types of skill sets addressed are typical of any CHW job: a need for domain knowledge and appropriate

communication and interpersonal skills developed through shared experience (Glenton et al., 2013; Wiggins & Borbón, 1998). However, there is limited research about the training of CHWs and descriptions of training in the literature indicate it varies widely between programs (HRSA, 2007; Lewin et al., 2009; Rhodes et al., 2007).

***Training in communication and interpersonal skills.*** As is evident from the literature, much of CHW work involves communication and interpersonal skills as they elicit information from clients to identify appropriate services and deliver health education and promotion services in communities (Calhoun et al., 2008; Duffy et al., 2004; Glenton et al., 2013)). However, even when a CHW works in an environment with other CHWs, he or she may not be able to observe sensitive interactions with patients due to privacy laws or social convention. For example, a CHW preparing to discuss safe options for accessing health care for a victim of domestic abuse may not have directly observed another CHW in the same situation. These are constraints to self-efficacy development through modelling or vicarious experience. However, interventions can provide vicarious experience by simulating the real world that is otherwise unavailable for observation (Gist & Mitchell, 1992) due to physical, social or legal constraints. Thus, having viewed a video of a colleague or actor in a simulated version of a similar conversation, the CHW can refer to the memory of that experience. The experience in the video informs the CHW's understanding of performance strategies and expenditure needed to have the same effect and contributes to her self-efficacy for performing the task and attaining the intended outcomes.

**CHWs and technology.** The use of a social learning system for CHW practice development, presumes CHWs have access to mobile technologies. There is little written

about CHW technology use, so we looked to literature about the communities from which CHWs come. CHWs tend to be from minority, low income communities that historically have been described as affected by a "digital divide" (Fox & Livingston, 2007). However, with the increasing availability of broadband access and use of mobile devices to access the Internet, populations that have been excluded from Internet technologies in the past are getting on line (EIU, 2013; Rainie, 2013). These characteristics of CHWs suggest that an online social learning system could overcome barriers to training for CHWs.

**CHW Cross-sectional Questionnaire**

From the literature review, we determined a need for a means to train CHWs. An online social learning system provides one such means. To determine willingness to participate in such systems as well as to determine the initial content for the tool, we 1) informally interviewed key informants in the CHW community, and 2) reviewed an existing curriculum used for training CHWs. The key informants included supervisors and program directors at agencies with CHW programs as well as administrators at training institutions designated by the State of Texas as official providers of CHW certification education.[2] The informal interviews were conducted to understand current curricula content and training needs as well as to determine logistics for recruiting participants for the research. Following these activities, we determined that communication skills for handling sensitive topics with clients would be appropriate content for the pilot of the

[2] Texas Administrative Code Title 25, Part 1, Chapter 146 and the Health and Safety Code, Chapter 48 gives the Texas Department of State Health Services the authority to operate a training and certification program for community health workers and *promotores de salud*.

social learning system. Furthermore, we decided that regularly-offered CHW continuing education workshops would provide an opportunity to recruit CHW participants without the potential of their feeling coerced to participate by a supervisor or other gatekeeper to the work setting.

Next, we wanted to determine how CHWs currently learn communication and interpersonal skills, what topics they find sensitive to address and how they use technology. We administered a questionnaire to a cross-section of CHWs attending the previously mentioned training workshops. The 40-item self-administered structured questionnaire had four sections: Training Content, Learning to be a CHW, Technology Use and Demographics. Each section was developed based on the following considerations.

**Training Content.** The first section of the questionnaire solicited information relevant to the development of the training content. To be user-centered and motivate interaction, a social learning system for CHWs must present training content of interest and relevance to the CHW participants. Based on conversations with CHW trainers and supervisors, the research team decided that the training content would focus on communication skills. The need for training on specific communication strategies was confirmed with a review of a continuing education curriculum for CHWs that was found to lack this content. The questionnaire asked CHWs respondents to identify in free text two topics of conversation they or their clients find difficult to discuss. Follow-up questions elicited the frequency they encounter each topic and reasons the named topics were difficult.

**Learning to be a CHW.** This section of the questionnaire included questions about formal and informal training, including communications with other CHWs and whether they incorporate the experiences of others into their work. These questions were intended to help gauge the types of training received, whether they perceived a need for training in general and the value they placed on learning from one another, specifically.

**Technology Use.** The third section of the questionnaire covered experience and comfort with different types of technology and social media. It was important to know if the CHWs had access to the Internet and personal computers and the skills to use them. Questions also assessed what other technologies might be appropriate and accessible to the population including cell phones, texting, computers, e-mail, Internet and web-based social networks.

**Demographics.** The final section of the questionnaire captured demographic data of the respondents. Demographic data not only included age, gender, and ethnicity, but also requested CHW certification and employment status. Respondents also self-identified their position or job title. These data inform the use of graphics, language and scenarios for the training content in the social learning system with the intent of reflecting the intended users and making them feel like the website was for them and by them. The demographics also would allow comparison of the survey respondents with the eventual system users.

The Harris County Hospital District (now Harris Health System) and Gateway to Care, Inc. are certified providers of continuing education for CHW certification. They provide free continuing education workshops that are attended by both CHWs who have earned certification and those who have not. The questionnaire was distributed to a convenience

sample of CHWs at six continuing education workshops provided by Harris County and Gateway to Care, Inc. in the spring of 2012. (A copy of the questionnaire is included in Appendix A.) The questionnaire was available in both English and Spanish. Consent was obtained by returning the anonymous questionnaire to a folder on an unattended table. That is, by returning a completed questionnaire, the respondent consented to use of their responses in this research. No personally identifiable data were collected on the questionnaires. The University of Texas Health Science Center at Houston Committee for the Protection of Human Subjects approved this process.

**Ethnographic Observations**

In addition to the questionnaire to broadly determine CHW training, experience and willingness to adopt technology, we needed to determine how well a social learning system might integrate within the work of CHWs. To that end, we completed ethnographic observations of CHWs at work. Four ethnographic observations were conducted at CHW work sites. The observational data add context to questionnaire responses by allowing the researcher to see how and when the CHW might use social media and communication technologies during the workday and with whom they communicate. Observation data were gathered with a structured form that focused the observations on types of communications and use of communication technologies as well as with whom they are communicating. Participants were recruited at the continuing education workshops described in the previous section of this document. Each observation was conducted for four hours during a "typical" workday for that CHW. Variables included the site, the clients served (typically and during the observation period), potentially difficult topics in the work domain, communication skills observed,

modes of communication used, information sources accessed and communications with other CHWs. In general, the observations add richness to the survey data, providing context to the User Analysis.

**Data Analyses**

For the questionnaire, descriptive statistics were generated using the statistical package IBM SPSS Statistics 19®. The ethnographic data were collected using a structured form (adapted from one designed by Parker et al. (2009)) and grouped thematically in a matrix according to the variables of interest noted above.

**CHW Questionnaire Results**

Forty-three CHWs completed the questionnaire. Their responses follow.

**User Demographics.** The typical respondent was a 45-year-old Latina woman with four years of experience as a CHW (Table 3).

Table 3

*Demographics of Questionnaire Respondents (n=43)*

| | | |
|---|---|---|
| Race/Ethnicity | Latino | 27 (63%) |
| | Black | 12 (27%) |
| | White | 4 (10%) |
| Survey Language | English | 27 (63%) |
| | Spanish | 16 (37%) |
| Age | Mean | 45 years |
| | Median | 43 years |
| Gender | Female | 39 (91%) |
| | Male | 4 ( 9%) |
| Experience as a CHW | Mean | 4 years |
| | Median | 3 years |
| | Minimum | < 1 year |
| | Maximum | 16 years |

The respondents were most likely to call themselves "Community Health Workers" (31%), but also used the terms "Promotor/a de Salud" (14%), or "Patient Navigator" (5%) and many used other terms (36%) or did not respond to the question (12%). This was important to know for the proper use of terms in the learning system content.

**Difficult topics.** Participants were asked to broadly describe topics that are difficult for them or their clients. Such responses suggested topics for the content of the training in the system. CHWs named 22 topics they encounter as difficult for them or their clients. (See Figure 3.) The topics covered five categories:

- Sexual health (N=17, 20%)–HIV, STD, safe sex, HPV, abstinence, contraception
- Domestic violence (N=12, 14%)–domestic violence, child abuse, sexual violence
- Health care access (N=11, 13%)–finances, health care access
- Immigration issues (N=7, 8%)–immigration issues, legal issues
- Mental health issues (N=7, 8%)–addiction, mental health

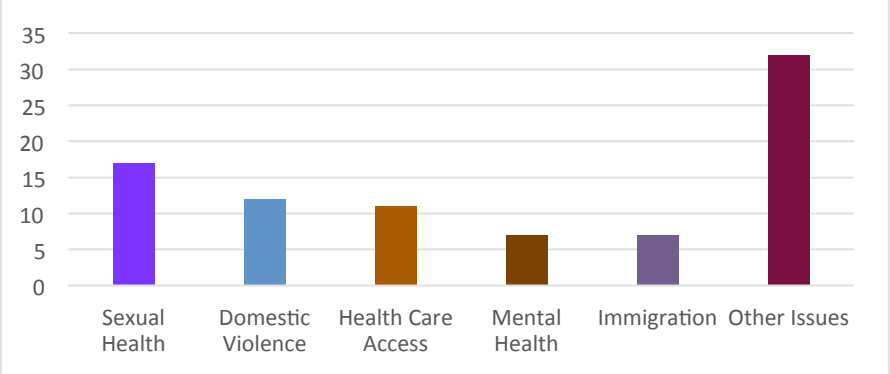



Figure 3. Difficult topics commonly identified by CHW respondents

These were the most common responses. Other responses (37%) included specific chronic diseases like breast, cervical and prostate cancer and diabetes, religion, illness,

terminal illness and weight management. These topics were pretty common with almost half of the CHWs estimating they talk about these difficult topics with more than 50% of their clients. More than half of the CHWs said the topics they listed were difficult to discuss because they make the client uncomfortable and about a third said the setting for the conversation may not be appropriate. Some of the topics were listed because they made the CHW uncomfortable and some because of cultural reasons.

**Learning to be a CHW.** Thirty-six of the CHWs who responded to our survey said they had ever held a job as a CHW. More than half (58%) learned the job through agency-provided-training and 28% watched or shadowed other CHWs on the job. When all respondents (whether or not they had ever worked as a CHW) were asked about formal training, it was not surprising that certification workshops and continuing education workshops topped the list (76% and 79%, respectively) given the location of the questionnaire administration.

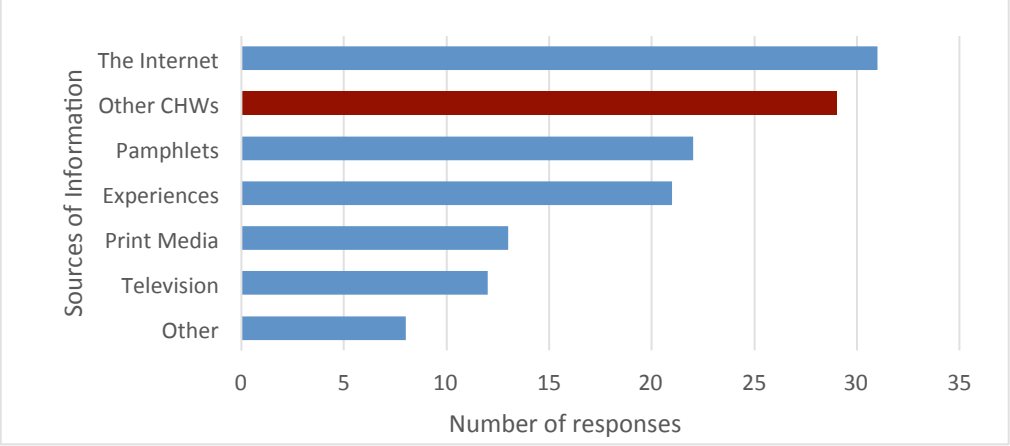



Figure 4. Sources of information CHWs used to learn their jobs

When asked about learning their jobs outside of formal training, "Other CHWs" were an important source of information (Figure 4). To determine access to peer learning and the

Table 4

*Frequency of communication between CHWs*

| Communicate with CHWs at | | |
|---|---|---|
| | *Own Agency | Other Agencies |
| At least once a day | 27% | 5% |
| Every other day | 7% | 10% |
| Weekly | 29% | 10% |
| Once or twice a month | 32% | 68% |
| Not once a month | 0 | 0 |
| Never | 0 | 8% |

* Four percent were the only CHWs at their site.

willingness to share and learn from other CHWs, we asked how frequently they communicated with CHWs both in their agency and in other agencies. Communication with other CHWs even within their own agencies was infrequent (Table 4). This suggests that providing access to other CHWs in a social learning system to share knowledge and develop norms may be desirable for CHWs.

The proposed SCT-SLT Theoretical Framework suggests that a social learning system can promote the development of self-efficacy for a task by fostering discussions among CHWs about their personal experiences successfully completing the task, in this case, handling a difficult topic. We wanted to know if the CHWs were already thinking about the experiences of others for this task and who those others might be. Overwhelmingly, they referred to others when performing this task: 100% agreed or strongly agreed that

they thought of strategies used by CHWs in their agency, 98% agreed or strongly agreed they thought of CHWs in the community and 93% agreed or strongly agreed they thought of other people like a trainer, coworker or nurse.

**Technology Use**. We found that CHWs use several types of information and communication technologies (ICTs) on a daily basis. Most had an e-mail address (98%) and access to a computer (97%) and the Internet (97%). Cell phone use (98%) and even texting (74%) was nearly ubiquitous. More than half belong to some sort of Internet-based social network. (See Table 5.) These results suggest that the CHWs have access to the technologies we were considering for the social learning system.

Table 5

*Social networks in which CHWs were members*

| Social Network | N* | % |
|---|---|---|
| Facebook | 25 | 58% |
| MySpace | 3 | 7% |
| CHW Network on Ning.com | 21 | 49% |
| Hi5 | 2 | 5% |
| Other network | 6 | 14% |
| None | 10 | 23% |

They also suggest familiarity with social networks, however a many (n=10, 23%) were not engaged online with a social network. So, a good portion of potential participants

might not be motivated or comfortable using a social network-like system to communicate in a learning community.

**Ethnographic Observations Results**

Observations took place in four CHW work settings (See Table 6.) including a low income housing complex for the elderly and disabled, a supplemental food clinic for women and children, a community center and a church.

During the observations, the CHWs encountered many of the difficult topics stated by respondents to the questionnaire including financial issues, domestic violence and cancer.

Table 6

*Factors effecting communication in settings where CHWs work*

| Site | Communication Skills | Communication Modes | Information Sources | Communication with CHWs |
|---|---|---|---|---|
| Apartments for elderly, disabled, low income | Eye contact, restating, listening, reframing, humor | Face to face, phone, e-mail | Internet, resource directory, paper records | Modeling, face to face, e-mail, phone |
| WIC clinic, low income, young families | Empathy, problem-solving | Face to face, e-mail, phone | Internet, paper and electronic records | none |
| Community Center eligibility assistance | Conveyed that the topics are normal. | Face to face | Paper records | Face to face |
| Church health fair drama for Hispanic families | Modeling, role playing, active listening | Face to face | NA | Face to face, CHW team |

Other survey results were reinforced, as well, including the use of the phone, e-mail, Internet and printed sources of information for their work. The different settings and tasks involved varied modes of communication but face-to-face was the most common. In three of the four cases, CHWs were observed interacting with other CHWs. The case studies further suggested a perceived need to interact with other CHWs and limited access for doing so. While two CHWs accessed the Internet during the observation period, two did not and also did not have access to a computer during the time. These results could indicate limited access to the technology needed for participating in an online social network during work hours for at least some of the intended participants.

### 2) System Design – Designing for CHWs in Houston, Texas

The challenge for the next stage of the project was designing a fully functional Internet-based social learning system that addressed the content and representational needs of CHWs.

**Following the TURF Framework**

The user analysis in Step 1 provided the basis for understanding the CHWs who were the intended users of the social learning system. The TURF Framework was used to systematically incorporate the findings from the user analysis into the design of the system.

In applying the TURF Framework to the design phase of this project, we focused on the underlying assumptions of the model:

*Tasks – Keep tasks simple (cognitively and operationally) and include only those needed to perform the functions afforded by the system.* The essential tasks for this system would be communication among the users and viewing training

videos that included content around which the CHWs would interact authentically thereby developing norms, knowledge and self-efficacy.

*Users – Design for user needs, knowledge, experience and perceptions.* The CHWs in the questionnaire and observations valued communications with other CHWs, so we needed to make communications easy. CHWs of all experiences were interested in learning from one another. We also wanted to focus the content on the topics identified by the CHWs as "difficult" for them or their clients.

*Representations – Make available tasks and functions obvious and as directly accessible as possible. Follow well-established design heuristics. Include graphics appropriate for the users.* The survey identified the CHWs experiences with social media and suggested that posts and comments such as on a "wall" in Facebook ® would be a familiar form of communication for them.

*Functions – Identify and provide the functions the users need and want. Avoid "overhead" functions dictated by the technology not by need.* In addition to providing functions for the essential tasks of communication and video watching, we anticipated a need for instruction on how to use the site.

**Implementing the Design**

The user analysis was used to design the prototype social learning system (See Figure 5 a-d at the end of this Chapter.). The data guided the design with regards to the appropriate technology for delivering the system, the tasks and functions needed, language to be used, the content for training, and the graphical representations.

**Technology.** A storyboard/mock up was developed of a potential structure and functions for a CHW social learning system based on the user analysis. After a review of

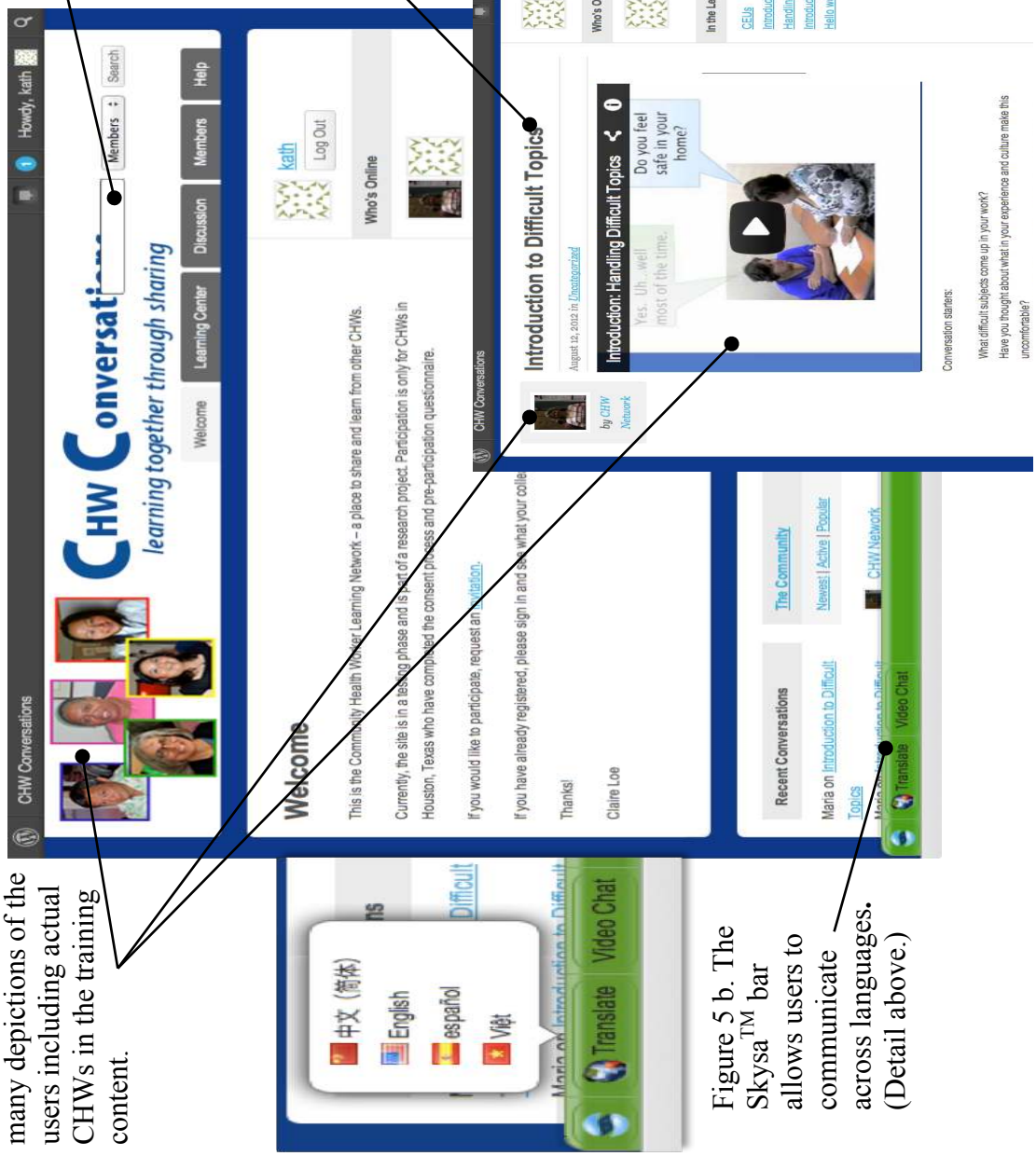
open source content management software, the blogging software WordPress© (www.wordpress.org) with the BuddyPress© social networking plug-in (www.buddypress.org) were selected as most closely fitting our design needs. While someone with limited html and programming skills can use the software, customization is limited for the novice programmer.

**Tasks and Functions.** Key functions within the social learning system include private and public messaging between members; posting of comments and replying to comments on posted video content, ability to start a discussion separate from training content (forum); access to live help and documentation for how to use the system; ability to translate (some) content.

**Graphical Representation.** Graphics were customized to reflect the cultures and diversity of the users. Custom graphics in the logo show people similar to the users. The training content includes images of actual CHWs in realistic scenarios. Participants were required to use real photos of themselves as their avatars. (See Figure 5 a.)

**Language.** The website was called CHW Conversations to emphasize both the audience and the purpose: to foster conversations among CHWs about CHW practice. Non-technical language is used throughout the system. For example, what would typically be labelled as a Forum is available under the "Discussions" Tab. In addition, as one-third of the potential users prefer to use the Spanish language, we have incorporated the Skysa™ Bar which allows easy access to Google Translate™ services. Members can translate comments of others into their preferred language and reply. This feature allows for multilingual conversations. (See Figure 5 b. and c.)

Figure 5. Customized elements of the design of CHW Conversations



**Content.** The training video content focused on the difficult topic of domestic abuse that was identified by CHW respondents to the questionnaire. While the videos were developed from slide presentations with voiceover, they were highly graphical in nature, showing real CHWs with clients (actors) and graphics that illustrated the content.

**Limitations to the design.** The social learning system was developed using WordPress® technologies and associated plug-ins including BuddyPress®. These technologies allow for significant customization especially if one is proficient working in the php scripting language and Cascading Style Sheets. The design customizations outlined above were implemented in the system. However, due to practical constraints of the technology, it was not possible to make changes to some layouts such as on the profile pages of users. As described, to the extent possible, the site was customized to incorporate tasks, functions and representations relevant to the CHW users. Nonetheless, an initial launch of the system, failed to recruit enough participants for the pilot study as originally designed.

### 3) User Testing – Discovering What Works and Where the Barriers Lie

First pass efforts at launching the system were met with unanticipated obstacles. In response to low recruitment, we conducted a follow-up usability study to begin to identify barriers to participation in a social learning network for this population of health workers. Findings could also be relevant for other groups of health care workers.

#### Sample

The sampling frame for this study was the pool of CHWs who had received recruitment e-mails for the original study. Data from the original study were used to categorize potential participants into four groups: A. Users – those who registered for the system,

watched the video and posted at least one comment, B. Barriers in System – those who registered for the system, but never participated (did not comment or otherwise interact with others), C. Barriers to System – those who at least started the consent and pre-questionnaire, but never registered for the system, and D. Barriers to Participation – those who did not access the consent and pre-questionnaire (See Table 7.).

Table 7

*Categorization of study sample by groups*

| Group | Level of Participation in Original Study | N |
|---|---|---|
| A. Users | • Completed consent and pre-questionnaire<br>• Registered<br>• Used the system | 3 |
| B. Barriers in system | • Completed consent and pre-questionnaire<br>• Registered | 5 |
| C. Barriers to system | • Completed consent and pre-questionnaire | 9 |
| | • Started consent and pre-questionnaire | 7 |
| D. Barriers to participation | • Did not access consent and pre-questionnaire | 67 |
| Total in recruitment | | 91 |

The study was conducted in two components based on Group. CHWs in groups B, C and D, were sent a link by e-mail to an online anonymous barriers survey. Members of groups A and B were recruited for guided talk aloud walkthroughs.

**Barriers Survey**

Groups C and D received the same survey that, in addition to demographics, consisted of ten statements to be rated using a four-point Strongly disagree/Strongly agree Likert-like scale. The statements included possible barriers to participation as identified in discussions with certified CHW Trainers and other CHW experts and were designed to differentiate between those due to the constraints of research and those due to system design. The barrier statements were followed by one open-ended question where the CHW could relate any other thoughts they had on the subject. The barriers survey for group B was the same as for groups C and D except for the exclusion of two items about the consent form and pre-questionnaire being a barrier to the system and the addition of an item about the low number of participants being a barrier.

**Barrier Survey Results.** Sixteen participants responded to the survey, two from Group B, six from Group C and eight from Group D. While the absolute numbers of participants for this study are small, they surpassed our expected response rates given that the sampling frame consisted of those with limited to no participation in the previous study. The groups were very similar to one another with respect to demographics (Table 8). The demographics were also similar to respondents to the CHW Questionnaire. The analysis focused on differences by Groups C and D and by preferred language, certification status and employment status in those groups. Responses by Group B were analyzed separately qualitatively.

Table 8

*Demographic characteristics of study participants by group*

| Characteristics | Group B | Group C | Group D | Total |
|---|---|---|---|---|
| Preferred Language | | | | |
| English | 1 | 4 | 6 | 11 |
| Spanish | 1 | 2 | 2 | 5 |
| Gender | | | | |
| Male | 1 | 1 | 1 | 3 |
| Female | 1 | 5 | 7 | 13 |
| Age (in years) | | | | |
| Mean | 49.5 | 47.83 | 47.25 | 48.2 |
| Range | 42-57 | 39-56 | 37-62 | 37-62 |
| Experience (in years) | | | | |
| Mean | 3.5 | 4.67 | 5 | 4.39 |
| Range | 3.4 | <1-12 | 1-11 | <1-12 |
| Certified CHW | | | | |
| Yes | 2 | 5 | 7 | 14 |
| No | 0 | 1 | 1 | 2 |
| Employed | | | | |
| Yes | 2 | 4 | 4 | 10 |
| No | 0 | 2 | 4 | 6 |
| Race/Ethnicity* | | | | |
| Black | | 1 | 3 | 4 |
| White | 1 | 1 | 1 | 3 |
| Latino/a | 1 | 4 | 3 | 8 |
| Asian | | 1 | 1 | 2 |

Group C: Accessed consent, did not participate in system
Group D: Received link for consent, did not access consent
* A respondent in Group C described herself as White and Latina.

***Comparison by Groups C and D.*** Means for each item were calculated by converting the response categories to the integers one through four with "Strongly disagree" having the value of one and "Strongly agree" four. Thus, a higher mean on any

Table 9

*Comparison of item mean scores of Groups C and D*

| Survey Item | Group | N | Mean | Std. Dev. |
|---|---|---|---|---|
| 1. I was *not interested* in the CHW Conversations website. | C | 6 | 2.33 | .816 |
| | D | 8 | 1.88 | .641 |
| 2. I *did not know how to use* the CHW Conversations website. | C | 6 | 2.17 | .753 |
| | D | 8 | 2.25 | .707 |
| 3. I *did not have time to use* the CHW Conversations website. | C | 6 | 2.33 | .516 |
| | D | 8 | 2.38 | 1.061 |
| 4. I *don't like using the computer.* | C | 6 | 1.50 | .837 |
| | D | 8 | 1.38 | .744 |
| 5. I *don't have access* to a computer all the time. | C | 6 | 1.33 | .516 |
| | D | 8 | 1.38 | .744 |
| I did not use the CHW Conversations website because: | | | | |
| 6. The *consent form and pre-questionnaire were too long*. | C | 6 | 2.33 | .516 |
| | D | 8 | 2.00 | .756 |
| 7. I *did not want to answer* questions on the pre-questionnaire. | C | 6 | 1.83 | .408 |
| | D | 8 | 2.00 | .756 |
| 8. I had *technology problems*. | C | 6 | 1.83 | .753 |
| | D | 8 | 1.88 | .835 |
| 9. I *did not know who else* was participating. | C | 6 | 2.17 | .753 |
| | D | 8 | 2.00 | .926 |
| 10. I *did not know the organizer* well. | C | 6 | 2.17 | .753 |
| | D | 7 | 2.00 | .816 |

given item indicates more agreement with the statement. We expected Group D to be more in agreement to the statements (i.e., agreeing that a factor was a barrier to their participation) than Group C as they were the individuals who did not access the consent and pre-questionnaire at all; however, this expectation was not borne out. As is evident in Table 9, on visual inspection the means are very similar. Chi-square analysis (Fisher's Exact) found no significant differences between Groups C and D on any item. Furthermore, it is notable, that none of the mean scores reach the level of "Agree" (2.5 or above) with any of the statements. The barriers with an average score closest to "Agree" included not having enough time to use the system, not knowing how to use the system, not being interested in the system, and finding the consent and pre-questionnaire to be too long. The statement with which respondents most disagreed related to computer use: "I don't like using the computer." And "I don't have access to a computer." This is not surprising for a survey administered online.

***Comparison by Preferred Language.*** Groups C and D were then combined and analyzed by preferred language (English or Spanish) using Pearson's Chi-Square with calculation of exact p-values (Table 10.). No significant differences were found. However, some important differences were suggested by responses to items two, nine and ten. The average response among Spanish-speakers for these questions was within the value range for "Agree" (2.5, 2.5 and 2.75 respectively). This suggests that some of these respondents experienced barriers to participation because of anticipating that they would not know how to use the website (item two), as well as concerns that they did not know who else would be participating (item nine) including not knowing the organizer well (item ten).

Table 10

*Comparison of mean scores Groups C and D combined by Preferred Language*

| Survey Questions | Language | N | Mean | Std. Dev. |
|---|---|---|---|---|
| 1. I was not interested in the CHW Conversations website. | English | 10 | 2.20 | .789 |
| | Spanish | 4 | 1.75 | .500 |
| 2. I did not know how to use the CHW Conversations website. | English | 10 | 2.10 | .568 |
| | Spanish | 4 | 2.50 | 1.000 |
| 3. I did not have time to use the CHW Conversations website. | English | 10 | 2.40 | .966 |
| | Spanish | 4 | 2.25 | .500 |
| 4. I don't like using the computer. | English | 10 | 1.40 | .699 |
| | Spanish | 4 | 1.50 | 1.000 |
| 5. I don't have access to a computer all the time. | English | 10 | 1.20 | .422 |
| | Spanish | 4 | 1.75 | .957 |
| I did not use the CHW Conversations website because: | | | | |
| 6. The consent form and pre-questionnaire were too long. | English | 10 | 2.10 | .738 |
| | Spanish | 4 | 2.25 | .500 |
| 7. I did not want to answer questions on the pre-questionnaire. | English | 10 | 1.90 | .568 |
| | Spanish | 4 | 2.00 | .816 |
| 8. I had technology problems. | English | 10 | 1.90 | .738 |
| | Spanish | 4 | 1.75 | .957 |
| 9. I did not know who else was participating. | English | 10 | 1.90 | .738 |
| | Spanish | 4 | 2.50 | 1.000 |
| 10. I did not know the organizer well. | English | 9 | 1.78 | .667 |
| | Spanish | 4 | 2.75 | .500 |

***Open-ended responses.*** Most did not provide feedback through the open-ended response question. However, one person suggested more computer training was needed and another said she did not remember receiving e-mails about the study. Two others indicated they thought the website would be a useful tool.

***Group B Barriers Survey Responses.*** Two of the five in Group B responded to the survey. While these data cannot be analyzed statistically, qualitatively they provide insight into the experiences of participants who registered and entered the system, but never interacted with others. The Group B respondents included one who preferred English and one Spanish, one male and one female; both were employed, certified CHWs of similar age (57 and 42 years) and experience (4 and 3 years). Responses to the 9 Likert-like scale items (Table 11) are notable in that they support the suggestion from Groups C and D that not knowing other participants and the organizer may be a barrier to participation for some. They also confirmed the perception that computer use and access are not issues, but time may be.

Table 11

*Group B responses to Barriers Survey*

| | Survey Questions | English-Speaker | Spanish-Speaker |
|---|---|---|---|
| 1. | I was not interested in the CHW Conversations website. | Disagree | Agree |
| 2 | I did not know how to use the CHW Conversations website. | Disagree | Strongly disagree |
| 3. | I did not have time to use the CHW Conversations website. | Agree | Strongly agree |
| 4. | I don't like using the computer. | Disagree | Strongly disagree |
| 5. | I don't have access to a computer all the time. | Disagree | Strongly disagree |

Table 11 continued

I did not use the CHW Conversations website because:

| | | | |
|---|---|---|---|
| 6. | I had technology problems. | Disagree | Strongly disagree |
| 7. | I did not know who else was participating. | Disagree | Strongly agree |
| 8. | There were not enough other people participating | Agree | Disagree |
| 9. | I did not know the organizer well. | Agree | Strongly Agree |

**Guided Talk Aloud Walkthroughs**

As described previously, the design of the social learning system was guided by heuristics for usable, useful and satisfactory design (Zhang & Walji, 2011) combined with the knowledge about the users gained in the cross-sectional survey and ethnographic observations of CHWs. However, the design was also determined by constraints presented by the software (WordPress and associated plug-ins) and the lack of a budget to hire experienced web developers. Guided walkthroughs (Nielsen, 2005), in addition to the surveys, were used to identify design features that increase complexity and create barriers to optimal use. In a guided talk aloud walkthrough, representative users are observed as they attempt to complete pre-defined tasks and talk their thoughts aloud. A moderator provides guidance and prompts the user to speak aloud their thinking. The moderator or a scribe will take notes and the sessions are usually recorded for further analysis.

The usability protocol for determining barriers during actual use consisted of three components: 1) Talk Aloud Walkthroughs to test three tasks in the consent/pre-questionnaire process and social learning system; 2) a System Usability Survey (Brooke,

1996) to gather subjective impressions; and, 3) Feedback Questionnaire to assess the subjects' perceptions of other CHWs' barriers to the system. The goal of the walkthroughs was to identify barriers created by the design of the system as well as to assess whether the CHWs had the skills required to complete the tasks (See Table 12.). In addition, before attempting Task Three, participants were asked to study the home page of the social learning system and describe the actions they could perform on the site, identifying the elements on the site that indicated each action. The computer screen and audio were recorded during the sessions and session moderators provided guidance and prompting as necessary.

Table 12

*Tasks tested in the Talk Aloud Walkthroughs*

| | **Task 1** | **Task 2** | **Task 3** |
|---|---|---|---|
| **Description** | Access the website CHW Conversations from the consent and pre-questionnaire | Register for CHW Conversations, activate the account and sign in | Watch a training video and make a comment about it |
| **Potential Barriers** | A lot of text at a high reading level.<br>A non-clickable web link requiring direct entry of address into web browser. | Formatting of registration form requires scroll to the bottom to submit.<br>Account activation requires user to leave system, access link in e-mail, log in to system with password. | One way to access the video requires recognition of tab menu navigation.<br>Access via tab menu requires two click action (from tab menu to list of articles to specific video).<br>Comment box is below all comments. |

| | Task 1 | Task 2 | Task 3 |
|---|---|---|---|
| **Skills involved** | Copying and pasting text<br>Use of the address bar in a web browser<br>Opening a new window in a web browser (potential) | Completing and submitting a form<br>Opening an e-mail message<br>Clicking a link in an e-mail message to access a webpage<br>Creating a password and using it<br>Signing into a website | Recognition of available actions<br>Use of tab navigation<br>Starting and stopping an embedded video<br>Posting a comment |

The System Usability Scale is a validated scale widely used to assess user perceptions of satisfaction, usefulness and ease of use (Brooke, 1996; Finstad, 2006). The Feedback Questionnaire is a short assessment of the user's perceptions of how other CHWs they know might perceive the system and what barriers they might have experienced. It also solicited suggestions for improving the system and participation.

**Talk Aloud Walkthrough Results.**

***Participants.*** Individuals from Groups A (fully participated) and B (registered, but did not interact) were recruited by e-mail to participate in a Talk Aloud Walkthrough. A gift card of a small monetary value ($50) was offered to compensate for the estimate of two hours of time required for the study. Out of the seven CHWs who were sent a recruitment e-mail, one from Group A and one from Group B responded. Both study participants were female in their 50s; both were certified CHWs and employed, one as a CHW and one specified she was a Patient Navigator; both were Latinas who spoke both English and Spanish, but one preferred to conduct the study in English and one in Spanish. (The English speaker actually made a joke that she wanted the option of

"Spanglish" for accessing the online consent document.) Three moderators, one of which was a native Spanish speaker, conducted the tests. The tests were conducted on two separate days.

***Task Barriers.*** The study showed participants had some difficulty in performing Tasks One and Three due to the potential barriers identified in Table 12. On Task One, with some prompting, both CHWs were able to access the registration page. In Task Two, accessing the submit button and activating the account through the link in an e-mail were not difficult for either participant. Task Three proved the most challenging for both participants. In particular, finding the video was difficult, though both completed the task with prompting from the moderators. The barriers to finding the video can be characterized by heuristic violations that increased the extrinsic difficulty (as described by Zhang & Walji, 2011) of the design (See Figure 6.):

*Match to real world.* The system navigation did not match the expectations (or world) of the users for website navigation. The match to real world heuristic guides designers to use representations (both in terms of language and iconography) that are familiar to the users (Nielsen, 2005).

- Group A User: After searching the page for a few minutes, the moderator showed the user from Group A the tabs and asked, "What do you think about these?" She was immediately able to recognize with this prompt that they were navigation options and selected the correct tab "The Learning Center" for accessing the training content. She commented that hyperlinked words somewhere in the main section of the page were preferred (Figure 6, C.).

- Group B User: The user from Group B did not recognize the tabs as navigation (Figure 6, A.) until the moderator not only pointed them out, and told her what they were. In her attempts to navigate the site, she clicked

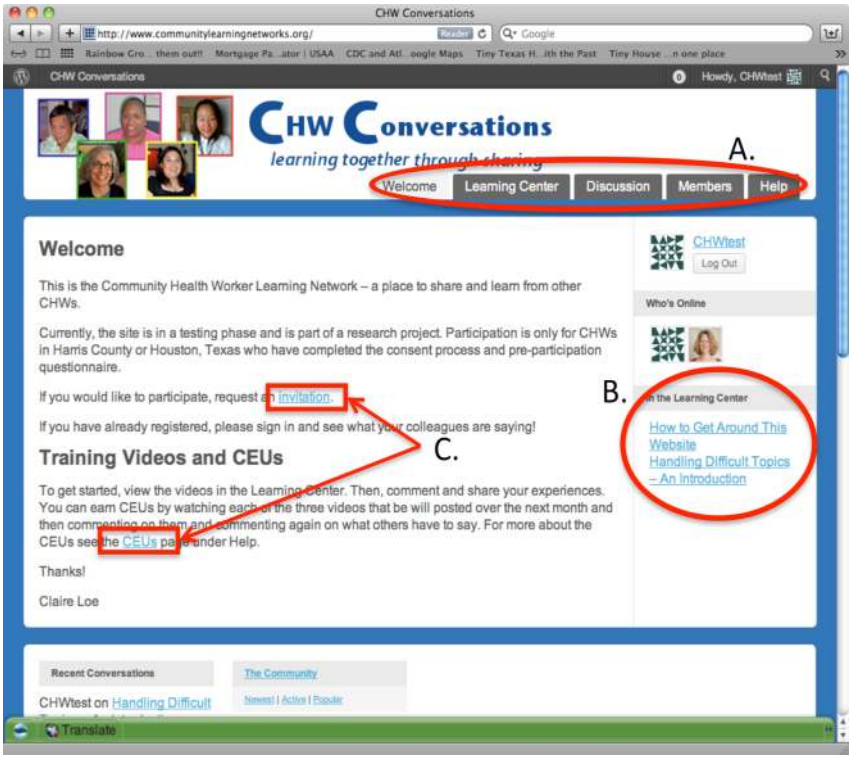



Figure 6. CHWs did not recognize navigation elements. They did not recognize the main navigation tabs (A) or mention or use the hyperlinks on the right hand sidebar (B) as potential navigation options. Both CHWs mentioned the hyperlinks in the text at center (C) as ways to access content in the site.

hyperlinks in the text content on the home page (Figure 6, C.). When told that the tabs were links to other pages within the site, she said she preferred left side navigation buttons or hyperlinked words such as those she had clicked. She had to be told to click the correct tab so that the test could continue.

- Neither participant clicked or acknowledged the direct links to the video content in the sidebar area on the right hand side of the screen (Figure 6, B.).

*Minimalist design.* Accessing the video required that the user navigate to an intermediate page, select the desired entry and click the hyperlinked words "read the rest of this entry →" to access the page with the video (Figure 7, A. and B.). The minimalist design heuristic posits that users should not be burdened with extraneous steps for reaching a task goal. It is not uncommon that systems require some functions unrelated to


Figure 7. CHWs had difficulty reaching the video content. Users did not recognize that "Read the rest of the entry" would take them from page A. to the video in the blog B.

functions needed by users or required for a task. These are known as "overhead" functions. Such functions should be minimized if they cannot be eliminated (Zhang &

Walji, 2011). This task workflow was necessitated by the software, which is based on a blog design.

- Users: Once the test users had clicked the appropriate navigation tab on the home page, they landed on a page with a list of blog entries (Figure 7). Both users spent considerable time on this page before determining the action for accessing the video. Both were given prompts for moving forward. The test user from Group B was eventually told where to click to access the video.

***Other Barriers Revealed.*** As intended, the talk aloud aspect of this study revealed barriers to participation in CHW Conversations in addition to the potential barriers explored by the protocol. One of the first comments by the Group B user was that she did not participate in the system after registering because the site was blocked by the firewall at her work and she did not have time to wait in line at the library. Her experience is illustrative of the complexity of access issues CHWs may face.

Another barrier for both test users was the amount of text on the site. In particular, one noted that she would not read the text above the video. She clicked straight on the play button to watch it. The text consisted of instructions and guidance for comments. The test user who preferred Spanish was able to understand the English text, but this would not be true for many of the potential Spanish-speaking users. To overcome this potential barriers, the design included a translate button to allow cross communication between users of multiple languages. However, the moderator had to point out the availability of the "translate" button on the bottom bar of the page. The test user said she liked this feature and played with it translating into Spanish and back again into English. She said

she would like the button up top rather than at the bottom. She thought she would notice it if it were in the header area of the page.

***Ratings and suggestions.*** After the talk aloud portion of the study, the users were asked to rate each task on a scale of one to ten according to how difficult they found the task and again on how difficult the task would be for other CHWs. They both rated the tasks as easy in spite of needing guidance along the way. One rated the midpoint for how difficult the tasks would be for other CHWs, explaining that it would be easy for some and difficult for some. Their ratings on the System Usability Scale also indicated they found the experience "easy". For example, both "Strongly disagreed" with the statement "I think that I would need the support of a technical person to be able to use this system." Given that the moderators' perceptions were that both users experienced a certain amount of difficulty on at least some of the tasks, these were unexpected responses. This may have been an effect of feeling social pressure to provide an agreeable response. Or, perhaps, they recognized the tasks as easy, once they had received assistance from the moderators to accomplish them. In any case, these methods of assessing users experiences with the system seemed to generate data contradictory to the walkthroughs. In contrast, the User Feedback Survey which required them to speculate on barriers for "CHWs I know" provided a somewhat different perspective. While both test users "Disagreed" or "Strongly disagreed" that CHWs they knew would not be interested or would not know how to use the website, one "Agreed" with the statements that CHWs would not have time, would not have access to a computer for outside of work activities and would not like using the computer. Interestingly, while she marked "Strongly disagree" for the statement "CHWs I know would not participate because they don't

know who else was participating," verbally she said, "Well, at first, but then it would be okay." Also, during the walkthrough, she scrolled down the names of participants in the system and made delighted comments when she saw someone she knew. When she saw that a friend had made a comment on the video she said, "Hey, I know her!" and made a point to post a reply to her comment. Similarly, she "Strongly disagreed" with the statement that CHWs would not participate because they did not know the organizer well, but she wrote a note next to the item: "Even though, they might not trust."

The reasons the test users gave for other CHWs not participating were:

> [They were] not aware or confronted with the many positive functions of the system.

and

> For the lack of experience as *promotores* and some have difficulty communicating in [writing in] Spanish, at times, it is easier for them to speak.

Finally, with respect to how they would make the website reach more CHWs, they both agreed it should be advertised to CHWs outside of Houston and one suggested including a flyer about the site when they receive the certification certificate from the State of Texas. In general, she thought sending announcements by mail would be taken more seriously and generate more interest than e-mails, though e-mails would be an appropriate follow-up she thought.

**Implementing changes**

The Usability Study provided important insight into barriers to address before re-launching the pilot study. The barriers survey suggested that lack of time, low computer skills and concerns about trust of others involved might be issues for CHWs who did not

access the system or participate. The talk aloud walkthroughs provided additional evidence that these might be relevant barriers. In addition, the one test user's experience with having a broken computer could suggest that a deeper exploration into the nature of "computer access" is needed. In discussions with CHWs and those who work with them, it was said that many who have computers at home have them for their children to use for school work and few have laptops. This could suggest that the home computers have limited capabilities and that the CHWs are not using the computers at home frequently and may not have the skills or confidence to do so on a regular basis. In addition, aversion to text-heavy interactions require further study for alternatives or assistive technologies.

Barriers to use uncovered in the Usability Study were overcome as follows.

**Barriers Reduction.** Several strategies were used to specifically address the barriers to participation in the research that were identified in the Usability Study.

Barrier 1: Lack of trust – not knowing the organizer and who else is participating

*Strategy 1: Face-to-Face training on the system conducted by the Principal Investigator*

The Principal Investigator (PI) conducted a face-to-face training allowing all participants to get to know her and one another. The PI was Technical Help. Participants were required to use a photograph of themselves as their avatar in the system.

*Strategy 2: Create custom content for the audience; make the content familiar*

The content consisted of three videos and two forum topics. Two of the videos are custom-made for CHWs in Houston, Texas. They included images of actual CHWs from

Houston. The first was a nine-minute video titled *Handling Difficult Topics – An Introduction.* The third was an eleven-minute video called *Handling Difficult Topics – Using Opening and Follow-up Lines.* The third video (ten minutes long), called *Risk Assessment with Routine and Acute Care Clients* had been made previously by the PI for clinicians and staff working in health centers that serve mobile populations including migrant farmworkers. This is a client-base familiar to CHWs in Houston. All three videos focused on communication skills for discussing the sensitive topics identified in the user analysis. The forum topics included resources relevant to CHW work and were designed to motivate the types of interactions under study.

Barrier 2: Functions and meaning in the social learning system obscured by the design.

*Strategy 1: Simplify system design: navigation and text instructions*

> The static index page of the site was simplified and hyperlinks to the video content were added when each new one was posted. These hyperlinks allowed direct access to the training video content. Also, the instructional text associated with the training content was reduced in quantity and simplified.

*Strategy 2: Training on use of the system*

In addition to providing an opportunity for participants to meet face-to-face, the two-hour training workshop provided a demonstration of system features and an opportunity for them to practice using the system in the presence of hands-on help.

Chapter Four describes the implementation and results of the re-designed pilot study.

## Chapter 4: Pilot Study – Motivating Online Communication for Workforce Development

The CHW Conversations social learning system was designed to overcome barriers to limited opportunities for face-to-face learning and to motivate communications that support workforce development among community health workers (See Chapter 3.). Specifically, we applied a User-Centered Design approach to stimulate conversations that promote development of self-efficacy in individuals and norms for CHW practice in the group. The proposed Social Cognitive Theory–Situated Learning Theory Theoretical Framework introduced in Chapter 2 (and reproduced below as Figure 8 for reference) suggests that these types of communications are necessary for the development of practice among a group of like practitioners. We believe the content and design of our social learning system will inspire these communications.

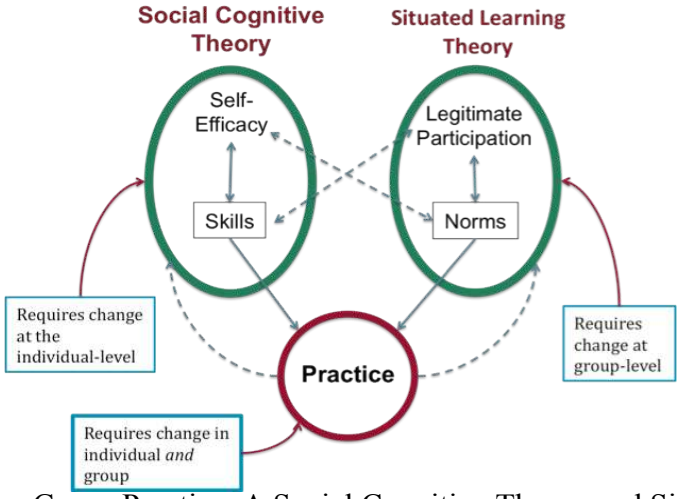



Figure 8. Developing Group Practice: A Social Cognitive Theory and Situated Learning Theory Framework

## Methods

### Study design

The social learning system content included three modules about communication skills for CHWs. (See Table 13.) Each week, the PI posted three videos (one each week) to "The Learning Center" webpage of the system followed two days later by a discussion topic posted on the "Discussions" page. The first video was in place for the initial two-hour training workshop, which provided instruction, demonstration and practice with the functions of the social learning system. During the workshop, each participant registered into the system, which required login for each visit, and participants created a profile with their picture and details about their status as a CHW (experience, settings, services, certification and employment). The PI also explained the study, the requirements for participation and compensation, and completed the informed consent process with each participant.

Table 13

*Module Content*

| | Video | Discussion Topic |
|---|---|---|
| 1 | Handling Difficult Topics – An Introduction | Various examples during training |
| 2 | Risk Assessment with Routine and Acute Care Clients | Appropriate Materials – discussion and website resource |
| 3 | Using Opening and Follow-up Lines | Learning from Others' Experience |

Following training, participants used CHW Conversations for three weeks. The PI notified participants by e-mail when she had placed new content and participants were free to view the content and respond however they liked. Toward the end of the study period the PI also sent reminders of the minimum requirements for compensation. Requirements for participation included a minimum number of comments on content posted by the PI, replies to other participants and original posts. Required participation increased as the study progressed. Graduated compensation was provided to encourage active participation and discourage attrition. That is, participants received a $50 gift card for participating in the training and then payment increased each week by $25 ending with $150 for the final group interview. In addition to the required postings, participants were able to post self-created content, hyperlinks and comments at any time during the study period. The minimum participation would result in nine posts including five comments on content posted by the PI, one reply to another's comment on PI content, one original discussion topic and two comments or replies on another's original discussion topic.

The study concluded with a face-to-face group interview that elicited details regarding participants' experiences within the social learning system and intentions to continue to use it if it were to remain available. Additionally, participants were queried to understand the most and least useful design elements and to elicit suggestions for improvements. A satisfaction survey and the System Usability Scale (SUS) (Brooke, 1996) were also administered. Original instruments used during this session are in Appendix B. Participants were recruited by e-mail using the existing recruitment pool from the previous studies and prioritizing recruitment of previous participants first. Forty potential

participants received a recruitment e-mail before the target of ten responded. A total of twelve participants were enrolled in the study. Five had received the recruitment e-mail forwarded by a friend and were not from the recruitment pool.

**Data collection and analysis**

All interactions including comments, posts, and replies were automatically collected by the system and stored in the webhosting company's MySQL databases. The data were exported and de-identified before being manually coded thematically for type of communication. Analysis centered around motivation to post and communication types and system and program feedback. (The term 'post' whether an initial topic, comment or reply will be used to refer to all of these data.)

**Motivation to post.** Posts were counted for each participant and each type of content (video or discussion). We considered the total number of posts per participant extending beyond the number of posts required for compensation as an indicator of intrinsic motivation to use the system.

**Communication types.** All participant posts were reviewed for self-efficacy producing and norm affirming communications and coded as such. Each post could contain multiple codes. Posts that were not coded as self-efficacy producing or norm affirming were coded as "other." The development of operational definitions for each code is described in detail later in this chapter.

Quantitative analyses were conducted in IBM® SPSS® Statistics version 21. Descriptive statistics included frequencies of each code by participant and content type–video or discussion post. Chi-square analyses using Fischer's Exact Tests were used to identify differences by content type.

**System and program feedback.** Prior to the final group interview, participants were asked to complete a Satisfaction Questionnaire and the System Usability Scale (SUS). The forms were completed anonymously and returned to a folder on a table at the back of the room. Each Satisfaction Questionnaire was tallied to create a satisfaction score and the scores for the group were analyzed descriptively for the mean score. The SUS was analyzed according to the proscribed procedure of the developer which yields a score for usability of a system (Brooks, 1996). A one-hour group interview was conducted with the PI facilitating using a semi-structured protocol which included questions about usefulness of the system and preferences for continued availability of the system. The interview was conducted in English and Spanish using a professional simultaneous interpreter to facilitate cross-language discussion. The session was recorded electronically on a cell phone plugged into the interpreter's headset and audio device. The content was analyzed for user perceptions of the usefulness of and satisfaction with functions of the system.

**Operationalizing communication types**

The posts data were coded following a Computer-Mediated Discourse Analysis (CMDA) approach. CMDA methods can be used to explore the different domains of language– structure, meaning, interaction, and social behavior (Herring, 2004). In this study, we are concerned with meaning. We created operational definitions for coding sentences for their meaning with regards to self-efficacy development and norm affirmation. (See Appendix B.)

**Self-efficacy developing communications.** To support the development of self-efficacy in our social learning system, we provide vicarious experiences as a means of

gaining self-efficacy through the assessment of one's own ability in the context of the action of others. According to Bandura (1997) such experience can lead to stronger belief in an individual's own ability to perform a specific task in a specific situation (i.e. self-efficacy) and improved ability. Given the limited opportunities for face-to-face interactions to promote observational learning, our social learning system supports vicarious experience via modeling in video and storytelling in participant posts. Such posts tell a story that may act as vicarious experience for others and develop self-efficacy. As Gist and Mitchell (1992) describe it (Figure 1, Chapter Two), developing self-efficacy through another's experience requires enough information about that experience to 1) analyze the task requirements, 2) attribute the success or failure of performance to either the actor or external forces, and 3) assess the personal and situational resources and constraints present. Fogg's (2003) observation that computer technologies such as video can create behavior change by showing cause and effect relationships support our proposed delivery system of modeled experience. In coding our data it is necessary to identify the communications within the social learning system that convey experience and potentially are self-efficacy engendering comments. Specifically, we said self-efficacy developing communications are those that include information about the situation (client, setting and/or problem to be addressed), the behaviors of the CHW and the outcome of the behaviors with respect to the stated or implied goal of the behavior. In essence, such communications should show context (situation) and cause (the CHW behavior) and effect (the client outcome). In self-efficacy statements, the speaker refers to himself or herself ("I have clients who…", "I explain that…") rather than to a group in general; the speaker describes the context of the encounter ("When a client is

uncomfortable…", "Many of my clients don't have legal documents…"); and, the speaker states an outcome usually of the client ("Then, the client is reassured that…").

**Group norm communications**. As vicarious experience is dependent on observed behaviors within a context and relevant community, we additionally coded our system interactions for normative content. Norms "define how group members should think, feel or behave" and are conveyed through both actions and words. "…[Group] members will assign these norms to themselves, employing the attributes of their social identity to define appropriate conduct for themselves in the social context (Postmes, Spears & Lea, 2000, p. 343)." It is evident, then, that social identity and group norms are interrelated.

In the SCT-SLT Framework, we focus on group norms as an expression of belonging and social identity. The norms of a group have been shown to both define the group prototype and influence behaviors of individuals who identify with the group (Hogg & Reid, 2006; Postmes, Spears & Lea, 2000; Preece, 2004). For the purposes of this study, we wanted to identify communications that convey group norms for practice by CHWs. Herring (2004) says that statements showing self-awareness relate to identity and "can be manifested in its members' references to the group as a group…" p. 356. Thus, we identified passages as group norm affirming communications when they state that specific behaviors, ideas or attitudes are ones appropriate for or characteristic of CHWs (or, in Spanish, *promotores/as de salud*). They are declarative statements that show self-awareness by referencing CHWs as the subject of the statement ("CHWs are concerned about…") and sometimes acknowledging that they are speaking within a group of CHWs ("We as CHWs know…"). The words used often convey obligation, duty or correctness using

words like “should” or “must” (“CHWs must know what resources are available…”) as well as negative statements about what CHWs should not do/think/feel.

**Other communications.** Posts and comments that contained thoughts, ideas or sentiments that were not directly related to a self-efficacy story or a norm affirmation were coded as ‘other’. While multiple codes were allowed when a post contained both self-efficacy developing and norm affirming statements, ‘other’ comments were not multiply coded (i.e. only the self-efficacy or normative comments were counted even in the presence of additional ‘other’ content.)

## Results

### Participants

Twelve CHWs participated in the study. During registration, they created a profile page within the system to convey to other participants their years of experience, certification status, the settings in which they work and the healthcare issues for which they provide services. Categories of the profile fields were predefined based on data collected on the CHW survey and ethnographic observations and included ranges for years of experience and settings and health areas. Participant characteristics are displayed in Table 14.

All participants reported that they were Certified CHWs in the State of Texas. Experience ranged from less than a year to over eight years with most having between two and four years of experience as a CHW. Nine indicated they work in Community Centers. The most common services provided were Patient Navigation (n=6) and Cancer Outreach and Education (n=5).

Table 14

*Participant Characteristics, N=12*

| Expertise | | Work settings | |
|---|---|---|---|
| Certified CHW | 12 | Community Centers | 9 |
| Employed as CHW | 10 | Clinics | 3 |
| Years as a CHW | | Phone Assistance | 2 |
| < 1 | 1 | Homes | 1 |
| 1 to 2 | 2 | Emergency Dept. | 0 |
| 2 to 4 | 5 | Other Places | 5 |
| 4 to 8 | 2 | Health care issues | |
| > 8 | 2 | Patient Navigation | 6 |
| Participation language(s) | | Cancer | 5 |
| English only | 5 | Diabetes | 3 |
| Spanish only | 3 | Medical Homes | 1 |
| Both | 4 | Aging | 1 |
| | | Other | 5 |

These characteristics suggest a context of a group with the necessary mix of experience in years, training and practice to allow participation by novices in the presence of experts to support norm development such as takes place in an apprenticeship (Lave & Wenger, 1991). That the participants are similar in settings and services could support a context in

which others' experiences are seen as being relevant to one's own as is necessary for self-efficacy development.

Also important to the context of interacting was the preferred language of the participants. Interactions in a group with mixed language abilities may have implications for group norm and self-efficacy development. While participants did not respond directly to an inquiry about their preferred language, a review of language use in the system showed a split between English- and Spanish-speakers with five using English only, three using Spanish only and four using both English and Spanish. We included a translate button in the design of the system to facilitate cross-language communication.

**Interactions Dataset**

Content in CHW Conversations was designed to motivate communication about one's own practice and the practice of CHWs as a group. Videos in the Learning Center showed CHWs handling difficult conversations in real world situations and described communication strategies. Discussion questions with each video and one of the forum topics provided by the PI in the Discussion section of the website elicited stories about handling sensitive topics with clients. The analysis, then, focused on interactions in the system and included

- comments on the PI-placed videos,
- replies to others' video comments,
- new forum posts which could be topics for discussion, hyperlinks to Internet resources or embedded videos, and
- comments and replies on Discussions initiated by the PI or other participants.

Participants engaged with the system in various ways. In addition to the posts of interest to the study, they could send messages to one another, post a 'status' on their profile and 'friend' one another in the system. These types of posts could be important for creating context and supporting trust within the system. However, they were not included in the analysis.

The twelve participants generated 207 posts during the three-week period. Posts created during the initial training workshop are not included in these totals, though comments and replies to those posts that came later are. Two posts were excluded because they were self-translations of other posts.

**Posts Motivated by the System.** Given the incentive model for the project, participants were required to make nine posts during the study period. However, the minimal requirement was not the only contribution made by participants of the study (See Figure 9.). Ten participants made more than the required number of posts with a range of

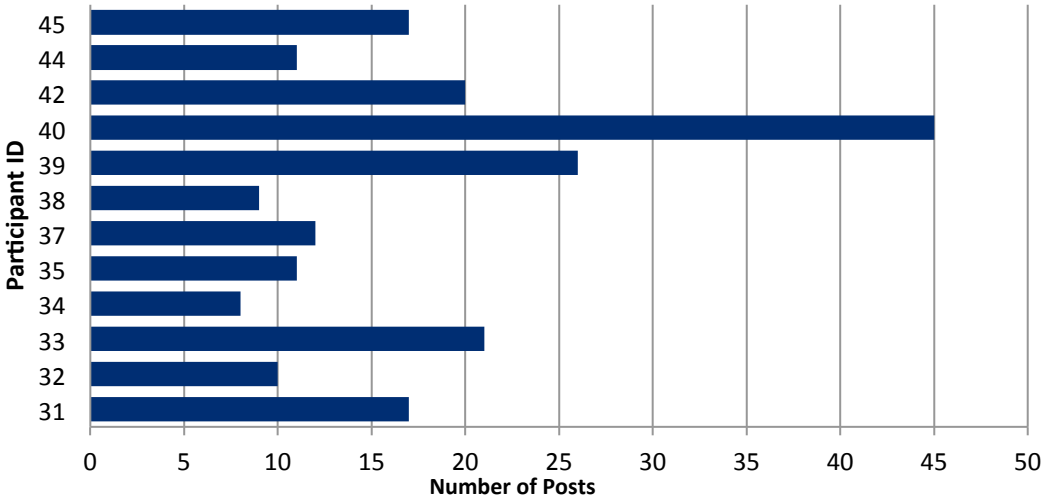



Figure 9. Total number of posts by each participant

from two additional posts to 34 additional posts. The mean number of posts was 17.3 with a standard deviation of 9.9. Excluding one outlier with 45 posts, the mean number of posts was 14.7 (5.6 std. dev.) per participant–63% more than required.

**Language of posts**. Participants used Spanish for 118 (57%) posts, English for 84 (41%) posts and both languages for five posts (2%). This matches closely the distribution of preferred language among the participants–five (42%) using English only and seven (58%) using Spanish for some if not all posts. The 207 posts belonged to thirty distinct threads (a thread encompasses an initial post and all of its comments and replies). More than half of the threads (n = 17, 57%) included interactions in both languages suggesting the translate button may have removed some barriers to cross-language communication.

**Coding and analysis.** The 207 posts were evaluated and coded according to the operational definitions of the communication type codes 'self-efficacy developing', 'norm affirming' and 'other'. Two posts were coded with more than one code resulting in 210 codes.

***Frequency of coded statements.*** Among the 210 coded statements, 24 were found to be normative and 12 were considered potentially self-efficacy building. Ten of the twelve participants generated posts that were coded as either norm affirming or self-efficacy developing and eight made more than one coded statement. Nine participants made norm-affirming statements and nine made self-efficacy developing statements. (See Table 15.) This distribution of codes suggests that the system motivated the intended types of communications from nearly all participants. However, statement types were not evenly distributed: three participants (users 31, 33 and 40) made more than half (n=14) of the norm-affirming statements while users 33, 34 and 44 made two self-efficacy

developing statements each compared to one for other users making these types of statements. In one post, User 31 made two norm affirming and one self-efficacy developing statements. In another post, User 34 made both a norm affirming and a self-efficacy developing statements.

Table 15

*Norm affirming and self-efficacy developing statements by user*

| User ID | Total # of posts | Codes | | | Years CHW | *Language |
|---|---|---|---|---|---|---|
| | | Norm | Self-efficacy | Total | | |
| **31** | **17** | **4** | **1** | **5** | **2 - 4** | **E** |
| 32 | 10 | 3 | 1 | 4 | > 8 | E |
| ***33*** | ***21*** | ***5*** | ***2*** | ***7*** | ***2 - 4*** | ***B*** |
| *34* | *8* | *3* | *2* | *5* | *1 - 2* | *E* |
| 35 | 11 | 0 | 0 | 0 | 1 - 2 | B |
| 37 | 12 | 0 | 0 | 0 | 2 - 4 | B |
| 38 | 9 | 1 | 1 | 2 | 2 - 4 | E |
| 39 | 26 | 1 | 1 | 2 | 4 - 8 | S |
| **40** | **45** | **5** | **1** | **6** | **< 1** | **S** |
| 42 | 20 | 0 | 1 | 1 | 4 - 8 | S |
| *44* | *11* | *1* | *2* | *3* | *2 - 4* | *E* |
| 45 | 17 | 2 | 0 | 2 | > 8 | B |

* Discerned from participation: E = English, S = Spanish, B = Both.
**Bold** indicates users with the most statements coded as norm affirming. *Italics* indicate users with the most statements coded as self-efficacy developing.

***Characteristics of users with the most codes.*** Table 14 also shows the demographic characteristics of the participants. Interestingly, the five participants with the most coded statements (by category) had two to four years of experience or less. Language preference included three who posted in English, one in Spanish and one in both languages. However, all of User 33's statements that were coded as norm affirming or self-efficacy developing were in Spanish. The sample is too small to conclude statistical significance of these characteristics, but these numbers suggest that years of experience may be an important factor to consider when selecting participants of a social learning system and hoping to motivate these types of communications in the group. They also further support that the design of the system effectively removed language barriers for the Spanish-speakers even though all content posted by the PI was in English.

***Codes by content type.*** Notably, the distribution of codes was significantly different by content type: Discussions and Videos. (See Figure 10.) We calculated $\chi^2$ statistics and determined that norm affirming and self-efficacy developing posts were more likely to be motivated by the video content than the discussion content (p-value =

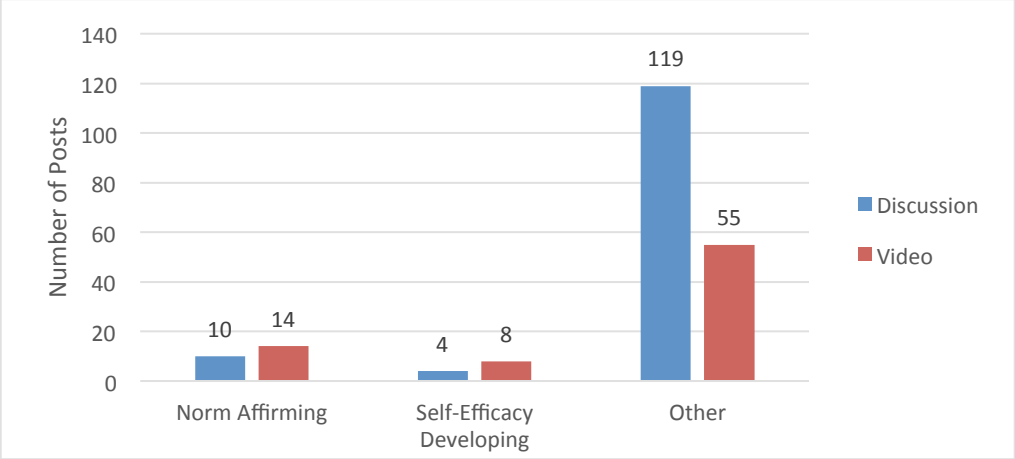



Figure 10. The distribution of Communication Types by Content Type

.037 and .029 respectively) while 'other' comments were more likely to be posted on discussions (p-value = .006).

Each post by the PI was intended to inspire conversations about the content of the post that conveyed statements of norms and/or experience. Some of the PI's posts inspired more of these types of statements than others. (See Table 16.) The following section describes each post and an example of the participant statements they motivated. Posts that were originally in Spanish are translated into English and indicated by italics. The original Spanish posts are in Appendix C.

Table 16

*Codes on PI posted content*

| Content | Norms Codes | Self-efficacy Codes | Other Codes | Total Posts |
|---|---|---|---|---|
| Video One | 7 | 2 | 25 | 32 |
| Video Two | 5 | 1 | 19 | 25 |
| Video Three | 2 | 5 | 11 | 17 |
| Discussion One | 1 | 0 | 9 | 10 |
| Discussion Two | 3 | 4 | 7 | 14 |

*Video One.* Video One, entitled *Introduction to Handling Difficult Topics,* is a nine-minute slideshow/video that covers topics CHWs said were difficult to discuss in the CHW Questionnaire; a simulated CHW encounter of a missed opportunity with a woman experiencing domestic violence (the CHW actor is a Houston-based CHW); reflection on what could be done in the situation presented, and the role of the CHW in addressing these issues.

The video was accompanied with the following discussion questions:

- What topics do *you* find difficult to discuss?
- What makes some topics more difficult?
- What would you do in a situation like this?

Video One received 32 comments and replies to comments. Seven of the comments contained normative statements and two communicated vicarious experience. For example, the following post was coded as containing two norm affirming (in bold) and one self-efficacy developing (in italics) statements:

> **Understanding the role and responsibilities of a CHW is key to ensuring the health and safety of our clients. We should always refer to the appropriate individual or agency.** *When clients are uncomfortable talking about their issues, I find Motivational Interviewing (MI) the most effective measure and reassuring the client that our conversations are confidential. Coaching the client to seek the appropriate help. Empowering the client to make the most beneficial decision for themselves and family.* **The conversation should not be difficult for the CHW, our knowledge and skills sets should allow for the correct outcomes and protect our clients….**

The first norm statement in this example consists of two sentences about CHW roles and responsibilities. It communicates both an identity reference using the term 'CHW' and the verb construction 'should always refer' indicating obligation. This is followed by an example of how this is done, the self-efficacy (SE) developing statement. The SE statement begins by providing context – 'when clients are uncomfortable talking about their issues' – followed by several behaviors the CHW uses – 'I find Motivational

Interviewing', 'reassuring', coaching' – and ending with some of the outcomes he expects from this behavior – 'seek the appropriate help', 'make the most beneficial decision.' This is followed by another norm statement using the 'should' sentence structure with a reference to the 'CHW' group. This comment on Video One received two replies – one in English and one in Spanish, both agreeing with the comment and one including another norm statement:

> *[Name of CHW], I agree with the use of MI and to use MINE [communication strategy] as CHW assets.*

The other self-efficacy developing statement on Video One was from a participant who posted:

> *It is also very important to give the community correct information and follow-up. Personally, I had an experience of giving a person the telephone number to get health care in a clinic that wasn't as easy to access as the clinic said. Our work must be to not only refer, but also make sure they obtain the services that the companies promise.*

In this case, the vicarious experience is about what *did not* work and what must be done to be successful: the context – a person in need of healthcare; the behavior – giving a telephone number; the outcome – difficulty accessing care; the resolving behavior – following up with the person.

*Video Two.* The second video, *Risk Assessment with Routine and Acute Care Clients*, was made for an earlier project but has content relevant to this research. It focuses on sexual health risks faced by fictional clients (Eduardo and Alicia) in a clinic serving migrant farmworkers and other mobile people. It also addresses the importance of

risk assessment to identify these risks and provide services beyond the presenting complaint. The ten-minute video was accompanied by the following discussion questions:

- Are there issues in this video relevant to your work as a CHW?
- What surprised you about Eduardo?
- What surprised you about Alicia?

Video Two received seventeen comments and replies. Five of the posts contained norm statements and one a self-efficacy statement. A typical comment that was coded as 'other' is represented by this one:

> All that we listen to in the video is relevant to the CHW, because it represent real health problems in our community. In several occasions the patients feel afraid to talk about Sex and we need to help the community teaching them how to prevent STD. We need to create prevention programs cultural competent and in their own language…Nothing surprised me about Alicia and Eduardo, this situation is sadly pretty frequent in the Community.

This comment was typical of 'other' comments on this video in that it acknowledged that the issues presented in the video are ones they see in their clients. It was also typical in that she offered solutions to these problems. Several of the other 'other' comments also went into details about the barriers to health care faced by the immigrant community such as not knowing the language, the lack of transportation and the loss of wages when one goes to the clinic. The comment above is nearly a norm statement, but does not clarify that the 'we' she is speaking of is CHWs.

The self-efficacy statement associated with Video Two related the content of the video directly to her experience with teen clients and sexual health. The CHW comments:

> I have clients who tell me that they have girl/boyfriends and I straight out ask them are they sexually active? and they feel comfortable enough to tell me and I do educate them and give them the resources to help protect them selves. It important to give our future generation the truth and point them in the right direction. Love yourself first.

*Video Three:* Video Three is titled *Handling Difficult Topics: Using Opening and Follow-up Lines* and focuses on two strategies to help transition into and introduce difficult topics. It, again, shows a Houston-area CHW interacting with clients and includes structured reflection times. Examples in the video include talking about finances and addressing sexual health. The 11-minute video also addresses the importance of using plain language and considering the context of the conversation for the client. The discussion motivators with this video included:

- Share an experience you have had using opening or follow-up lines.
- How do you respond when a sensitive topic comes up in the middle of a session with a client?

Video Three motivated 17 posts and the most self-efficacy coded statements with five as well as two norm affirming statements. Most of the self-efficacy coded statements, like the example below, involved describing an encounter with a client. The example also begins with a norm statement.

> … It is the responsibility of the CHW reassure the client confidentiality. At time when interviewing a client for eligibility services (Gold Card) I find the

> undocumented people are less open. They're afraid to give certain information because of their immigration status. When this happens I explain to the clients the eligibility process. The information that's provided to me is strictly for the purposes of the application and it will not be reported to the policía de inmigración. I try to make sure that my tone of voice is at a level of concern. It is my job as an Eligibility Counselor/CHW to provide services to my clients regardless of their status. Once they see my sincerity, they left their guards down and start teaching me Spanish words. It's a win, win situation.

Another example shows a similar approach of explaining an encounter with a client and the result:

> *…Well, I am a volunteer in an organization that holds health fairs, Pap's and clinical breast exams. And, normally, we have to tell the patient that they have to remove all of their clothes so that when the doctor arrives she can do the exam. For many women, it is not easy to undress in front of other people and especially for women from 50 years and older. But, while I talk to them, I am gaining her trust and thus it is simpler for them. Also, I ask them if they need to ask questions of the doctor, to help them so that they understand some medical terms that the doctors use at times.*

It is interesting that none of the responses to Video Three actually shared opening or follow-up lines, however, many shared how they speak to their clients. They used words like 'reassuring them', 'gain their trust' and said they let them know they are there to help and everything is confidential.

*Discussion One:* Discussion One was about using appropriate educational materials to facilitate a discussion about a difficult topic and provided a link to a website with very low literacy materials. The PI ended the topic with the questions: How do you use materials in your work? Are you able to download ones online or does your work provide good materials? Nine participants made ten comments on this post. The normative post was:

> *When we use an image let us make sure that this helps people to understand what is being said. Make sure you do not confuse them. This type of material is what I commonly try to use as a CHW.*

*Discussion Two:* Discussion Two directly asked participants to share their experiences and prompted context, behavior and outcome. The PI wrote:

> One way people improve skills is to watch another person do it or hear about another person's experience doing it. Even experts learn something new from others or confirm what they already have been doing.
>
> Can you describe for the group an experience you had with a difficult topic with a client and how you handled it? What strategies did you use? Were you happy with how it turned out? Would you do something differently today?

Participants made 14 posts on this discussion topic and half were either norm affirming or self-efficacy developing. Discussion Two motivated the only coded comment of User 42, a self-efficacy statement:

> *The difficult topic that I have run into is to talk with men about the necessity to get the prostate exam. Well, MACHISMO doesn't permit us. And, the strategy that I use is to tell them that we have to think about our family because we could get*

*sick in such a way that they are the ones that truly suffer. And, although it is really few that come to understand that prevention is the only way for this not to happen, we have to continue motivating and informing our community. I love serving the people and I am happy with what I do.*

Really, the behaviour or strategy here he describes explicitly is to discuss the needs of family with the client, but he is demonstrating another behaviour: persistence against the odds.

*Discussions Initiated by Participants.* Six of the 24 statements coded as norm affirming comments were posted on five discussion topics initiated by participants. The initial posts and associated norm statements are shown in Table 17 (original Spanish text is in Appendix D). The discussion topics presented by the participants show a depth of knowledge and an eagerness to share as well as learn. The norm statements typically included a sharing of one's knowledge of the topic and a statement of the CHW's role or responsibility with regards to the topic or population concerned.

Table 17

*Participant initiated discussions and associated norm statements*

| | |
|---|---|
| Initial | *Title: *Eating Healthfully* Code: Not coded<br><br>Post: *Eating Healthfully* |
| Norm | *...But, it is important that as CHWs we help our community see that it is not necessary to stop eating everything if we eat it in moderation.* |

| | |
|---|---|
| Initial | Title: *The Healthcare Market Place* Code: Other<br><br>Post: *(ObamaCare) People agree and people disagree. I believe that we only have to orient people so that the system gives them the answers and orient them to choose the option that best suits each individual.* |
| Norm | *I agree very much, but it is important that we as Promotores de la Salud let the community know that to have medical insurance is as important as having car or house insurance.* |
| Initial | Title: preeclampsia Code: Other<br>Post: [Edited for length] It is very important for women to seek prenatal care early to screen for preeclamsia which is a condition that occurs during pregnancy that can cause death to the mother and baby. This condition results in sudden high blood pressure that causes premature births and even death…It is very important to establish if a pregnant woman is at risk for preeclamsia very early to lower risks associated with this condition. A helpful resource is www.preeclamsia.org. |
| Norm 1 | I totally agree, [Name of CHW], seeking prenatal care in the first trimester is very important. I have noticed from working in the field that the teenagers and younger generation are comfortable with not seeking medical attention until the end of pregnancy. This is where the CHW's job is to help educate the community in every way possible. |
| Norm 2 | *Preeclampsia causes damage to the maternal endothelium, kidneys and liver. When a woman suffers from it, they induce labor or Cesarean section and it can appear up to six weeks postpartum. It is the most common and dangerous complication of pregnancy, so it must be diagnosed and treated quickly, as severe cases endanger the life of the mother and the fetus. As CHWs we must help: MINE.* |
| Initial | Title: teen pregnancy Code: Other<br>Post: Obesity in pre teen pregnancy: how can we get the word out to our youth of 2015 & help them? |

| | |
|---|---|
| Norm | … As a CHW, we have to educate and re-educate on the benefits of trying healthy eating and their [teens'] prenatal care. In many cases most cannot afford the option of eating something else other than what's already on their table. Encourage them to eat as much fruit and vegetables when possible even if it's at school, and continue with the regular prenatal appointments. |
| Initial | Title: Cardiovascular in the Homeless Community Code: Other<br>Post: [Edited for length.] …Compared to the general population, the homeless had much higher rates of smoking but not diabetes, hypertension or obesity. However, most of the homeless affected by these risk factors had not received adequate treatment for hypertension, high blood cholesterol and had poor control of diabetes, the estimated average risk of suffering a heart attack or dying of coronary disease within the next 10 years was five percent, about the same as men in the general population. Please give me your feedback on assisting a client with cardiovascular disease |
| Norm | … The problem we face as CHWs is ensuring the clients maintain their appointments and take the medication prescribed by the physician. I agree with [Name of CHW], living on the streets losing their medication is a problem, but again there are agencies that will allow them to keep their medication stored. We need to educate our homeless community. |
| | * A practice post posted during the initial training.<br>*Italics indicate translated from the original Spanish.* |

***Recoding the 'Other' posts.*** While we were primarily interested in the self-efficacy developing and norm affirming communications, we wanted to identify what types of communications were in the 'other' posts. These additional types of communications may also play a role in practice development. We used a grounded theory approach (Glaser & Strauss, 1997) to identify themes within the large number of posts coded as 'other'. We identified ten distinct themes within these posts: 'Asking a

Question', 'Events', 'Resources', 'Discussion Starter', 'Cheerleading', 'Relating own Experience', 'Information', 'Response/Acknowledgement', 'Strategies', and 'Analysis'. A description of these codes is in Appendix D.

**System Usability, Satisfaction and Perceptions**

**Satisfaction Questionnaire.** The Satisfaction Questionnaire consisted of nine statements to be rated on a five point Likert-like scale. Seven of the items focused on intentions to use the different functions of CHW Conversations if it remained available; two items evaluated importance of and opportunities for communication with other CHWs. Eleven participants completed the Satisfaction Questionnaire. Responses were highly positive with all items having an average score of 5 indicating Strongly Agree, Very Important, or Very Often.

**System Usability Scale.** The System Usability Scale is a ten-item instrument used to assess key constructs of usability. Five participants completed the System Usability Scale with average scores of 86, 77.5, 82.5, 85, 90, and 95. According to Jeff Sauro, comparison of scores for hundreds of systems indicates that a score of 68 or above is above average (Brooks, 1996). This suggests that the participants who completed the SUS found CHW Conversations to be usable and easy to learn.

**Group Interview.** The group interview mirrored the satisfaction expressed in the above standardized measures. Participant were asked about what they found to be useful for their work, what they liked most and what they would change in the system, how other's posts affected them and what organization might be best to administer the system in the future. (See Appendix B.)

Participants were glad to have access to the resources and expertise of their peers. One mentioned it allowed her to get to know more CHWs. Several commented specifically about the online resources about health information that others had shared and wanted the information available to others – even those who were not CHWs.

Specific features mentioned during the interview included the videos –"They were deep"–and the Translate Button –"not always fluent," but essential to cross the language barrier. They also said that the profile photos helped the conversations have more meaning.

Barriers to using the system included poor functionality on mobile devices. Some participants encountered firewalls at their workplaces and had to access it on their cellular telephones. They could not post resources or use the Translate Button in the mobile environment.

Additional features they wanted in the system included opportunities to earn continuing education credits for CHW Trainers, a place to post jobs, and a searchable list of local referral resources. They said they would like the site to continue administered by a local CHW training organization.

## Limitations

The limitations to this study include the small sample size and limited timeframe for participation. Because of these limitations, we were not able to conduct a social network analysis or explore user characteristics needed within a learning community both of which are relevant for practice development. In future studies, we will have more than one person code for communication types in order to test the strength of our operationalizations and establish inter-rater reliability.

Since recruitment occurred through e-mail communications, it is possible that the sample was more computer savvy than CHWs in the recruitment pool who did not reply to the request to participate. However, recruitment for research has more stringent requirements than recruitment for implementation of a social learning system purely for workforce development. In that type of implementation, low computer skills would need to be addressed.

The presence of compensation for participation also limited our ability to generalize to a natural setting situation where learners would not be compensated for participating. Other incentives may be appropriate, however, such as continuing education units. Also, we were not able within the structure of this study to measure change in practice. However, future studies will test the constructs of the model that have been explored here for their influence on practice.

## Discussion

Participation in CHW Conversations was robust. Few postings in the social learning system seemed rote or only intended to meet the requirements of participation. Many posts were long and thoughtful. In all, participants' posts were made up of 10,185 words or an average of 49 words per post. Other communities of practice and online groups exist for CHWs in Texas and nationally including the Health Worker Network on www.ning.com sponsored by the University of Texas Health Science Center at San Antonio and a LinkedIn community, but an unsystematic review of their content finds their focus is on posting about resources, events and jobs, but not practice. In addition, posting is infrequent. However, these sites have a different purpose than CHW

Conversations. To develop practice in a workforce group such as CHWs requires designing for that development.

Understanding design elements that can motivate specific types of interactions and communications is important for all types of systems used for computer-mediated communications. In this study, we have shown that a combination of content, training and design based on user analysis and User-Centered Design can motivate communications theorized to improve practice in a workgroup. Specifically, we found that content posted with tailored discussion questions was important for stimulating norm-affirming and self-efficacy developing communications that would not have occurred otherwise. We also found that video content with tailored discussion questions was especially important for motivating self-efficacy communications. Furthermore, while Wenger (2001) discusses the need for a 'Technology Steward' to provide technological assistance for virtual communities of practice, our work suggests the importance of a 'Training and Technology Steward' who can facilitate learning communications within the system in addition to handling technology barriers. This is not necessarily an expert in the domain of interest, but more importantly a facilitator who places specific content and elicits the communications that are more likely to create learning.

Designing online systems for workforce development has broad application in healthcare. Many healthcare workers face similar barriers to training and association as CHWs. Many medical specialists work as the only representative of their craft in their workplaces and move from one site to another. Public Health Nurses work in diverse settings in communities and may have few opportunities to consult with like others. The

findings in this research could help design social learning systems for these healthcare workers.

## Conclusions

The results of this study are important to the field of cognitive informatics and computer-mediated learning. In this study we have shown that we can design for certain types of communications. Computer Mediated Discourse Analysis has on focused development of norms for communication within a virtual setting (Herring, 2004). Here we look beyond communication in a system and explore the communication of group norms in a real life setting. Situated learning suggests that practice in a group is vital for development of norms for practice (Lave & Wenger, 1991), and creation and re-creation of group knowledge (Engeström et al., 1996). Our work suggests that norms for practice can be communicated within a social learning system. Social Cognitive Theory also suggests the need for observations of behavior as they occur or for video content carefully scripted to inspire self-recognition among the intended audience. We found, however, that vicarious experience may be communicated in a social learning system with the right motivating factors.

This study has laid the groundwork for future research on the SCT-SLT Theoretical Framework that could test whether these two constructs – self-efficacy and norms – are, in fact, the necessary and sufficient constructs for the development of practice in a group of healthcare workers like community health workers. In addition to this study on self-efficacy and norms, we identified ten additional potentially meaningful themes in the posts coded as ‘other’. These themes will be useful for future research into the SCT-SLT Theoretical Framework and social learning system development.

## Chapter 5: Conclusions and Recommendations for Further Study

As the demand for healthcare services increases and the burden of preventable chronic diseases reaches epidemic proportions, the need for cost controls and preventive services is pressing. Lower cost healthcare workers such as community health workers (CHWs) can act as community-based change agents who support preventive behaviours and appropriate use of health care services (Lewin et al., 2009). CHWs are intermediaries between health care services and communities and have been identified as part of a multifaceted solution to lower healthcare costs while improving quality of life for communities currently experiencing disparities in health and healthcare outcomes (AADE, 2003; IOM, 2001, 2015). To realize such a change in the health system an expansion of the CHW workforce is needed.

Training for the development of the CHW workforce must take care to support rather than negate the innate natural helper skills that make CHWs effective liaisons between communities and healthcare agencies while providing appropriate domain knowledge and practice development for a broad spectrum of today's wellness and healthcare challenges (Calhoun et al., 2008). Such training must also remove the barriers to association inherent in CHW work (Bolinger et al., 2011; Kash et al., 2006; Parker et al., 2010). In response to these needs, we tested a training mechanism that simulates group participation in practice, that is, a mechanism with the ability to transfer knowledge while supporting the development of practice in the group.

## System Design for the Development of Group Practice

Our research ultimately identified design features of a social learning system that can motivate learning communications. We found that custom-designed videos coupled with tailored discussion questions motivated self-efficacy developing and norm affirming communications more than unstructured discussion alone. Our proposed SCT–SLT Framework suggests these types of communications are necessary for practice development in a group like CHWs. We also discovered limitations in traditionally accepted methods of User-Centered Design.

### A Social Learning System for CHWs

Following widely adopted User-Center Design principles and standard design heuristics as described in the TURF Framework (Zhang & Walji, 2011), we conducted a user analysis and designed and implemented CHW Conversations using open-source blogging software with social networking functions (WordPress® with the BuddyPress® plug-in). Features of the site design based on findings from the user analysis included:

- training slideshow/videos about communication skills with topics identified by CHWs as difficult and featuring local CHWs;
- photographs in the header region representative of the diverse CHW community in Houston;
- member profiles highlighting skills and experience with the requirement to upload photos as avatars;
- a translation button for communication in groups with many languages;
- default labels such as “Forum” and “Leave a Reply” changed to “Discussion” and “Join the Conversation,” to reflect language common to the audience.

**CHWs' Perceived Need for the Social Learning System**

Low participation in the initial pilot of the social learning system contradicted the informal feedback we had received from the CHW community indicating a need and desire for such a site. During events to gather names for the recruitment pool, administration of the cross-sectional survey, and recruitment demonstrations of the system, CHW responses were encouraging and enthusiastic. In addition, the test users in the talk aloud walkthroughs performed after the initial launch made comments about how much they liked the content and seeing their colleagues' names in the member list. They said they wanted to provide feedback so that the system would be launched again. Responses on a pre-questionnaire about user expectations that was part of the initial launch also indicated enthusiasm for a system like CHW Conversations. Of the seventeen respondents, all but one indicated they would use such a system at least once a week. Also, most "Agreed" or "Strongly Agreed" with the positive expectation statements about the system. (See Tables 18 and 19.)

Table 18

*Expectations for use of CHW Conversations (pre-questionnaire respondents)*

| How often do you think you will log into the social learning system? | | |
|---|---|---|
| | Percent | N |
| At least once a day | 24% | 4 |
| About every other day | 29% | 5 |
| Once a week | 41% | 7 |
| Once or twice a month | 0% | 0 |
| Not even once a month | 6% | 1 |
| Never | 0% | 0 |
| | Total | 17 |

Table 19

*Expectations for value of CHW Conversations (pre-questionnaire respondents)*

| Expectation statements | Strongly Disagree | Dis-agree | Agree | Strongly Agree | N |
|---|---|---|---|---|---|
| I am looking forward to communicating with CHWs I already know. | 1 | 1 | 7 | 8 | 17 |
| I am looking forward to communicating with CHWs I don't know, yet. | 2 | 0 | 7 | 8 | 17 |
| I am looking forward to viewing the videos on communication techniques. | 1 | 0 | 6 | 10 | 17 |
| I am looking forward to seeing the resources provided by other CHWs. | 1 | 0 | 5 | 11 | 17 |
| I am looking forward to sharing resources I have with other CHWs. | 1 | 0 | 4 | 12 | 17 |
| Interacting regularly with other CHWs is very important to me. | 1 | 0 | 6 | 10 | 17 |
| I would like to have more opportunities to interact with other CHWs. | 1 | 1 | 5 | 10 | 17 |
| Learning to use the social learning system will be easy. | 1 | 0 | 10 | 6 | 17 |
| This social learning system will be useful for getting to know how other CHWs do their work. | 1 | 0 | 5 | 11 | 17 |
| This social learning system will help me improve my communication techniques. | 1 | 1 | 8 | 7 | 17 |
| This social learning system will help me be more confident in communicating with clients. | 1 | 2 | 8 | 6 | 17 |
| This social learning system will help me do my job better. | 1 | 0 | 7 | 9 | 17 |
| It is important to me that this social learning system is only for CHWs. | 1 | 2 | 7 | 7 | 17 |

## Limitations to the Initial Design

Despite efforts to design a site that was appealing as well as usable, the number of CHWs who registered for the system was not great enough to test the feasibility of a social learning system to change practice. These results might suggest that such a site is not a feasible training mechanism for CHWs. Before such a conclusion was settled upon, we conducted further exploration of the barriers to using the site.

## Implications for Designing Systems for CHWs

A follow-up usability study identified barriers not predicted by the original user analysis. CHWs' jobs vary extensively from organization to organization (Calhoun, 2008, Lewin, et al., 2009) and, even, in our observations, from one day to the next. The four observations for this study revealed different settings, modes of communication used and populations served in each case (See Table 6, Ch. 3). Even combined with the CHW cross-sectional questionnaire, the study did not provide details to adequately address

- the CHWs' access to computers;
- limitations on time to participate;
- low computer skills of some of the CHWs;
- diversity in languages as well as reading skills; and,
- trust of others in the system.

**Defining access.** Many CHWs come from economically disadvantaged communities of color that have often been described as experiencing a "digital divide." A recent report by the Economist Intelligence Unit (2013) *Redefining the Digital Divide* characterizes disparities in Internet access as "challenges of usage:"

"[The digital divide] now encompasses access to higher broadband speeds and the willingness and ability to use them, or the degree of 'useful usage' in the public and private sectors alike. (EIU, 2013, p. 3)" Our experience is in concert with this characterization of access. While, the cross-sectional survey found that computers as well as cell phones were ubiquitous among the intended users of CHW Conversations and that most had smart phones and the ability to stream video on their computers. The follow-up usability study suggests computer access is more complex than the picture painted by these few data points. Informal discussions with those who work with CHWs regularly (trainers, supervisors and researchers) and focus groups with a similar population (Loe, Retzlaff & Anderson, 2008) suggest that often computers are in the home for use by children for schoolwork. The parents may not have the time, skill or comfort level to use them. The experience of one of the walkthrough participants who had a computer but it was broken further suggests these users may have older equipment and little ability to troubleshoot or have technical problems fixed. Furthermore, while 90% in the cross-sectional survey indicated they used a computer for work and personal purposes, the availability of time and restrictions such as firewalls at work can create barriers to use of the computer for training. The availability of high speed Internet to the users in this study was not explored, but warrants further study.

**Limitations on time.** Some participants in the usability study indicated that lack of time was a barrier to participation. While providing a training resource online was intended to overcome time barriers associated with traditional face-to-face training, the social learning system does not eliminate the need for participants to commit time for learning. For changes in self-efficacy and group norms to occur, CHWs would have to

spend time not only to view training content and interact with others, but also to reflect on those experiences (Epstein, 2008). As noted previously, many CHWs may not spend much of their work time at a desk on a computer. Of the four CHW settings observed, two CHWs conducted at least some of their work at a desk with a computer, but their time at the desk included time with clients and, when using the computer, they were directly addressing client needs. The other two observations were in community settings with no computer access. Thus, it is assumed participation in CHW Conversations would require at least some CHWs to use personal time. In addition, CHWs are often low-income workers (Gateway to Care, 2011) and some work part-time (Calhoun et al., 2008) suggesting they are likely to work multiple jobs while managing the responsibilities of family life leaving little time to participate in online training. It is also possible a statement that they did not have time to participate reflects lack of motivation to participate. As one of the walkthrough participants suggested, "[Other CHWs did not participate because they were] not aware or confronted with the many positive functions of the system."

**Limited computer skills or comfort using computers.** The common wisdom among CHW trainers and supervisors conveyed in discussions before the research began was that CHWs are not comfortable with or knowledgeable about using computers and that other efforts at blogs and communities of practice for CHWs had failed because of this discomfort. Informally, some CHWs expressed some trepidation about their skills at using computers. At the same time, they expressed enthusiasm for the idea of the social learning system and for the opportunity to learn to use the computer. The research did not attempt to measure computer skills or comfort using computers. However, the cross-

sectional survey indicated relatively low levels of membership in social networks like Facebook® (57%) which could reflect limited skill or comfort or reinforce the idea that they do not have personal time to use a computer. During recruitment sessions where the social learning system was demonstrated using laptop computers, several CHWs would gather around each computer. It was observed that many did not know how to use the trackpad on a laptop to move the cursor. It seemed the CHW in the group with the most skill and comfort would operate the computer while the others watched. Some were very resistant when encouraged to give it a try.

**Language diversity, reading level, and multilingual interactions.** Creating a social learning system for a community made up of speakers of multiple languages presents challenges beyond the scope of the research presented here. However, to overcome some of the barriers to non-English speakers and to facilitate interactions among speakers of different languages, the design incorporated a Translate Button provided as a WordPress® plug-in by Skysa® that allowed one-click activation of Google's translation services for the five most common languages in the Houston area. While the test user in the walkthroughs who preferred to use Spanish indicated this was a desired and useful feature, it did not turn out to be usable for that user without instruction because she did not recognize the availability of the function.

A related issue was the amount of text in the system. One of the walkthrough users indicated she would not read all of the text but would pick out a few words relevant to her. She and the other test user did, however, eagerly and carefully read the comments of others. Both users looked for hyperlinked text to navigate the system, but the initial design did not feature hyperlinks to the primary content of interest in the areas on the

screen where they expected them. This created an unnecessary barrier to the content. It is likely that these barriers would be accentuated for users who do not speak or read English at all and for those who have difficulty reading. The original user analysis did not explore web navigation, language or terminology preferences or literacy.

**Trusting others in the system.** For at least some of the Spanish-speaking CHWs, it was important to know the organizer of the system and the other CHWs who were participating. While one test user in the walkthroughs indicated on the feedback questionnaire that knowing others in the system was not important, she commented out loud, "Maybe at first [it would help to know the others.]" She also marked "Strongly Disagree" for the statement "CHWs I know would not participate because they did not know the organizer well," but wrote to the side of the statement "even though they might not trust." These types of contradictory responses may have come from an interest in providing socially desirable responses with her official response on the form, but, being encouraged to be honest with her assessment so that the system could be improved. Nonetheless, these responses support the notion that familiarity and trust are important. The importance of familiarity with others was also indicated by delighted responses by both test users on seeing the names of those they knew as members in the system. The nature of how familiarity and trust of others in the system affect participation and ways to foster trust needs to be explored further.

**Recommendations for Designing for Workforce Development**

The usability study provided important guidance for re-designing our system and our research. These types of re-design have relevance to the broader domain of research on

computer systems for workforce development in healthcare. We redesigned our final pilot study based on these findings.

**Customizing the site further.** While many of the design features of the site that were included based on the user analysis were successful, the user walkthroughs highlighted areas for improvement that could increase the motivation of CHWs to participate in the site and the ease with which they could do so. Key navigation improvements would include:

- reducing the amount of text;
- using left side navigation links;
- creating one-click access to training content on the home page; and,
- making the translate button more visible and explaining its use.

These proposed changes are not particularly unique, but some were directly identified by the usability study. While we made some of these changes, we were not able to make all of them for the pilot study because of constraints within WordPress®.

**Build trust and familiarity.** Others have recognized the importance of the development of trust within communities of practice (Preece, 2004; Usoro, Sharratt, Tsui, & Shekhar, 2007). None have explored the nature of trust for joining a new group. One way to build trust for newcomers to a group may be to make visible the expertise of users in the group. Upon registering in the system, a user completed a user profile that included the type of work they had done or were currently involved in (for example, aging in place, services eligibility). One of the test users said she would want this information to appear along with the person's name and photo, so she would know who she could go to for specific expertise. This might also allow users to develop a reputation for their

expertise. Building reputation has been shown to foster participation in communities of practice (Wasko & Faraj, 2005).

With reminders from the PI, everyone had a profile photo posted within the first few days. Using actual photos of the participants in the system was noted by participants as helping motivate participation in the system. As all of the participants knew at least one other person in the study, this is presumed to be due to familiarity and trust.

Another approach we adopted was to provide an initial face-to-face training workshop. This gave an opportunity for the participants to meet one another and the facilitator. Group trainings may also allow users to get to know one another outside of the system, if they are not already acquainted, further promoting trust and motivation to participate.

**Support access to technology.** Face-to-face registration and computer and mobile technology skills workshops, in general, can helped timid users overcome skill-based barriers to use of the social learning system while supporting access to other online technologies as well. The initial training workshop helped overcome some of the design and navigation issues identified in the usability study. In particular, we found the translate button was a well-liked and used feature of the website after its availability was shown to users. A facilitator of these workshops who is also available as help in the system can be a Training and Technology Steward. The Technology Steward as described by Wenger (2001; 2006) provides technical assistance and can help troubleshoot access issues, but does not participate as a member of the group. In this study, the PI acted as Training and Technology Steward, addressing technology issues and placing video and discussion content designed to engender interactions. She did not,

however, participate in the discussions so that participants would see one another as experts in the group.

**Incorporate mobile technologies.** Additional ways to access the system and participate could improve participation and provide motivation for frequent participation. For example, receiving push notifications on a mobile device might improve participation. In the existing design, e-mail notifications of new content or comments were an opt-in rather than opt-out option – a constraint of the software chosen. Several of the final study participants mentioned that they preferred to access the system on their phones, but it did not work as well. Assuring that the chosen technology has this option is recommended.

**Promoting the system among potential users.** Finally, both the test users in the walkthroughs and the final study participants suggested the system should be promoted throughout Texas and even nationally or internationally not just in Houston. There are large CHW groups in San Antonio, the Rio Grande Valley and El Paso, Texas from which others could be recruited to participate. One test user suggested that the Texas Department of State Health Services program that oversees CHW Certification could send out a flyer about the system with the certificates of new and renewing Certified CHWs. Flyers coming from the state might also increase trust of the system. She also suggested that sending paper flyers in the mail followed-up with e-mails may be more effective than e-mails alone. Ultimately, having a well-thought-out plan to promote and launch a system including understanding preferred communication modes and trusted organizations as well as offering a way to know who else is participating is recommended for any social learning system designed for a specific group of healthcare workers.

## Implications for Research and Intervention Development

**Unique challenges for user analysis.** The implications of this research are broader than just the challenges of designing systems for CHWs. Existing user analysis techniques may not be sufficient to identify complexities associated with other healthcare workers who, like CHWs, have diverse work settings and duties, diverse technology skill levels, and varied hardware with which to access a system. User analysis methods must yield results that help researchers and designers tease out key motivators for participation and identify deal-breaking barriers. CHWs are not the only healthcare workers with these characteristics who would benefit from opportunities to interact around issues of practice with colleagues in dispersed locales. Public health nurses, home health care assistants and rural physicians are some examples of others who may have unique needs and barriers to participation that would require new methods for user analysis to achieve useful, usable and satisfactory design of systems.

**Measuring Success.** Recognizing that some successful communities of practice consist of up to 90% of members who are 'lurkers' (Nonnecke & Preece, 2000), one could conclude that the participation problems could have been overcome by recruiting from a larger pool of CHWs. Much of the research about online, workplace communities of practice, studied implementations with a large pool of potential participants such as at multinational corporations (Ardichvili, 2008; Jennex, 2005) or a university (Scherer, Shea & Kristensen, 2003). With a training intervention such as the one in this study, successful implementation cannot be measured by numbers of participants alone. A high level goal for such an intervention is to contribute to the expansion of the CHW workforce. Unlike other knowledge-focused training goals, this goal requires some level

of saturation within the pool of potential and existing CHWs in a community with participants from across different levels of expertise and experience. Both of the partnered theories for changes in individual self-efficacy and group norms as proposed for this research depend on robust participation across the CHW community. Situated Learning theory was developed from observations of craftsman apprenticeships where practices were learned and new knowledge created through interactions among the novice, intermediate and expert craftsmen (Lave & Wenger, 1991). Sharing of experience in a group with diverse levels of expertise may be necessary to promote self-efficacy for the most appropriate practice behaviours and skills to emerge. That is, a group of all novice users might reinforce poor practices or a group of all expert users might lack experience with new situations for performing a practice.

Defining a successful implementation of a social learning system for CHWs without considering not only the number but also the type of participants may also be an issue of equity. As noted earlier, the "digital divide" represents an unequal distribution of usage challenges, in this case, no time, old hardware, perhaps slow connection speed, few computer skills, low literacy or limited skills with the majority language (EIU, 2013). A social learning system should strive to overcome these inequities and motivate participation by everyone in the system. New information systems have the risk of perpetuating disparities among participants, what Donella Meadows refers to as a system trap of "Success to the Successful" where those who have a resource are better situated to take advantage of or acquire additional resources (Meadows, 2008). Providing training and skill development opportunities equitably to the CHW community is not only morally correct, but supports the goal of learning created through the robust sharing of

diverse experiences and perspectives in a diverse community. Participation across the spectrum of CHW experience may be an important measure of success that assures development of a workforce that reflects the diversity of the communities to be served. Other healthcare workers may have differential access to technology that should be explored before defining success of a social learning system designed for them.

**Outsider status of the researcher/developer.** As described earlier, issues of trust of the researcher may have been relevant to low participation in the initial pilot study of CHW Conversations. The status of the researcher as an outsider to the CHW community likely also contributed to the difficulty in recognizing and eliciting key factors related to user characteristics that were barriers to participation. This is not an uncommon position for biomedical informatics researchers to be in as they conduct workflow and business process analyses to develop requirements for new system designs or re-designs. Biomedical informatics is not the only research domain that experiences a distance between the researcher and the people and organizations involved as participants in the research. Public health in particular has sought to find methods to overcome distrust and disinterest of the populations they intend to serve with research results (Viswanathan, Ammerman, Eng, et al., 2004). Community-Based Participatory Research or CBPR is one approach that engages and collaborates with communities to identify research topics, develop the research design, conduct data collection, interpret research findings and disseminate research results (Minkler & Wallerstein, 2008). CBPR proponents are self-conscious about the power relations between academia and marginalized communities that have not always reaped benefits from the research in which they participate and,

historically, at least, at times have suffered harm from participation (Tuskegee Syphilis Study Legacy Committee, 2007).

> The ultimate benefit to emerge from such collaborations is a deeper understanding of a community's unique circumstances, and a more accurate framework for testing and adapting best practices to the community's needs (Viswanathan et al., 2004, p. 1).

A collaborative approach is not unknown in biomedical informatics when research academics collaborate with clinicians on development of devices or systems for clinical use (ref.: personal experience). In these cases, the balance of power between researcher and researched is more equal and cultural differences may be less extreme than between researchers and communities. The application of CBPR methods to biomedical informatics research with communities that experience health disparities or, even, healthcare workers like CHWs who are not in positions of power in the clinical care setting may prove a valid way to overcome the shortcomings in user analysis and barriers to participation experienced in the research presented here. Furthermore, CBPR has been promoted as a way to effectively and sustainably translate intervention research findings into practice (Wallerstein & Duran, 2010).

**Designing for self-efficacy developing and norm affirming communications.** Our study showed that designing for specific types of learning communications is possible. We found that customized videos with discussion questions tailored to the communications types of interest were successful at eliciting both self-efficacy developing and norm affirming communications more than open discussion alone. This has important implications for the development of the healthcare workforce, in general,

not only CHWs. Workplace competencies depend not only on having an adequate knowledge base, but also being able to perform which requires both individual agency and group acceptance. Our study suggests training must include opportunities for workers in a community to interact around meaningful content in order to support the development of self-efficacy and norms for performance among those workers. The learning communications in this research are posited to develop behaviors for practices in the workplace, i.e. outside of the online space. The ability to engineer particular types of communications online for behaviors in the offline world has important implications for new areas of research in Cognitive Informatics.

Designing for specific types of interactions may also be relevant to the development of various other types of health information technology. Clinical decision support (CDS) systems, for example, must convey a range of information on which clinicians and other medical staff must respond. The findings here contribute to our understanding of potential responses that adhere to the Five Rights of CDS whereby the right information is delivered to the right person in the right format through the right channel and at the right time in workflow (Campbell, 2013).

**A theoretical foundation for practice development.** For this study, we proposed the Social Cognitive Theory–Situated Learning Theory Framework for Practice Development. The Framework has relevance for online and face-to-face learning communications for the performance of work by a group. Further studies are needed to validate the model constructs. The current study lays the groundwork for future work to test and substantiate the performance outcomes predicted in the model.

In addition to self-efficacy and norm communications, we identified other types of communications in social learning systems that may contribute to practice development that also warrant further study.

**In Summary**

In designing a social learning system for Community Health Workers, we encountered unanticipated barriers to participation not revealed by the user analysis. Using more in-depth Usability Testing, we discovered a need to more fully understand the nature of computer access and barriers to access for this group. Some ways to improve access include making it easy to participate using mobile technologies and assisting the development of skills and comfort with technology. At least at the beginning before a community of participants grows, it is important to find ways to engender trust and familiarity among participants and with the facilitator or Training and Technical Steward for the system.

Our findings contribute to the field of biomedical informatics by suggesting new methods for user analysis and system design. Recognizing that the characteristics of CHWs may also be common with some other groups of healthcare workers, adopting new methods for user analysis such as those used in CBPR may be helpful. It is also important to be aware that existing measures of success for participation in such systems are not necessarily based on the learning of all participants. Furthermore, we found that we could design for specific types of learning communications–self-efficacy developing and norm affirming–that the SCT-SLT Framework suggests are central to the development of group practice. This could have broad application for the design of online systems for development of the healthcare workforce.

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Collection site: Survey number:

**Patient Navigator/Community Health Worker Survey**

**Section One. Difficult Conversations in CHW Work**

1. Many of the topics that come up with clients aren't things that are easy to discuss in everyday conversation. You have to be sensitive or careful when discussing these topics. Both health topics or social issues may be sensitive. For example, some CHWs think that issues related to **HIV** can be hard to discuss with some clients. **Finances** is another topic that may be sensitive for some people to talk about. **Please name two topics that you find you must be sensitive about with clients.**

**Topic A.** _____ **Topic B.** _____

2. How often do you discuss these topics with clients?

a. I discuss **Topic A** with

1❒ EVERY client
3❒ MORE THAN HALF of my clients
2❒ ABOUT HALF of my clients
4❒ ONLY A FEW of my clients

b. I discuss **Topic B** with

1❒ EVERY client
3❒ MORE THAN HALF of my clients
2❒ ABOUT HALF of my clients
4❒ ONLY A FEW of my clients

3. What makes **Topic A** difficult to discuss? (Check all that apply.)

1❒ The topic makes some of my clients uncomfortable
2❒ The topic sometimes makes me uncomfortable
3❒ We are not always in a setting where we feel comfortable speaking about this topic
4❒ For cultural reasons
5❒ Other reasons or comments: _____
_____
_____

4. What makes **Topic B** difficult to discuss? (Check all that apply.)

1❒ The topic makes some of my clients uncomfortable
2❒ The topic sometimes makes me uncomfortable
3❒ We are not always in a setting where we feel comfortable speaking about this topic
4❒ For cultural reasons
5❒ Other reasons or comments: _____
_____
_____



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IRB NUMBER: HSC-SBMI-11-0491
IRB APPROVAL DATE: 2/28/2012

Collection site: Survey number:

**Section Two. Being a Community Health Worker**

In the questions below, the term "job" refers to both volunteer and paid positions where you are recognized as a CHW.

7. How did you learn how to do your job? Check **ALL** that apply.
(If you are not currently in a CHW job, answer for your last CHW job.)

1❒ I have never had a job as a CHW. (Please go to the next question.)
2❒ Another CHW showed me what to do.
3❒ I watched what the other CHWs do.
4❒ My agency had a training/orientation for my job.
5❒ My supervisor showed me what to do.
6❒ Someone else at my work showed me what to do.
7❒ Some other way: _____

8. What kind of training do you get to help you be a CHW?

1❒ My agency provides training workshops for staff.
2❒ I took CHW Certification classes.
3❒ I take CHW Continuing Education classes.
4❒ Other: _____

9. Where else do you get the information you need to be a CHW?

1❒ I talk to other CHWs.
2❒ I read brochures at agencies I visit.
3❒ I look things up on the Internet.
4❒ I read magazines/newspapers.
5❒ I see things on TV.
6❒ I rely on my personal experiences.
7❒ Other: _____

10. Complete the sentence. (Choose **ONE**): "I work as a _____."

1❒ Patient Navigator
2❒ Promotore /Promotora de salud
3❒ Other _____
4❒ Community Health Worker
5❒ Lay Health Worker

11. How do you communicate with other CHWs? Check **ALL** that apply.

7❒ I don't communicate with other CHWs
1❒ in person
2❒ texting on a phone
3❒ on a social network website like Facebook
4❒ talking on a phone
5❒ by e-mail
6❒ in another way: _____

12. How often do you communicate with CHWs **from your agency?**

7❒ I am the only CHW in my agency
1❒ At least once a day
2❒ About every other day
3❒ Once a week
4❒ Once or twice a month
5❒ Not even once a month
6❒ Never

13. How often do you communicate with CHWs **from other agencies:**

1❒ At least once a day
2❒ About every other day
3❒ Once a week
4❒ Once or twice a month
5❒ Not even once a month
6❒ Never

14. When in a difficult conversation with a client, I think of strategies **CHWs in my agency** use to make it easier.

5❒ Strongly Agree
4❒ Agree
3❒ Not sure
2❒ Disagree
1❒ Strongly Disagree

15. When in a difficult conversation with a client, I think of strategies **other CHWs in my community** use to make it easier.

5❒ Strongly Agree
4❒ Agree
3❒ Not sure
2❒ Disagree
1❒ Strongly Disagree

16. When in a difficult conversation with a client, I think of strategies **other people** (like a trainer, coworker, nurse) use to make it easier.

5❒ Strongly Agree
4❒ Agree
3❒ Not sure
2❒ Disagree
1❒ Strongly Disagree

**Section Three: Technology Use**

17. Do you use a cell phone? Check **ONE** box only.

1❒ No, I never use a cell phone
2❒ Yes, for personal purposes only
3❒ Yes, for work purposes only
4❒ Yes, for both work and personal purposes

18. Is the cell phone you use for work a smart phone (like an iPhone or Android phone)?

1❒ No 2❒ Yes 3❒ I don't know
4❒ I don't use a cell phone for work.

19. Do you own the cell phone you use for work?

1❒ No 2❒ Yes
3❒ I don't use a cell phone for work.

20. How often do you use a cell phone to make or receive phone calls?

1❒ At least once a day 4❒ Once or twice a month
2❒ About every other day 5❒ Not even once a month
3❒ Once a week 6❒ Never

21. How often do you use a cell phone to send or receive text messages?

1❒ At least once a day 4❒ Once or twice a month
2❒ About every other day 5❒ Not even once a month
3❒ Once a week 6❒ Never

22. Can you send and receive an unlimited number of text messages?

1❒ No 2❒ Yes 3❒ I don't know
4❒ I don't have a cell phone.





UTHealth The University of Texas Health Science Center at Houston
IRB NUMBER: HSC-SBMI-11-0491
IRB APPROVAL DATE: 2/28/2012

23. Do you use a computer?

1❒ No, I never use a computer
2❒ Yes, for personal purposes only
3❒ Yes, for work purposes only
4❒ Yes, for both work and personal purposes

24. How often do you use a computer?

1❒ At least once a day
2❒ About every other day
3❒ Once a week
4❒ Once or twice a month
5❒ Not even once a month
6❒ Never

25. Do you use the Internet?

1❒ No, I never use the Internet.
2❒ Yes, for personal purposes only
3❒ Yes, for work purposes only
4❒ Yes, for both work and personal purposes

26. How often do you use the Internet?

1❒ At least once a day
2❒ About every other day
3❒ Once a week
4❒ Once or twice a month
5❒ Not even once a month
6❒ Never

27. Do you use the Internet to watch videos on YouTube or some other website? Check **ONE** box only.

1❒ No, I don't use the Internet.
2❒ No, I cannot play videos on the Internet
3❒ No, I do not choose to watch videos on the Internet
4❒ Yes, I watch videos on the Internet

28. Do you have an e-mail address?

1❒ No, I don't have an e-mail address.
2❒ Yes, I have a personal e-mail address only
3❒ Yes, I have a work e-mail address only
4❒ Yes, I have both work and personal e-mail addresses

If you DO NOT have an e-mail address, **GO TO #32**.

29. Where do you read your e-mail? Check ALL that apply.

1❒ On a computer at home
2❒ On a computer at work
3❒ On a cell phone
4❒ On a public computer (like at a library or community center)

30. Do you use e-mail for work or personal purposes?

1❒For work purposes only
2❒For personal purposes only
3❒For both work and personal purposes

31. How often do your read your e-mail?

1❒ At least once a day 2❒ About every other day
3❒ Once a week 4❒ Once or twice a month
5❒ Never

32. Are you a member of these social networking websites? Check **ALL** that apply.

1❒ Facebook 2❒ MySpace 3❒ CHW Network 4❒ Hi5 5❒ Other: _____ 6❒ none

33. Please mark the best choice for how often you use social networking websites. Please only mark those **you are a member of**.

| I view: ↓ | At least once a day | About every other day | Once a week | Once or twice a month | Never |
|---|---|---|---|---|---|
| Facebook | 1❒ | 1❒ | 1❒ | 1❒ | 1❒ |
| MySpace | 2❒ | 2❒ | 2❒ | 2❒ | 2❒ |
| CHW Network | 3❒ | 3❒ | 3❒ | 3❒ | 3❒ |
| Hi5 | 4❒ | 4❒ | 4❒ | 4❒ | 4❒ |
| Other | 5❒ | 5❒ | 5❒ | 5❒ | 5❒ |

**Section Four: Demographics**

34. How old are you? _____ 35. Are you: 1❒ Female 2❒ Male

36. How many years have you worked or volunteered as a CHW? _____

If less than one year, how many months? _____

37. How do you describe your race/ethnicity? Check ALL that apply:

1❒ Black 2❒ White 3❒ Latino/a
4❒ Asian 5❒ Other

38. Are you currently employed as a CHW?

1❒ No 2❒ Yes

39. Are you currently employed as a Patient Navigator?

1❒ No 2❒ Yes

40. Do you volunteer as a CHW?

1❒ No 2❒ Yes

41. Do you volunteer as a Patient Navigator?

1❒ No 2❒ Yes

42. Are you a Certified Community Health Worker?

1❒ No 2❒ Yes

**Thank you for your time and for sharing your experiences and expertise!**



UTHealth The University of Texas Health Science Center at Houston
IRB NUMBER: HSC-SBMI-11-0491
IRB APPROVAL DATE: 2/28/2012

# Appendix B: Group Interview Protocol and Satisfaction Survey

**CHW Conversations Semi-structured Group Exit Interview**

I want to thank you for spending your time to participate in this study. I wanted to close the study with this group interview to get your impressions of CHW Conversations.

1. Can you tell me something that happened on the website that you found useful for your work?
    a. In what ways will it help you in your work/

2. Was there anything that happened that bothered you or you found annoying?

3. When you read about other CHWs' experiences with a difficult conversation, how did that affect you?

4. What did you think about the resources in the Discussion section of the website?

5. What did you like most?

6. What would you change?

7. If the website were to remain active after this study, what organization would be best to run it?

    a. Who should participate – Houston CHWs only? Texas-wide? Any CHW?

**Post-Participation Survey – CHW Conversations Learning System**

Please rate from 1 to 5 the following statements about your experiences participating in the system.

1. If CHW Conversations were available all the time, I would use it to communicate with CHWs.

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

2. If CHW Conversations were available all the time, I would use it to view training resources like videos.

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

3. If CHW Conversations were available all the time, I would use it to view resources posted by other CHWs.

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

4. If CHW Conversations were available all the time, I would use it to share resources with other CHWs.

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

5. How often would you use CHW Conversations if it were available all the time?

| **Hardly Ever** | | | | **Very Often** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

6. How important is it to you to be able to communicate with other CHWs on a regular basis?

| **Not important** | | | | **Very important** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

7. I would like to have more opportunities to communicate with other CHWs.

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

8. I think this social learning system was useful for getting to know how other CHWs do their work.

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

9. I think this social learning system was useful for learning more about communication and interpersonal skills.

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Appendix C: Self-efficacy developing and norm affirming codes operationalized

Table 20

*Operational definitions of communication type codes*

| Code Name | Operational Definition | Components |
|---|---|---|
| Norm affirming | Declarative statements that show self-awareness that state that specific behaviors, ideas or attitudes are ones appropriate for or characteristic of CHWs (or, in Spanish, *promotores/as de salud*). The words used often convey obligation, duty or correctness. | Reference CHWs as the subject of the statement ("CHWs are concerned about…") and sometimes acknowledge that they are speaking within a group of CHWs ("We as CHWs know…"). Include words like "should" or "must" ("CHWs must know what resources are available…") as well as negative statements about what CHWs should not do/think/feel. |
| Self-efficacy developing | Communications that include information about the situation (client, setting and/or problem to be addressed), the behaviors of the CHW and the outcome of the behaviors with respect to the stated or implied goal of the behavior. Such communications should show context (situation) and cause (the CHW behavior) and effect (the client outcome). | The speaker refers to himself or herself ("I have clients who…", "I explain that…") rather than to a group in general; the speaker describes the context of the encounter ("When a client is uncomfortable…", "Many of my clients don't have legal documents…"); and, the speaker states an outcome usually of the client ("Then, the client is reassured that…"). |

Appendix D: Chapter Four examples with original Spanish text

Video One Translated Examples

> [Nombre de CHW] estoy de acuerdo con el uso de MI y aplicar el MINE [estrategia de communicación] como CHW activos.
>
> *[Name of CHW], I agree with the use of MI and to use MINE [communication strategy] as CHW assets.*

The self-efficacy developing statement on Video One was from a participant who posted:

> También es muy importante darle a la communidad la información corecta y hacerle seguimiento. En lo personal tuve la experiencia de darle a una persona número de teléfono para agarar cuidado de salud en una clinica lo cual que la clinica promovía no era tan fácil como decían para acesar. Nuestro trabajo debe de ser no solamente referir pero asegurarnos que optengan Los servicios tal como las compañías prometen.
>
> *It is also very important to give the community correct information and follow-up. Personally, I had an experience of giving a person the telephone number to get health care in a clinic that wasn't as easy to access as the clinic said. Our work must be to not only refer, but also make sure they obtain the services that the companies promise.*

Video Three Translated Examples

> …Bueno soy voluntaria en una organizacion donde hacen ferias de salud, Pap's y examines clinicos de seno y normalmente pues les tenemos que decir a la paciente

que tiene que quitarse toda su ropa para que cuando la doctora llege le haga su examen. Para muchas mujeres no es facil desvestirse enfrente de mas gente y sobre todo a las mujeres de una edad entre los 50 anos o mas pero mientras hablo con ellas voy ganandome su confianza y asi se les hace mas sencillo tambien les pregunto se necesitan hacerle preguntas a la doctora para ayudarles a que entiendan algunos terminos medicos que aveces utilizan los doctors.

*...Well, I am a volunteer in an organization that holds health fairs, Pap's and clinical breast exams. And, normally, we have to tell the patient that they have to remove all of their clothes so that when the doctor arrives she can do the exam. For many women, it is not easy to undress in front of other people and especially for women from 50 years and older. But, while I talk to them, I am gaining her trust and thus it is simpler for them. Also, I ask them if they need to ask questions of the doctor, to help them so that they understand some medical terms that the doctors use at times.*

Discussion One translated examples

Cuando usemos una imagen asegúremonos de que esta ayuda a las personas a comprender lo que se esta diciendo. Asegúrate de que no los confunda. Este tipo de material es el que comunmente trato de usar como CHW.

*When we use an image let us make sure that this helps people to understand what is being said. Make sure you do not confuse them. This type of material is what I commonly try to use as a CHW.*

El tema dificil que me a tocado es platicar con los hombres la necesidad que hay de aserse el examen de la prostate pues el MACHISMO no nos permite. Y la

estrategia que utilizo es decirles que tenemos que pensar en nuestra familia,porque podemos llegar a enfermarnos de tal manera que son los que realmente sufririan. Y auque son realmente pocos los que logran entender,que la prevencion es el unico metodo de que esto no suceda,tenemos que seguir motivando e informando a nuestra comunidad. Me encanta servir a la gente y soy feliz con lo que hago.

*The difficult topic that I have run into is to talk with men about the necessity to get the prostate exam. Well, MACHISMO doesn't permit us. And, the strategy that I use is to tell them that we have to think about our family because we could get sick in such a way that they are the ones that truly suffer. And, although it is really few that come to understand that prevention is the only way for this not to happen, we have to continue motivating and informing our community. I love serving the people and I am happy with what I do.*

Table 21 (Table 17 with original Spanish)

*Participant initiated discussions and associated norm statements*

| | |
|---|---|
| Initial Post | *Title: Comer Saludable  Code: Not coded<br>Post: Comer Saludable<br>*Eating Healthfully* |
| Norm Statement | …Pero es importante que como CHW ayudemos a nuestra comunidad a ver que no es necesario dejar de comer todo lo que comemos si no comerlo con moderacion.<br>*But, it is important that as CHWs we help our community see that it is not necessary to stop eating everything if we eat it in moderation.* |

| | |
|---|---|
| Initial Post | Title: Mercado de Salud Code: Other<br>Post: (ObamaCare) Gente de acuerdo y gente en desacuerdo. Creo que solo tenemos que orientarlos para que sea el sistema<br>el que les de las respuestas y los oriente, para que escojan la opcion que mas le convenga a cada quien.<br>*(ObamaCare) People agree and people disagree. I believe that we only have to orient people so that the system gives them the answers and orient them to choose the option that best suits each individual.* |
| Norm Statement | Muy de acuerdo pero es importante que nosotros como promotores de la salud les hagamos saber a la communidad que tener un seguro medico es tan importante como lo es tener un seguro de carro o de casa.<br>*I agree very much, but it is important that we as Promotores de la Salud let the community know that to have medical insurance is as important as having car or house insurance.* |
| Initial Post | Title: preeclampsia Code: Other<br>Post: It is very important for women to seek prenatal care early to screen for preeclamsia which is a condition that occurs during pregnancy that can cause death to the mother and baby. This condition results in sudden high blood pressure that causes premature births and even death. Many women seek prenatal too late sometimes when the are well into the second and third trimesters. Women should be seeking prenatal care as soon as the suspect that they are pregnant. One of the early signs of preeclamsia is elevated protein found in urine of pregnant woman in the first trimester. It is very important to establish if a pregnant woman is at risk for preeclamsia very early to lower risks associated with this condition. A helpful resource is www.preeclamsia.org. |
| Norm Statement 1 | I totally agree [Name of CHW] seeking prenatal care in the first trimester is very important. I have noticed from working in the field that the teenagers and younger generation are comfortable with not seeking medical attention until the end of pregnancy. This is where the CHW's job is to help educate the community in every way possible. |

| | |
|---|---|
| Norm Statement 2 | La preeclampsia, ocasiona daño al endotelio materno, riñones e hígado. Cuando se padece aplican la inducción del parto o una cesárea y puede aparecer hasta seis semanas posparto. Es la complicación del embarazo más común y peligrosa, por lo que debe diagnosticarse y tratarse rápidamente, ya que en casos graves ponen en peligro la vida del feto y de la madre. Como CHW debemos ayudar MINE. *Preeclampsia causes damage to the maternal endothelium, kidneys and liver. When a woman suffers from it, they induce labor or Cesarean section and it can appear up to six weeks postpartum. It is the most common and dangerous complication of pregnancy, so it must be diagnosed and treated quickly, as in severe cases endanger the life of the mother and the fetus. As CHWs we must help MINE.* |
| Initial Post | Title: teen pregnancy Code: Other<br>Post: Obesity in pre teen pregnancy: how can we get the word out to our youth of 2015 & help them? |
| Norm Statement | … As a CHW, we have to educate and re-educate on the benefits of trying healthy eating and their prenatal care. In many cases most cannot afford the option of eating something else other than what's already on their table. Encourage them to eat as much fruit and vegetables when possible even if it's at school, and continue with the regular prenatal appointments. |
| Initial Post | Title: Cardiovascular in the Homeless Community Code: Other<br>Post: (Edited for space.) Compared to the general population, the homeless had much higher rates of smoking but not diabetes, hypertension or obesity. However, most of the homeless affected by these risk factors had not received adequate treatment for hypertension, high blood cholesterol and had poor control of diabetes, the estimated average risk of suffering a heart attack or dying of coronary disease within the next 10 years was five percent, about the same as men in the general population. Please give me your feedback on assisting a client with cardiovascular disease |

| | |
|---|---|
| Norm Statement | … The problem we face as CHWs is ensuring the clients maintain their appointments and take the medication prescribed by the physician. I agree with [Name of CHW] living on the streets losing their medication is a problem, but again there are agencies that will allow them to keep their medication stored. We need to educate our homeless community. |
| | * A practice post posted during the initial training. |

Appendix E. Themes from statements coded as 'Other'

Table 22

*Themes from statements coded as 'Other'*

| **Code** | **Definition** |
|---|---|
| Analysis | Explains why things are the way they are such as why a client population experiences a certain health problem or barrier to care. |
| Strategies | Suggests methods for the CHW to reach a goal with clients or a population of clients in general. |
| Response/ Acknowledge | Mentions a specific CHW, usually, praising them for or agreeing with their contribution to the discussion. |
| Information | Provides factual information about a health topic without providing a specific reference or resource. |
| Relating own experience | Mentions personal experience with a population, health problem or practice. |
| Resources | Provides a link to a resource on the Internet. |
| Cheerleading | Provides positive statement or quote. Sometimes like cheerleading. |
| Events | Provides information about an event of interest to CHWs. |
| Discussion Starter | Makes a statement or asks a question solely to spark discussion. |
| Asking a question | Asks a question for more information about something. |