Computer-Supported Cooperative Work on Healthcare Education for the Seniors

Yingdi Liu

Georgia Institute of Technology

Project Proposal

OMSCS 6460: Educational Technology

Abstract

This proposal outlines research track work on investigating effects of computer-supported cooperative work (CSCW) on accessibility and efficiency of healthcare education for the seniors. The phenomena to be investigated is how accessible and efficient could CSCW techniques be used when providing accurate healthcare-related information to the seniors, who have different demographic background. The goal of preliminary is to define what this research can contribute to senior community by studying the effects of computer supported and distributed learning network targeting convivence of usage for the seniors. Meanwhile, the preliminary proposal presented here might be useful to attract potential collaborators for this course project.

Keywords:

Educational Technology, Computer-Supported Collaborative Work (CSCW), Healthcare Education, Seniors

Table of Contents

Statement of Work

Elder health care has been a critical issue we are facing (Waxman, 2018) (Leutz, 1985) (Cutler, 1990). Not only it is a social humanitarian issue, but also, it is a multi-billion-dollar market with intensive and emergent need (Gaynor, 2015). When people get older, their physical and mental health condition is getting inevitably less optimal. They may need a lot of help form their younger family members. Besides, they may not know what to do to take care of themselves and to prevent disease (Mirowsky, 2017). However, their children may not live with them and may not be able to check their conditions or provide help on time. Nowadays, the caregivers mainly consist of social workers, doctors, physicians or nurses, of whom the educational resources are extremely limited and not available for many people all the time.

Therefore, a fully developed tool for the elders to educate themselves of health and caretaking knowledge is urgently needed and is going to be very helpful, within which the computer-supported cooperative work (CSCW) on health care education is promising (Fitzpatrick, 2013). My project targets Elder Health Care education for seniors, which is purposed to help the elder people's physical and mental health by educating the elders with health knowledge. The research targets are "elder people" where the context narrows down to any senior whose age is over 65. The goal of this project is to research how to use CSCW to develop network and distributed learning environment, where the elders are convenient to know their own health condition and learn anything relevant to it too. In this case, they can use the knowledge they learn to guide their life style towards a better and healthier way.

To narrow the topic down to a Five-week's project, the research question is how to effectively deal with diverse culture background of users in the content of Social Learning Theory (SLT) within computer-supported cooperative work (CSCW) system.

Introduction: CSCW and Social Learning Theory

Computer-supported cooperative work (CSCW) and Social Learning Theory (SLT)

In any educational computer-supported cooperative work (CSCW) system, the quality of training and the response time for any *abnormal* situations are essential. The technical system can only scale well while maintaining good quality of education in a *decentralized* and *automatic* manner, such as Social Learning platforms or distributed apps or online forum style of learning. Studies have shown that many CSCW applications share two characteristics: a significant investment has been made in their development, and their successes have consistently fallen far short of expectations (Grudin, 1988). I think the reason been that the application fields have not been closely targeted to its intended audients, and the methodologies used in preliminary user cases studies are not efficient. Here our ultimate goal is to research proper approaches to provide individual tailored, scientific health related knowledge to the seniors.

An interesting and representative CSCW system is an e-learning environment where participants have to solve a mission working in collaboration with other students in a team (Sancho, 2008). The general architecture's critical part is the Adaption Engine and Learning Strategy Manager, where the CSCW model is adapted among all the players real time, while the learning strategy is controlled and adjusted by a centralized manager to make sure the correct and efficient path is taken. This model generally reflects the idea I wish to implement and investigate for Social Learning Theory with its applications in CSCW system.

Social Learning Theory (SLT) is a theory of learning and social behavior. In SLT, people will learn new behaviors by *observing* and *imitating* other people.(Bandura, 1971) SLT believes that

learning is a cognitive process. The learning occurs only from observation and/or direct instruction in a social context.(Bandura, 1963) It may not need motor reproduction or direct reinforcement.(Bandura, 1963) Besides the observation of behavior, learning also occurs through the observation of rewards and punishments, which is known as vicarious reinforcement. This is to say, if a particular behavior always get reward, it will persist; and conversely, if a particular behavior always get punished, it will desist.(Renzetti, 2012) On the other hand, in the traditional behavioral theories, behavior is governed solely by reinforcements, by placing emphasis on the important roles of various internal processes in the learning individual.(Bandura, 1971)

At the origin and early stage (1960s ~ 1990s) development of SLT, it's a model integrated behavioral and cognitive theory of learning and explains a wide range of learning experiences. Based on the initial outlines on Bandura and Walters in 1963 (Bandura, 1963), Bandura further detailed it in 1977 (Bandura, 1977). Grusec gave 5 key tenets of SLT as following (Grusec, 1992):

1. *Learning is not purely behavioral; rather, it is a cognitive process that takes place in a social context.*
2. *Learning can occur by observing a behavior and by observing the consequences of the behavior (vicarious reinforcement).*
3. *Learning involves observation, extraction of information from those observations, and making decisions about the performance of the behavior (observational learning or modeling). Thus, learning can occur without an observable change in behavior.*
4. *Reinforcement plays a role in learning but is not entirely responsible for learning.*
5. *The learner is not a passive recipient of information. Cognition, environment, and behavior all mutually influence each other (reciprocal determinism).*

These 5 key tenets have formed the foundation, and since then SLT has become perhaps the most influential theory of educational learning and development. (Muro & Jeffrey 2008)

Recently, SLT theory is rooted in many of the basic concepts of traditional learning theory. It has often been called a bridge between behaviorist learning theories and cognitive learning theories, because it encompasses attention, memory, and motivation.(Muro & Jeffrey, 2008) As the most influential theory of educational development, SLT was used in many research fields: Since 2009(Akers, 2009), Ronald Akers have used SLT in investigating social structures and relation of crime and deviance, while Joan Cochran et al.(Cochran, Maskaly, Jones, & Sellers, 2017) have further research on intimate partner violence; Julian Rotter(Rotter, 2017) applied SLT in the practice of psychotherapy; In 2016, Liu et al (Liu, Chu, Song, Xue, & Lu, 2016), have studied SLT in computer algorithm optimization. For educational technology, Dunleavy, Matt, and Chris Dede(Dunleavy & Dede, 2014) have shown positive results of SLT in adult education via augmented reality; Conley et al.(Conley, Lutz, & Padgitt, 2017) have shown a relatively new aspect of SLT: online learning environment with its advantages and limitations.

Limitations: Social Learning Theory (SLT)

As shown above, while most recent works support SLT, as every other theory it also has certain limitations. For example, as shown in Conley et al.'s(Conley et al., 2017), and George et al.'s work(George & Walker, 2017) in 2017, online learning environment is relatively new as social interaction format, its lack of regulation, and more importantly ways of assessment of participation could be problematic to measure the results of education. Also, the new and fast changing

infrastructure needed could be barrier for persons with disabilities or technically inclined(Brunstein, Jaime, Curi, d`Angelo, & Mainardes, 2015).

Challenges: Applying SLT on CSCW

As discussed above, social learning theory (SLT) has been long tested to be promising but nowadays it is facing challenges from renewed technical innovations, such as online or computer assisted environment.

The impacts of SLT on computer-supported cooperative work (CSCW) is positive and substantial (Brown & Treviño, 2014): in a CSCW environment, Brown et al. has shown in 2014 that we can incorporate symbolic modeling to bring desirable responses. Among a group of people participating in the network at different time and places, the “positive role models”, promoted by automatic algorithm in the educational system or by a voting mechanism among peers, represents players who can pass on correct scientific knowledges about healthy food, exercise, and information regarding common diseases. “Negative role models”, who may be lack of knowledge or less informed in above mentioned area, may not even be any real players in system (artificial by design) provide an objective view regarding common rumors and preconceived ideas in above mentioned area. The last but most populous, undecide players, who are the targeted users of our research, may have doubt in both previous values, but the goal of our CSCW educational platform is to reinforce with reward for the “positive role models”, so that players can mimic them in social behaviors, and gain more scientific knowledges regarding a healthier lifestyle through the process.

Strauss et al.(Strauss, 2017; Taylor, 2017) have shown that SLT has also transformed CSCW by psychological modeling with its conflicting theories, in which the psychological impact of SLT on CSCW is discussed on the basis of what role does reinforcement play in observational learning.

Notice that SLT has been developed since the 1960s, much earlier in time than CSCW, which was first coined by Irene Greif and Paul M. Cashman in 1984. Naturally the upstream influence of SLT on CSCW provides research methodology, background, and a new platform the challenge and test out the theories. I think another proper question to ask ourselves is what is the impact of CSCW on SLT? It could bring a lot of challenges since we are applying SLT in a completely new environment: geographically distributed, demographically diverse, and utilize computer assisted augmented reality, and cooperate via online network which is abstract and lack of central management. However, I'm not extending this discussion since it is not asked here yet.

1. Demographical Diversity

There are several challenges for CSCW which include demographical differences among the peers. There are some limitations to the social learning theory that make it more complicated than it is made out to be especially in engaging in CSCW. A change in the environment does not automatically mean that a person will change too, as shown by Jung et al.(Jung, Lim, & Kim, 2017) that the issues with online document editing. Culture differences will show difference views of value and scope, where the "positive" and "negative" roles as shown in the previous section is no longer commonly recognized. For example, culture differences might have different choice of words or ways of expression, either explicit or implicit, during collaborative document editing

process. Without a more universal or common agreement among peers for the desired responses and approach, it could be difficult to form a management authority for the CSCW network.

2. Leadership Role

Another challenge is that the theory also seems to ignore biological and dispositions of people. Challenges of CSCW include needs for “leadership”, such as a centralized learning management people or authority, software or artificial intelligence management algorithm, which can vote and select for “positive role models”, filter rumors and misinformed “knowledges” from the group learning process.

3. Diverse Culture Background of Users

Another challenge is the diverse background of users: (1) Culture diversity include demographical information. For space and time variations, our users could be geographically distributed all around the world, thus making it difficult for CSCW to work due to progress sync requirement; (2) other culture differences: such as some people may believe in traditional medicine or alternative medicinal approaches for elders while some others might strongly against it. This will make it challenging to let these people work together to resolve their differences.

Potential Resolutions to the Challenges

However, most of these challenges could be resolved with efforts. Some resolutions could be: (1) automatically categorize users/learners by their geographical preferences and interest group (focus group model); Thus, making it easier for people to connect with others with similar interests nearby, and eventually promote face-to-dace interactions; (2) the CSCW protocol should always

incorporate some degree of management algorithm (leader) to support a healthy and scalable learning environment. For example, we need to filter out the rumors and harmful opinions against their peers, and promote scientific conclusions which have been long tested.

Project and Data Planning

Research Methodology

The first step of research would be literature reviews, including walkthroughs of existing CSCW infrastructures. An important and up to date research literature would be *"A review of 25 years of CSCW research in healthcare: contributions, challenges and future agendas"* (Fitzpatrick, 2013). The advantage of this method is to get *status quo* information regarding research of CSCW on healthcare education, which includes electronic records, technical interaction and integration, healthcare policies, and coordination of digital records of various stake holders. Meanwhile, this review is *not* specifically targeting the seniors, thus we have lots of room for the convenience and ease of use principles for the coordination of computer assisted educational network. In sum, this method will help to identify practical advantage and possible flaws in current designs. In this proposal, I plan to focus on only three variable parameters: food, excises, and disease.

What I want to resolve is clear, and I plan to employ a **hybrid quantitative and qualitative methodology** in my research project, as to analyze data obtained from interviews and surveys, as well as obtained from other reliable resources, together with a careful qualitative design on the ease of use for healthcare education, so that it will be both convenient and efficient to use for the seniors and persons with disabilities to acquire necessary health related information.

Independent and dependent variables, internal and external validity

Preliminarily, the independent variables will be the healthcare apps and websites which focuses on education, i.e. the simulation environment; while the dependent variables will be the effectiveness and efficiency of different groups of participants to acquire necessary knowledges

and information from such environment, i.e. different designs of technology flow or even the interface itself might help the elders to understand the information more quickly and efficiently. Internal validity will be from data analysis for consistency and significances generated by the proposed survey and interviews, and external validity would be from comparison with available external research data and literatures.

Data Plan and Spring-back Plan

The main difficulties for the proposal data plan is data availability: although the literature for CSCW and SLT is abundant, not much is focused on health education for the seniors. Not many of the audients of this course consist of the targeted senior people who can take the surveys. However, everybody at least has close contact to immediate family members or friends who are of elder ages, and may need health care or in need of scientific health related education. My planned Spring-back Plan is to channel through these people, i.e. if *direct* data is not available, try *indirect* information gathering as spring back plan. It might not be as efficient but still useful in contexts.

- Data Plan 1: Interviews

To effectively address the healthcare education needs of the elders, it will be important to seek out a representative set of individuals and conduct interviews. I plan to gather about Ten interviews with elder people, possible questions include: “how many times a week do you search Internet for your health related concerns”, “For previous searches, how much percentage do you use apps on mobiles as compared to desktops/laptops”, “how would the health provider’s portal designs affect your usage, such as font size, link structure, and how to put information together” The interview questions will be further developed along the way of this project, though I will focus mainly on

CSCW network on healthy food selection for the seniors, healthy low risk excises, and potential disease prevention. This data plan is mainly qualitative.

- Data Plan 2: Survey

Another goal is to research on what the elders' concerns about ease of use through network, as well as how to resolve lack of knowledge via CSCW techniques in EdTech. It is very important to know what is necessary for the elders to know, at least where to start to search, about information which they don't have yet. The survey will question about dependent against independent variables as mentioned in the last paragraph of the Research Problem section and having the survey methodology is a very useful approach which can be hybrid quantitative and qualitative. Sample survey question could be "from scale 1 to 7, with 1 been least likely and 7 been most likely, how would you share on computer network with others about your experience on selecting healthy food and exercises?", and "from scale 1 to 7, with 1 been least likely and 7 been most likely, how would you rate your experience managing digital health record through mobile app?"

- Data Plan 3: Existing Technology Walkthrough

Understanding existing technology will help us for a better grasp on designing interfaces for our goal (Grudin, 1988) (Procter, 2006) (Fitzpatrick, 2013). At first, a website searching is carried out for existing education interfaces utilizing CSCW techniques. I can avoid errors made by previous designs and find out the most important part of the interface. Also, designs with similar purpose will give us the ideas of the trends in the similar domain and migrations of user groups. For example, the hospital health care technical systems for patients might have a lot of similarities. At

the same time, I can research on how to avoid mistakes of over complex designs and list principles for others to develop new apps.

- Data Plan 3: Spring Back

As mentioned before, if I am not able to gather enough reliable data by Week 3 where the decision point is set, I will take the spring-back plan to use sub-set of data from my own experience and people who I've known to have immediate family members who are senior and in need or are interested in health educations tailored for them. The advantage is that I can obtain these data relatively easy through surveys and questionnaires, while the disadvantage is that they may not be as directly presentative.

Task List and Calendar

Task List and Intermediate milestones

Please refer to the last page for the detailed description of the task, as well as the correlation between tasks and corresponding scheduled week:

1. Preliminary data fetching, compose complete literature review and status quo review
2. Develop Research Methodology
3. Data acquisition from feedbacks
4. Generate intermediate conclusions
5. Data analysis and integration: preliminary
6. Draft report
7. Data integration and conclusion: preliminary
8. Data integration and conclusion: refinement
9. Draft and finalize final deliverables: research paper
10. Record presentation as required

Milestone 1:

Develop survey questions and solicit survey response for classmates; create interview script for the education needs of seniors, and go through existing technology analysis on similar topic. Kick-off Spring-back data plan if main data plan is not sustainable.

Milestone 2:

Make final adjustment. Share preliminary data and observations. Plans for ongoing analysis leading up to the final deliverable. Make first draft of the final report paper.

Research Calendar

(refer to the last page after the reference section)

Reference

Akers, R. (2009). Social Learning and Social Structure. *New York: Routledge*.

Bandura, A. (1963). Social learning and personality development. *New York: Holt, Rinehart, and Winston*.

Bandura, A. (1971). Social Learning Theory *General Learning Corporation*.

Bandura, A. (1977). Social Learning Theory. *Oxford, England: Prentice-Hall*.

Brown, M. E., & Treviño, L. K. (2014). Do Role Models Matter? An Investigation of Role Modeling as an Antecedent of Perceived Ethical Leadership. *Journal of Business Ethics, 122*(4), 587-598. doi:10.1007/s10551-013-1769-0

Brunstein, J., Jaime, P., Curi, D. P., d`Angelo, M. J., & Mainardes, E. W. (2015). Assessment and evaluation of higher education in business management: an analysis of the Brazilian case in the light of social learning theory for sustainability. *Assessment & Evaluation in Higher Education, 40*(6), 833-854. doi:10.1080/02602938.2015.1041096

Cochran, J. K., Maskaly, J., Jones, S., & Sellers, C. S. (2017). Using Structural Equations to Model Akers' Social Learning Theory With Data on Intimate Partner Violence. *Crime & Delinquency, 63*(1), 39-60. doi:10.1177/0011128715597694

Conley, Q., Lutz, H. S., & Padgitt, A. J. (2017). Creating participatory online learning environments: A social learning approach revisited. *Journal of Interactive Learning Research, 28*(1), 5-27.

Dunleavy, M., & Dede, C. (2014). Augmented Reality Teaching and Learning. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of Research on*

Educational Communications and Technology (pp. 735-745). New York, NY: Springer New York.

George, B. H., & Walker, A. (2017). Social Learning in a Distributed Environment: Lessons Learned from Online Design Education. In M. Orey & R. M. Branch (Eds.), *Educational Media and Technology Yearbook: Volume 40* (pp. 53-66). Cham: Springer International Publishing.

Grusec, J. E. (1992). Social learning theory and developmental psychology: The legacies of Robert Sears and Albert Bandura. *Developmental Psychology, 28*(5), 776-786.

Jung, Y.-W., Lim, Y.-k., & Kim, M.-s. (2017). *Possibilities and Limitations of Online Document Tools for Design Collaboration: The Case of Google Docs*. Paper presented at the Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing, Portland, Oregon, USA.

Liu, Z.-Z., Chu, D.-H., Song, C., Xue, X., & Lu, B.-Y. (2016). Social learning optimization (SLO) algorithm paradigm and its application in QoS-aware cloud service composition. *Information Sciences, 326*, 315-333. doi:https://doi.org/10.1016/j.ins.2015.08.004

Muro, M., & Jeffrey, P. (2008). A critical review of the theory and application of social learning in participatory natural resource management processes. *Journal of Environmental Planning and Management, 51*(3), 325-344. doi:10.1080/09640560801977190

Renzetti, C. C., Daniel; Maier, Shana. (2012). Women, Men, and Society. *Pearson*, 78-79.

Rotter, J. B. (2017). Some implications of a social learning theory for the practice of psychotherapy. *Foundations of Behavioral Therapy*.

Strauss, A. L. (2017). Psychological modeling: Conflicting theories. *Routledge*.

Taylor, E. W. (2017). Transformative learning theory. *Transformative Learning Meets* Bildung, Rotterdam(SensePublishers), 17-29.

Grudin, J. (1988). Why CSCW applications fail: problems in the design and evaluation of organizational interfaces. Proceedings of the 1988 ACM conference on Computer-supported cooperative work. ACM.

Breslow, L. P. (2013). Studying learning in the worldwide classroom: Research into edX's first MOOC. *esearch & Practice in Assessment,*, 8.

Cutler, D. M. (1990). An aging society: opportunity or challenge? *Brookings papers on economic activity* , 1 - 73.

Dillahunt, T. W. (2014). Democratizing higher education: Exploring MOOC use among those who cannot afford a formal education. *The International Review of Research in Open and Distributed Learning, 15*(5).

Duncan, J. C. (2000). The use of personal computer-based aviation training devices to teach aircrew decision making, teamwork, and resource management. *Proceedings of the IEEE 2000*, 21-426.

Fitzpatrick, G. a. (2013). A review of 25 years of CSCW research in healthcare: contributions, challenges and future agendas. *Computer Supported Cooperative Work (CSCW)*, 609 - 665.

Fletcher, J. D. (2009). Education and training technology in the military. *Science, 323*(5910), 72-75.

Gaynor, M. K. (2015). The industrial organization of health-care markets. *Journal of Economic Literature*, 235 - 84.

Grudin, J. (1988). Why CSCW applications fail: problems in the design and evaluationof organizational interfaces. *Proceedings of the 1988 ACM conference on Computer-supported cooperative work.* ACM.

Hays, R. T. (1992). Flight simulator training effectiveness: A meta-analysis. *Military psychology, 4*(2), 63.

Hunter, D. R. (2006). Hunter, D. R. (2006). Risk perception among general aviation pilots. *The international journal of aviation psychology, 16*(2), 135-144.

Leutz, W. N. (1985). *Changing health care for an aging society.* Lexington Books.

Mirowsky, J. (2017). *Education, social status, and health.* Routledge.

Pappano, L. (2012). The Year of the MOOC. *The New York Times, 2*(12), 2012.

Procter, R. e. (2006). Special issue: CSCW and dependable healthcare systems. *Computer Supported Cooperative Work (CSCW),* 413 - 418.

Rodriguez, O. (2013). The concept of openness behind c and x-MOOCs (Massive Open Online Courses). *Open Praxis, 5*(1), 67 - 73.

Saadatdoost, R. S. (2014). A Netnography Study of MOOC Community. *PACIS,* 116.

Salas, E. B. (1998). t is not how much you have but how you use it: Toward a rational use of simulation to support aviation training. *The international journal of aviation psychology, 8*(3), 197 - 208.

Sancho, P. F.-F.-M. (2008). NUCLEO: Adaptive computer supported collaborative learning in a role game based scenario. *Advanced Learning Technologies, ICALT'08, Eighth IEEE International Conference*, 671-675.

Schmidt, K. a. (1992). Taking CSCW seriously. *Computer Supported Cooperative Work (CSCW),* 7 - 40.

Waxman, R. E. (2018). Impact of brief education on healthy seniors' attitudes and healthcare choices about Alzheimer's disease and associated symptoms. *International psychogeriatrics* , 1 - 9.

Yuan, L. a. (2015). Partnership model for entrepreneurial innovation in open online learning. *E-learning Papers*, 41.

Zhang, T. (2017). *MOOCs for seniors: How to design MOOCs for seniors?* Kirk Brunson's EdTech Project Repository.

Research Calendar

Start Week	May 14, 2018

Week	5	6	7	8	9	10	11	Time/hrs	Note
Starting	Jun 11	Jun 18	Jun 25	Jul 2	Jul 9	Jul 16	Jul 23		
Intermediate Milestone 1	project proposal							5	Keep revise proposal untill the 7th week.
		Preliminary data fetching, compose complete literature review and status quo review						12	Weekly updates 1: data plan and literature review. The literature review is not only based on healthcare, but more on Computer Based Collaborative Work. These should contribute to the first section of the final project paper.
			Develop Research Methodology					12	Revised draft of proposal delivered by the end of week 7 for Weekly status check 2. Develop survey questions and solicit survey response for classmates; create interview script for the education needs of seniors, and go throung existing tchnology ananlysis on similar topic.
Intermediate Milestone 2			Data acquisition from feedbacks Generate intermediate conclusions					13	Revise and refine data acquisition based on the above research methodology; Start of data analysis to generate intermediate conclusions
					Data analysis and integration: preliminary			12	Data analysis and integration: validation and refine; Identify progress level by milestone 2, make final adjustment. Share preliminary data and observations. Plans for ongoing analysis leading up to the final deliverable.
End of project					Draft report			8	Draft report, no major adjustment check-point
						Data integration and conclusion: preliminary		7	Check if data can and how much it can support conclusions Integrate data into final report results
						Data integration and conclusion: refinement		8	Get as much information from existing data as possible Preliminary draft of final paper draft should be ready
							Draft and finalize final deliverables: research paper	5	Final version of research paper. Also take care of the fonts and reference format. Paper will be SIGCHI format, typically with about 6 pages
							Record presentation as required	4	Final version of recorded presentation: This will be a screen capture with audio of I walking through my PPT slides for ~ 10min. I plan to create ~ 12 pages for my senior health education research.
							Total time	86	