

Running Head: CONTENT KNOWLEDGE

Does Content Knowledge Impact the Effectiveness of a Web-based Simulation for
Communication Skills?

Amy B. Adcock¹

Molly H. Duggan¹

Lee A. Belfore²

Old Dominion University

¹Darden College of Education

²Batten College of Engineering and Technology

Introduction

In the quest to provide meaningful learning experiences for students at a distance, instructional designers and content experts continue research and development of new learning technologies. These technologies are designed to employ effective instructional strategies and affordances for meaningful learning in a self-paced, computer-based environment. The web-based interview simulation described in this paper is currently under development by a team of content experts, instructional designers, and computer engineers to meet the needs of distance education students practicing helping skills. The system, Computer Agents Teaching Helping Interactions Effectively (CATHIE), is entirely web-based and student-directed. CATHIE provides an interview simulation activity, model responses and feedback all targeted at the development of effective communication skills. Initially, CATHIE was designed specifically for students in the human services profession. Over time, it was noted that the system might serve as a more general training tool for improving helping skills for students in similar domains such as counseling. The research described in this paper was conducted to determine the capabilities of CATHIE as a general helping skills trainer.

The rationale for designing CATHIE was twofold. The first reason was to answer an increasing call to deliver helping skills instruction to a large number of students at a distance (McClam, Woodside, & Cole-Zakrzewski, 2005). Second, students in fields that require in-depth knowledge of verbal and nonverbal helping skills (e.g., human services and counseling) need to practice skills to become effective professionals. Their need to practice, however, must be balanced with the need of agencies to provide high quality services for clients, keeping client welfare paramount at all times (ESHSP, 2000). An online simulated interview environment

allows students to safely practice these skills in a cost effective ethical manner and at their own pace.

Background

Training for Empathy and Helping Skills

Empathy is a core condition for communicating effectively with clients (Chung & Bemak, 2002), requiring that the helper enter the client's world (Rogers, 1961), feeling *with* the client rather than *for* the client (Capuzzi & Gross, 1999). Empathy has even been identified as the foundation of all counseling (Feller & Cottone, 2003; Martz, 2001). This core condition requires that helpers be able to place themselves in the position of a client, to be able to feel, see, and think from the client's perspective, thereby understanding the client's world. In this way, the effective helper senses the client's anger, frustration, or fear, but without the helper being drawn into the emotion, thus remaining objective.

Helpers who interact with a client out of sympathy rather than empathy are often less able to maintain their objectivity as they tend to infuse their personal emotions with those of the client, allowing their own emotions to shape the responses they give the client. Effective helpers communicate their empathy in such a way that the client believes the helper is empathic while the helper explores the client's cognitive and affective worldview. This skill is vital for helping professionals who are trying to help their clients effect change. The helping process is not necessarily linear, as recent research indicates that helping occurs in a continual shift between the helper and helpee (Woodside, Paulus, & Ziegler, 2005).

Another consideration is the need for skills practice. Counseling and human services students need to practice helping skills to become effective helpers, but balancing the need to practice with the need of agencies to provide high quality services for clients often proves

difficult (ACA Code of Ethics, 2005; ESHSP, 2000). Increasing the opportunities for skills practice to meet both student and program needs while decreasing the risks for the client is vital to counseling education.

Helping Skills Training and Assessment

Because the competency of the helper directly impacts the quality of the services that clients receive, much research has focused on the specific skills needed in the helping process (Carkhuff, 1969; Fugua & Gade, 1982; Ivey, 1994; Roffers, Cooper, & Sultanoff, 1988). Rogers' (1951, 1958, 1961) work on empathy as a core condition was one of the earliest attempts to assess the quality of helping skills. In response to this need for quality control and the building of training programs, Truax and Carkhuff (1967) and Carkhuff and Berenson (1967) developed didactic experiential programs designed to teach the facilitative conditions, especially empathy, thereby classifying and refining Rogers's theory. Other instructional methods for teaching helping skills have included the use of films (Koch & Dollarhide, 2000), traditional role-play (Shepard, 2002), and the use of paid client actors in simulated treatment team projects (Osborni, Dean, & Petruzzi, 2004).

These strategies, however, are often time-intensive and may be costly. They also are difficult to use when dealing with students at a distance and do not provide opportunities for practice outside of the classroom. Evaluating the mastery of skills is often accomplished using peer-supervisor ratings of audiotaped, videotaped, or simulated interviews with clients (Baker, Daniel, & Greeley, 1990; Elstein, Sprafka, & Shulman, 1978; Ford, 1979; Larson, Day, Springer, Clark, & Vogel, 2003). Rater disagreement, however, may create problems when using this method of assessment. This method can also be extremely time-consuming when reviewing extensive numbers of taped interviews.

A Simulation to Practice Helping Skills at a Distance

When presented with the need to develop a means for students to practice using the strategies described in the previous section, CATHIE designers and content experts gravitated towards the development of an instructional simulation. One of the basic tenants of an instructional simulation is to provide a stand alone training environment for a skill best practiced without consequences for example, students interacting with a real client in need of counseling or services. Reviews of the effectiveness of computer games and simulations show the majority of studies of simulation environments promote better retention, transfer, and a more positive affective response (de Jong & Van Joolingen, 1998; Randel, Morris, Wetzel & Whitehill, 1992). A common assumption that guides the development of effective simulations is that instruction designed to capture the context of the domain is valuable for future practice (Brown, Collins & Duguid, 1989). In the domain of helping skills for human service and counseling professionals, common methods of instruction include case-based role-plays, group work, and videotapes of professional-client interactions. These techniques, however, are often costly and difficult to adapt for use in a distance learning setting where students are physically separated from both their instructor and fellow students. It is these assumptions and constraints that drive the design, implementation, and evaluation of CATHIE.

The current version of CATHIE utilizes an animated agent, case-based scenarios, and response choice feedback (both text-based from the system and with speech and nonverbal gestures from the character) in a web-based format. Through delivery on the web and with the use of an animated character acting as a client in need, the design team has developed a system to allow students physically separated from their instructor and/or fellow classmates to participate in a realistic counseling session without the trepidation or consequences of

interactions with an actual client in need. CATHIE is specifically designed to simulate client-helper role-play, an effective method of practice and a necessary skill (Osborni, Dean, & Petruzzi, 2004; Shepard, 2002) for both human services and counseling students.

Animated Agents as a Critical Affordance

A key feature of the CATHIE system is the use of a human-like animated agent presented as a client in need. Animated agents are computerized characters embedded in computer-based instructional environments (Johnson, Rickel & Lester, 2000). While the CATHIE agent is anthropomorphic, agents can come in all types of representations (i.e., genies, parrots and paperclips). Research suggests the presence of these characters in computer based training environments gives users the sense of a human-to-human interaction (Reeves & Nass, 1996). Because of this, CATHIE designers have the opportunity to create an environment where working with the client on screen will be as effective as performing a simulated role-play exercise with fellow classmates, instructors or actual clients.

Although some researchers question whether the presence of animated agents are a necessary feature in computer-based environments (e.g. Clark & Choi, 2005), CATHIE designers contend that the presence of this character is a critical affordance for meaningful learning in this situation. In helping skills training, a primary skill is the ability to understand both verbal and nonverbal responses from a client. Knowing how to decode nonverbal gestures, such as emotional response or tone of dialog, is essential to the holistic communication experience of a helping professional. In CATHIE, the agent serves as a computerized stand-in for an actual client, fellow student, actor, or instructor so that participants can practice this important skill even at a distance.

Purpose of this Research

The process of designing any new learning technology requires the development and evaluation of appropriate instructional strategies and interface affordances. The proper combination of both strategies and affordances results in a system that is effective and reusable for any content domains requiring the target skills. For the purposes of this investigation, we used the beta version of CATHIE to examine the communication skill development of participants from different areas of study, both human services and counseling.

Previous assessments using human services students (Adcock, Duggan, Nelson & Nickel, 2006; Duggan & Adcock, 2007) have shown that the CATHIE system is an accessible, effective delivery mode to practice helping skills. These early studies focused on the general functionality of the system, the interface and efficacy of its underlying instructional strategies. Now that the system is functioning well as a stand-alone web-based platform, the researchers felt it important to examine the effects of CATHIE using students in different focus areas. Ideally, CATHIE will be an effective practice module for all students practicing skills needed in helping professions the helping professions as it is designed to enhance general helping skills.

This paper presents data collected to investigate the effects of CATHIE on students studying in different domains (human services and counseling). To test the general efficacy of CATHIE as a training tool we address the following specific question: Is CATHIE an effective tool for developing helping skills for participants regardless of their specific content knowledge? As we answer this question, we move towards the ultimate goal of developing a usable tool that can be customized to teach skills in nonverbal and verbal communication in many domains.

Methods

The CATHIE Training System

The current CATHIE system is a web-delivered interactive interface containing an animated agent developed using *Haptik People Putty*[®] software. A student volunteer recorded the client dialog to increase the agent's verbal response authenticity. The interface included the agent, a frame for feedback, and a frame with three response choices (see Appendix A). Participants would start the interaction by choosing an opening for the dialog. They then listened to the agent's response and (acting as the professional) would choose from three possible responses each rated at different levels of effectiveness. After each response, participants received feedback tailored to the effectiveness of their responses and giving clues to the more appropriate response when necessary. The purpose of the feedback was to improve the students' ability to formulate the words that go into an effective response. The client then responded to the choice via speech and gestures. The dialog continued until an end point was reached. The case-based scenario used in this assessment revolved around a young student struggling to figure out a solution to remain in school. Participants were required to provide the student with empathetic responses and guidance to resolve her issue.

Procedure

Participants were recruited from both human services and counseling courses (one senior undergraduate and one beginning graduate course) and contacted by the researchers via email. They were asked for their participation and (depending on the instructor of record) received extra credit or fulfilled a course requirement for their participation. They were directed to a specific website where they read the informed consent and clicked to confirm acceptance of the conditions. They then viewed a page giving them instruction on how to work with the program.

Once participants read and printed the instructions and clicked to the next page, they took a short pretest (described below). The students then interacted with the program. After their interactions, participants answered questions about their perceptions of the instructional environment, their attitudes towards computers, and their perceived effectiveness of the program. They then completed a posttest and exited the program. The entire training session lasted approximately one to two hours.

Assessments

Pre and Posttest Format

To assess the effectiveness of CATHIE as a practice tool, participants completed a pre- and posttest that included assessments of both helping skills (e.g., an open ended response demonstrating how they would communicate with a client) and discrimination of prewritten responses (e.g., rating prewritten responses on an effectiveness scale). Appendix B shows an example of the pre and posttest format. Responses from both case study scenarios were scored using the Carkhuff Empathic Understanding Scale (Carkhuff, 2000) to measure changes in helping skills acquisition. Posttest scores were compared with pretest scores to determine significant skill acquisition. Because of the difference in assessment, two separate skill sets (the ability to respond to a client in your own words and the ability to discriminate effective from ineffective responses) were examined individually.

The scoring of the two assessments also differed. To score the open-ended responses, a content expert rated the responses according to the standard scale. To score the participant's ability to discriminate effective from ineffective responses, an expert rating of each participant response was subtracted from the student's rating participant for the response, with the differences participant added together, and then divided by five to participant compute the final

discriminating measure participant score. It should be noted here that because of participant the calculations involved in this assessment, lower scores on the posttest indicate an increase in discrimination of response effect.

Perceptions of the CATHIE System

In order to assess each participant's perception of the effectiveness of the system, a six question Likert type scale was administered immediately after the participant's interaction. Items from the scale are based on an existing scale designed to measure perceptions of animated agents in tutoring systems (Adcock & Van Eck, 2005). The wording of the items was slightly adjusted so that the items were conducive to the interactions in the CATHIE system. Appendix C shows the items used in this assessment.

Results

The following section reports the results of our analysis of pre and posttest helping skills across different content areas. To account for prior knowledge, Analyses of Covariance (ANCOVAs) were used to determine whether skill acquisition scores differ across the two content areas. Pretest scores were used as a covariate. In order to examine specific effects of CATHIE training, both ability to respond to clients and ability to discriminate effective from ineffective responses were examined.

Participant Demographics

Data were examined from 42 participants. Twenty participants were enrolled in the upper level undergraduate human services course (HMSV 468). Twenty-two were enrolled in the beginning level counseling course (COUN 633). Of these 42, 83% were female. The majority of participants were Caucasian (67%), nine African American (21%), with the remaining participants Asian American (5%) and Hispanic (2%). Participant ages ranged from 19 to 55

years old. The majority of participants (55%) reported they had experience working in the field of human services or counseling. This is not surprising, as many of the participants had reached the level of a required internship practicum.

Performance Across Domains

To examine the effects of the CATHIE system on participants in different domains, two separate ANCOVAs were used. In terms of ability to respond to clients the ANCOVA showed no significant differences in students from either human services or counseling ($F(1,39)=.065$, $p=.800$). In addition, the discrimination assessment showed no significant differences between the student populations ($F(1,39)=2.70$, $p=.108$). Table 1 shows the pre and posttest score means and standard deviations for each assessment (response ability and discrimination ability).

Table 1.

Pre and Posttest Results Separated by Content Area

	Response Ability		Discrimination Ability*	
	<i>M(SD)</i>		<i>M(SD)</i>	
	<i>n=42</i>		<i>n=42</i>	
	HMSV468	COUN633	HMSV468	COUN633
Pretest	3.05(1.04)	2.64(.601)	.730(.407)	.682(.408)
Posttest	3.50(.932)	3.54(.653)	.410(.358)	.445(.195)

*Lower posttest score indicates a gain in skill.

Combined Learning Gains

As there were no significant differences across content areas the dataset was combined to examine the learning effects of the CATHIE system. Repeated measures t-tests were used to

determine whether there were significant differences in the pre and posttests overall. Preliminary findings indicate that all participants significantly increased their ability to respond to a client in the response ability assessment ($t=3.937, p=.000, MD=.691$). An effect size of +0.61 indicates a large positive effect in favor of the CATHIE system.

Assessment of the participants' ability to discriminate the effectiveness of responses showed a significant improvement in skill ($t=4.20, p=.000, MD=.276$). An effect size of +0.65 indicates a large positive effect in favor of the CATHIE system. Table 2 shows the pre and posttest means and standard deviations for the entire data set. Note that due to the calculations, a decrease in score indicates a gain in participants' discrimination ability.

Table 2.

Combined Pre and Posttest Results

	Response Ability	Discrimination Ability*
	<i>M(SD)</i>	<i>M(SD)</i>
	<i>n=42</i>	<i>n=42</i>
Pretest	2.83(.853)	.705(.403)
Posttest	3.52(.788)	.429(.281)

*Lower posttest score indicates a gain in skill.

Participant Perceptions

Immediately after their interaction, participants completed a survey assessing their perceptions of the environment's effectiveness. Results comparing the two populations (human services and counseling) showed no significant differences ($F(1,40)=.552, p=.462$) so it was decided to combine the dataset. Responses from the six items were combined into a scale ($\alpha = .782$). The mean score for the scale was positive ($M= 4.04$) indicating that overall the participants

felt the program was beneficial for acquiring essential helping skills.

Discussion

The goal of this research was to determine if the development of CATHIE as an easily accessible practice module for helping skills is moving in the right direction. For this assessment, we compared populations from both human services and counseling. Both domains require similar helping skills when interacting with a client even though the content covered in courses might be different. If successful, this assessment will confirm the portability of CATHIE as a training tool for helping and/or communication skills. The charge of the instructional designer is to work with content experts and developers to design, development and implement tools that fill an instructional need. CATHIE grew out of the need to serve students taking courses in domains that require the development helping skills especially those students in a distance learning program. Because of this separation from the instructor and fellow students, practice in tested methods of helping skill development (in this case role play) is hampered. To answer this need, the CATHIE design team has developed an interview simulation environment. Current and past data support the contention that CATHIE is able to improve helping skills by improving the ability to respond to clients and to see the difference in effective versus ineffective responses. CATHIE is by no means intended to be the sole means of practice for these skills. But, as our development continues, we are finding positive evidence of CATHIE's effectiveness when used as a supplement to coursework and internship experience.

The latest phase of CATHIE evaluation concerns the ability of the system to reach not on the human services students it was originally designed for but to reach students in other content areas with similar skill needs in this case, counseling. From the data collected, it appears the goal of developing a system for general helping skills is moving in a positive direction. The

findings from this evaluation advance the development of an effective instructional simulation. By employing an animated character, a system for skills that require the understanding of both verbal and nonverbal responses is possible. As built, the system is cost effective and easy to deliver making it a viable anytime anywhere practice module.

The CATHIE system can be a meaningful learning environment to practice communication skills and that these skills can be improved regardless of content knowledge. We also continue to see positive perceptions of the system in terms of believability, motivation and improvement of skills. On the basis of this evidence, the applications for this system are broad and apply to any content area that requires not only verbal but nonverbal decoding as an important skill. Additionally, the system can serve as a practice module for students regardless of the delivery of their coursework. To continue the refinement of this tool, an authoring interface (including the capability to choose from many agents) is being developed to broaden the application of CATHIE. Further analyses including physiological responses to the interface and the use of embedded interactive learning modules to fine-tune skill development are also planned.

References

- Adcock, A.B., Duggan, M., Nelson, E. & Nickel, C. (2006). Teaching effective helping skills at a distance: The development of project CATHIE. *Quarterly Review of Distance Education*, 7(4), 349-360.
- Adcock, A.B. & Van Eck, R. (2005). Reliability and factor structure of the Attitude Toward Tutoring Agent Scale (ATTAS). *Journal of Interactive Learning Research*, 16(2), 195-217.
- Baker, S. B., Daniels, T. G., & Greeley, A. T. (1990). Systematic training of graduate-level counselors: Narrative and meta-analytic reviews of three major programs. *The Counseling Psychologist*, 18, 355-421.
- Brown, J., Collins, A. & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.
- Carkhuff, R. (1969). *Helping and human relations*. New York: Holt.
- Carkhuff, R. R. (2000). *The art of helping in the 21st century* (8th ed.). Amherst, MA: Human Resource Development Press.
- Carkhuff, R., & Berenson, B. (1967). *Beyond counseling and therapy*. New York: Holt, Rinehart, & Winston.
- Clark, R.E. & Choi, S. (2005). Five design principles for experiments on the effects of animated pedagogical agents. *Journal of Educational Computing Research*, 32(3), 209-225.
- de Jong, T., & Van Joolingen, W. R. (1998). Scientific discovery learning with computer simulations of conceptual domains. *Review of Educational Research*, 68(2), 179-201.
- Duggan, M. & Adcock, A.B. (2007). Pedagogical agents teaching helping skills in an online environment: A pilot study. *Journal of Interactive Online Learning* 6(1), 56-71.

- Elstein, A. S., Sprafka, S. A., & Shulman, L. S. (1978). *Medical problem-solving: An analysis of clinical reasoning*. Cambridge, MA: Harvard University Press.
- Ethical standards of human service professionals [ESHSP]. (2000). *Human Service Education* 20, 61-68.
- Ford, J. D. (1979). Research on training counselors and clinicians. *Review of Educational Research*, 49, 87-130.
- Fugua, D. R., & Gade, E. M. (1982). A critical reexamination of the practice component in counselor training. *Counselor Education and Supervision*, 21, 282-294.
- Ivey, A. E. (1994). *Intentional interviewing and counseling: Facilitating client development in a multicultural society*. Belmont, CA: Brooks/Cole.
- Johnson, W.L., Rickel, J.W., & Lester, J.C. (2000). Animated pedagogical agents: Face-to-face interaction in interactive learning environments. *International Journal of Artificial Intelligence in Education* 11, 47-78.
- Koch, G., & Dollarhide, C.T. (2000). Using a popular film in counselor education: Good Will Hunting as a teaching tool. *Counseling Education and Supervision*, 39(3), 203-210.
- Larson, L.M., Day, S. X., Springer, S. W., Clark, M. P., & Vogel, D. L. (2003). Developing a supervisor feedback rating scale: A brief report. *Measurement and Evaluation in Counseling and Development* 35(4), 230-238.
- McClam T., Woodside, M., Cole-Zakrzewski, K. (2005). A survey of human service educators: A longitudinal study. *Human Service Education*, 25, 65-73.
- Osborni, C. J., Dean, E.P., & Petruzzi, M.L. (2004). Use of simulated multidisciplinary treatment teams and client actors to teach case conceptualization and treatment planning skills. *Counselor Education and Supervision*, 44(2), 121-134.

- Randel, J. M., Morris, B. A., Wetzel, C. D., & Whitehill, B. V. (1992). The effectiveness of games for educational purposes: A review of recent research. *Simulation and Gaming, 23*(3), 261-276.
- Reeves, B., & Nass, C. (1996). *The Media Equation*. Stanford, CA: CSLI Publications.
- Roffers, T., Cooper, B., Sultanoff, S. M. (1988). Can counselor trainees apply their skills in actual client interviews? *Journal of Counseling and Development, 66*, 385-388.
- Rogers, C. (1951). *Client-centered therapy*. Boston: Houghton Mifflin.
- Rogers, C. (1958). The characteristics of a helping relationship. *The Personnel and Guidance Journal, 37*, 6-16.
- Shepard, D.S. (2002). Using screenwriting techniques to create realistic and ethical role plays. *Counseling Education and Supervision, 42*(2), 145-158.
- Truax, C. B., & Carkhuff, R. R. (1967). *Toward effective counseling and psychotherapy: Training and practice*. Chicago: Aldine.

Appendix A

The CATHIE Interface



Appendix B

Sample Assessment

Part I.

Before you begin this program, we would like to explore your current knowledge of helping skills.

Imagine that you have been talking to the following student for about 15-20 minutes.

"Every time I think I'm about to catch up, something happens to put me even further behind. My car just died again, and it'll cost \$500 to repair it. I don't have that kinda money. I have a work-study job here on campus and need the car to get to work and classes. If I don't have a car, I can't make money, and if I don't repair the car, I can't get to work. If I don't work, I can't go take classes. I can't afford this right now, but I need to figure out something to do - now!"

Now write down what you would say to this student - the exact words you would use if you were actually speaking to this student.

Part II.

Helping professionals need to be able to discriminate between possible helping responses to determine the effectiveness of a helping response. This next section will give us an idea of your current skill level at judging the effectiveness of a response.

Imagine that you have been talking to the following student for about 15-20 minutes.

"Every time I think I'm about to catch up, something happens to put me even further behind. My car just died again, and it'll cost \$500 to repair it. I don't have that kinda money. I have a work-study job here on campus and need the car to get to work and classes. If I don't have a car, I can't make money, and if I don't repair the car, I can't get to work. If I don't work, I can't go take classes. I can't afford this right now, but I need to figure out something to do - now!"

Listed below are several alternative responses that might have been made by someone trying to help this client. Next to each response, type in a number to indicate your rating of the effectiveness of the response. Use the following scale:

- | | | |
|-----|---|---------------------|
| 1.0 | = | Very ineffective |
| 2.0 | = | Ineffective |
| 3.0 | = | Minimally effective |

4.0 = Very effective
5.0 = Extremely effective

_____ a. "I know what that's like. The last time my car died it cost more than that. I've got a good friend who's a mechanic. I bet he can give you a deal on the parts, maybe labor too."

_____ b. "So, your car has broken down again, and you have no idea how you are going to pay to get it repaired."

_____ c. "You're frustrated because you need to repair your car, but the repairs are expensive and you are unsure of how to find the money to pay for them. Let's think about some ways to find the resources to pay for these repairs, then we can make a step-by-step plan of how to get it done."

_____ d. "You're feeling frustrated about your car needing expensive repairs, but you don't know what to do about it or where to start."

_____ e. "You're frustrated about how to pay for your car now that it's broken down again."

Appendix C

Participant Perception Items

1. The use of the program increased my motivation to learn the subject area.
2. My interactions encouraged the development of my knowledge in this area.
3. Interacting with the program increased my interest in the subject.
4. My interactions with the program were helpful in learning about helping skills.
5. I believed what the program had to say.
6. My helping skills have improved due to my interactions with the program.