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Designing an Interactive Simulation to Practice Communication Skills Online

Amy B. Adcock  
College of Education  
Educational Curriculum and Instruction  
Old Dominion University

Molly H. Duggan  
College of Education  
Educational Leadership and Counseling  
Old Dominion University

Lee Belfore  
College of Engineering  
Electrical and Computer Engineering  
Old Dominion University

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### Introduction

The Computer Agents Teaching Helping Interactions Effectively (CATHIE) system was developed to assist programs training students at a distance to utilize effective empathetic communication skills. Traditional techniques for teaching these skills include role-plays, group work, and even videotapes of helper-client interactions. Web-based simulations afford the opportunity to practice a myriad of skills and, when designed effectively, provide realistic consequences to participants' actions. In addition, simulations present a practical solution to the problem of acquiring communication skills even when physically separated from one's instructor and/or peers.

CATHIE is designed as an interactive web-based interview simulation that serves as easily accessible, anytime, anywhere practice for these skills. Development and evaluation of CATHIE occurred at a large southeastern university with an extensive network of distance education sites serving the entire state. As a result, courses can contain up to 300 students, most of whom are physically separated and taking the class alone. Previous evaluations (Authors, 2007) indicate CATHIE is accessible and effective. Designers are using a rapid prototyping cycle of development to create an optimal practice module (Tripp & Bichelmeyer, 1990). This allows researchers to vary instructional strategies and message design of CATHIE along with addressing accessibility issues and overall perceptions of CATHIE as a tool. Data collected from these evaluations allow designers to improve the tool and continue to test out affordances.

This paper will describe the beta version of CATHIE and present assessments of the efficacy of updated instructional strategies (the modeling of a best practices script and response choice feedback), message design (a new character and varied presentations of the best practices

script), and perceptions of the efficacy of CATHIE as a tool (via participants' responses to survey items). The following specific research questions will be addressed:

- Is the beta version of CATHIE an effective tool for the online practice of communication skills?
- Does reading a best practices script prior to interaction with the simulation significantly improve the acquisition of communication skills?
  - If there is a significant effect using the best practices script, which format is optimal?
- Is there a significant relationship between student perceptions of the efficacy of CATHIE and their performance on communication skills assessments?

#### Theoretical Framework

A primary goal in training human service professionals (HSPs) is to give them effective helping skills to work with clients on a daily basis. HSP services vary depending upon the employment setting and the clients, with HSPs working in such settings as homeless and domestic violence shelters, community mental health, correctional facilities, schools and postsecondary institutions, and family violence, aging, alcoholism, drug abuse programs. Despite this broad array of settings, HSPs share a primary purpose: to assist individuals and communities in functioning as effectively as possible (National Organization for Human Services [NOHS], 2007). Communication skills are so important for the HSP that the Council for Standards in Human Service Education [CSHSE] identifies effective communication strategies and skills as one of the 12 skill sets that entry- and mid-level human services workers use daily in their jobs (2005).

Human service educators face constant challenges to provide learning experiences that assist students in developing their skills for use with clients, co-workers, and supervisors. Human service programs offered through distance learning face even more difficulties as educators struggle with designing online and interactive video courses that provide opportunities for helping skills practice along with the evaluation of such skills. Techniques used in traditional classes such as role-plays, group work, and even videotapes are much more difficult to adapt for use in a distance learning setting. Add to this the challenge of large class sizes often found in distance learning, and teaching interpersonal communication skills at a distance becomes even more overwhelming. Therefore, educators may want to consider other less traditional methods to provide opportunities for their distance-learning students to learn and practice helping skills appropriate for the field.

#### *Animated Agents and Interactive Simulations*

Animated agents are computerized characters embedded in multimedia instructional environments (e.g., Baylor, 2001; Graesser, Weimer-Hastings, Weimer-Hastings, Kruez, & the Tutoring Research Group, 1999; Moreno, Mayer, Spires & Lester, 1997). The presence of these animated characters allows designers to create environments where learners can interact with a conversational partner. Research in the functions of animated agents continue with the majority of studies showing agents can be a useful feature in computer-based instruction (e.g., Atkinson, 2002; Baylor, 2001; Graesser et al. 1999; Graesser, VanLehn, Rose, Jordan, & Harter, 2001; Hubal & Guinn, 2001; Johnson, 2004; Moreno, Mayer & Lester, 2000). Of primary importance is findings that indicate users generally apply the same social interaction rules when interacting with a computerized character as when they are interacting with humans (Reeves & Nass, 1996).

Some of the current uses of animated agents include their presence in multimedia instructional environments simulating patient interviews and patient assessment (Hubal & Guinn, 2001). The CATHIE system highlights another possible role for agents, acting as a client in a simulated interview session (Authors, 2007). By using anthropomorphic characters in a realistic situation, designers are taking advantage of the positive aspects of interactive simulations. Instructional situations in simulations are context driven, open-ended requiring participants to employ problem solving or discovery skills. Each participant's movement through the simulation module is dynamic. The simulation advances according to user actions, and the consequences of their actions in realistic setting set the path for the simulation.

Reviews of the effectiveness of computer games and simulations shows the majority of studies of simulation gaming environments promote better retention, transfer and a more positive affective response from users (Bredemeier & Greenblat, 1981; Randel, Morris, Wetzel & Whitehill, 1992). Some suggest these positive results are due to the active participation of users in the environment (Randel et al., 1992). Others attribute different characteristics of simulation game environments to their success such as the ability to build in instructional scaffolding (De Jong & Van Joolingen, 1998). Others feel the ability to create an environment that is interactive, dynamic, and provides feedback through outcomes is the reason simulations work as educational tools (Prensky, 2001; Rieber, 1996). Although there are still questions as to the features that make them effective, the majority of the research shows simulation games provide an opportunity to deliver contextual instruction allowing for experiential learning and deep knowledge.

By using animated characters in an easily accessible web-based module, CATHIE has potential as a useful tool for teaching empathetic communication skills. Creating a simulated

interview allows students to practice these skills in a realistic setting with consequences tied to their actions. Further revisions and implementations of CATHIE will result in a tool that allows distance learners or any student needing supplemental practice to fine tune their empathetic communication skills so that they may be effective professionals in their chosen field of practice. It also gives instructors in this field a method for assessing their students' progress even when they may never meet face to face.

## Methods

### *The CATHIE Environment*

This paper presents data collected from the second stage (beta version) of CATHIE implementation. Data collected from the first stage of implementation indicated necessary refinements to the system in terms of access and instructional strategies (Authors, 2006). These refinements resulted in the current beta version. For example, one finding in the initial assessments indicated that participants reading a text-based best practices summary showed significant learning gains in helping skills. For the beta version, the researchers included a best practices script before interaction to test its efficacy in preparing students for the learning experience (Gagne, Briggs & Wager, 1992). The script was presented in two versions (long format and small bites) to ensure the optimal presentation format. Additional allowances for easier access, increasing instructional effectiveness and improvement in the character's appearance and voice were included in the beta version.

This version of CATHIE also included text-based feedback incorporated into the system's interface. The feedback was included to address the problem of discrimination skill acquisition. By cueing participants as to the correct and incorrect aspects of CATHIE, it is hoped participants would form conceptual models of what effective and ineffective responses might

look like. Due to programming issues, it was too difficult to compare presentation of feedback versus no presentation of feedback. The researchers made the decision to include feedback and concluded that improvement in discrimination scores would, in part, justify the addition of the feedback.

The beta version of the CATHIE system employs an animated agent developed using *Haptek*<sup>®</sup> *People Putty* software. A student volunteer recorded the client's dialog to increase the agent's authenticity and understandability. These changes also improved accessibility to users using a modem to access the Internet. The interface included the agent, a frame for feedback, and a frame with three response choices (Appendix A). Learners listened to the agent and acted as the Human Service Professional (HSP) by choosing from three possible responses to client comments. After each response, the participants received feedback tailored to the effectiveness of their error response as the first assessment indicated that participants were not exhibiting sufficient gains in their ability to discriminate effective from ineffective responses. Client responses were also tied to the level of effectiveness of the choice. The client responded via speech, and the dialog continued until an end point was reached.

#### *Procedure*

Participants were students from several Human Services courses who received extra credit or fulfilled a course requirement for their participation. The researchers directed them via email to a specific website according to the condition they had been randomly assigned. At this site, they read the informed consent and clicked to confirm acceptance of the conditions, completed demographic questions, and took a short pretest (described below). If participants were assigned to the best practices condition, they were asked to read a script of an ideal interaction between a client and HSP. Some of the participants read a script on one long page and

some were asked to read three dialog turns per page and continue clicking “Next” until the entire script was finished. The content of both scripts was identical. After reading this script, the students then interacted with the program. After their interactions, participants answered questions about their perceived effectiveness of CATHIE as a learning tool. They then took a posttest identical in format to the pretest but with different scenarios. After completing the posttest, participants exited the program.

### *Assessments*

#### *Learning Gains*

To assess the effectiveness of CATHIE as a teaching tool, participants completed a pre- and posttest that included assessments of both communication 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). Responses from both case study scenarios (see Appendix B for an example) were scored by a content expert using the Carkhuff Empathic Understanding Scale (Carkhuff, 2000) to measure changes in communication skills acquisition.

The discriminating measure of prewritten helping statements was scored according using the Discriminating Response Score Sheet (Appendix C) client script and interactive condition. The expert’s rating of each response was subtracted from the student’s rating for the response, with the differences added together, and then divided by five to compute the final discriminating measure score. It should be noted here that because of the calculations involved in this assessment, lower scores on the posttest indicate an increase in discrimination of response effectiveness.

#### *Perceptions of Efficacy*

Before completing the posttest, participants completed six survey questions assessing their perceptions of CATHIE's efficacy. Five Likert-type items were used to assess motivation, knowledge development, interest, helpfulness, and believability on a 1 (strongly disagree) to 5 (strongly agree) scale. An additional item (using the same metrics) asking the participant to report perceived improvement in communication skills was included. Appendix C gives a list of these items.

### *Data Analysis*

The following statistical analyses were used to determine the effectiveness of the beta version of CATHIE and inform researchers for future iterations of the system.

#### *Effectiveness of CATHIE as a Learning Tool*

To determine whether CATHIE is an effective tool for the online practice of communication skills, Paired Samples t-tests for both open-ended responses and discrimination skills was conducted on the entire data set.

#### *Effects of Best-practices Script*

To determine whether reading a best practices script enhances the acquisition of communication skills, a One Way Analysis of Covariance (ANCOVA) was conducted on the entire data set. An examination of posttest means (controlled for pretest scores) and post hoc test was planned to determine if there was an optimal presentation format for the scripts (long format or short bites).

#### *Perceptions and Performance*

In order to assess the perceptions of CATHIE's efficacy, means from the six survey questions were examined. Additionally, Partial Correlations (controlling for pretest scores) were

run comparing each survey item to identify any significant relationships between participant's perceptions of each dimension of CATHIE's efficacy and their overall skill acquisition.

### Results

Participants ( $n = 80$ ) in upper level Human Service courses interacted with the CATHIE system over the Fall, Summer, and Spring semesters of 2006. Results from this implementation are described in detail in the following sections. Because of the differences in scoring methodologies for the pre and post assessments, response ability and discrimination skills were analyzed and will be presented separately.

#### *Demographics*

Seventy-six of the eighty participants were female (95%). Median age of the participants was 35. A majority of participants were Caucasian (74%). Twenty-one percent were African American. Other ethnicities reported included Asian American (3%) and Native American (1%). A majority of participants (68%) reported they were currently working in the human services field. This finding is not surprising as participants from two of the classes used in this assessment were enrolled in courses requiring internship experience. A majority of participants (94%) report they take their courses at a distance rather than on the main campus. A majority (71%) also reported they access the Internet via a high speed connection but some still use a modem (29%).

#### *Overall Learning Gains*

##### *Response Ability*

A Paired samples t-test was used to determine if there were significant differences in the pre and posttests overall. Findings indicated that participants increased their communication skills significantly from pre to post assessment ( $t = 4.50$ ,  $p < .01$ ,  $MD = .613$ ). An effect size was calculated ( $d = .503$ ) showing the simulation had a moderate effect in the acquisition response

ability.

### *Discrimination Skills*

Another Paired samples t-test was conducted to examine the effects of the CATHIE intervention on participants' ability to discriminate effective from ineffective answers. The ability to discriminate between possible responses is an important element in learning how to most effectively help a client. HSPs who communicate using effective responses are better able to get the client involved in the process by communicating an openness to the client's point of view (Carkhuff, 2000). As with the previous version of CATHIE, findings indicated a significant negative trend in discrimination skills ( $t= 2.94, p= .004, MD=.205$ ). An effect size was calculated ( $d = .33$ ) showing the simulation's negative effect on discrimination ability has a small to moderate effect. Table 1 shows the means and standard deviations from both skill assessments.

Table 1.

### *Helping Skills and Discrimination Scores*

	Response Ability*	Discrimination Scores*
	<i>M(SD)</i>	<i>M(SD)</i>
Pretest	2.38(1.03)	.085(.483)
Posttest	2.99(.700)	.120(.456)

\*significant at the .01 level

### *Presentation of Script*

#### *Response Ability*

An ANCOVA was used to determine if the presentation of the best practices script had a measurable effect on participants' ability to respond to clients. Pretest scores were used as a

covariate. Findings showed no significant effect of presentation of the script on posttest scores ( $F = .133, p = .88$ ). However, an examination of the means showed a slight effect in favor of the presentation of the long format script.

### *Discrimination Skills*

An ANCOVA was used to determine if the presentation of the best practices script had a measurable effect on participants' ability to discriminate effective responses. Pretest scores were used as a covariate. Findings showed no significant effect of presentation of the script on posttest scores ( $F = .003, p = .997$ ). However, an examination of the means showed a slight effect in favor of the presentation of the small bites script. Table 2 shows the posttest score means by script presentation condition.

Table 2

### *Script Comparison Means\**

	No Script	Long Format	Small Bites
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>
	<i>N=31</i>	<i>N=33</i>	<i>N=16</i>
Response Ability	2.97(.763)	3.05(.591)	2.94(.814)
Discrimination Ability	.123(.412)	.121(.538)	.113(.521)

\*Means reported are adjusted according to pretest scores

As no significant differences were found in the presentation of the scripts and both formats showed slight trends in both skill types, further analysis on the optimal script form will be conducted after more data can be collected.

### *Perceptions of Efficacy*

Participants in the CATHIE interaction were asked to report their perceptions of the efficacy of the system after their interactions. An examination of the means indicated participants reported an overall positive perception of CATHIE's efficacy. Table 3 shows the means of each item.

Table 3

*Perceptions of CATHIE's Efficacy*

Perception Items	<i>M(SD)</i>
The use of the program increased my motivation to learn the subject area.	4.12(.832)
My interactions encouraged the development of my knowledge in this area.	4.18(.635)
Interacting with the program increased my interest in the subject.	4.14(.764)
My interactions with the program were helpful in learning helping skills.	4.27(.676)
I believed what the program had to say.	4.08(.735)
My helping skills have improved due to my interactions with the program.	3.84(.943)

Rating scale: 1=strongly disagree; 2=disagree; 3=undecided; 4=agree; 5=strongly agree

*Perceptions of Efficacy and Skill Acquisition*

Partial correlations were conducted in order to test the relationship between perceptions of CATHIE's efficacy and participants' skill acquisition. Each perception item was compared separately to the posttest score means. Pretest scores were controlled. An examination of the findings indicated no significant correlations between perceptions of CATHIE and skill acquisition in terms of both response ability and discrimination skills.

## Discussion

This paper presents data from the second exploratory study of an interactive online simulation designed for students to practice empathetic communication skills online. Large-scale changes to the system were made after a previous evaluation including a new character, text-based feedback and the presentation of a best practices script. Consistent with the rapid prototyping approach, these revisions required a second assessment to determine if the CATHIE module is continuing to be an effective methodology for supplemental practice of these skills. This second assessment also allowed us to test the new affordances constructed to address discrepancies found in the first version of the module. This efficacy is critical as the majority of students interacting with CATHIE are students taking their courses at a distance with as many as 300 additional classmates.

The ultimate goal of this exploration and prototyping cycle is to create and deliver an easily accessible, self-paced system that can provide practice and feedback to students physically separated from fellow students and instructors. CATHIE can also serve as supplemental practice for students taking the course in any mode of delivery. Therefore, it is important to continue revising and evaluating the system until it shows progress in training students in both empathetic responses to the client and in their ability to choose the correct tone and structure of an effective response from modeled responses. This evaluation will lead the researchers to make further improvements to CATHIE and the cycle will continue until CATHIE consistently performs its intended task.

#### *Communication Skills Acquisition*

A comparison of pre and posttest scores measuring response ability showed a moderately positive effect of CATHIE on participants' ability to respond to clients. However, a comparison of pre and posttest assessments of discrimination skills indicated participants' ability to choose

effective responses declined. This is consistent with the previous evaluation of CATHIE (Authors, 2006). Although not what was expected, results from this phase of implementation are still encouraging. It appears that CATHIE is still effective at training students in empathetic responses to their clients. However, the issue of discriminating effective responses is still unresolved.

To try and improve CATHIE's ability to teach discrimination skills, the developers included text based feedback after each response choice indicating whether the response was the most effective or least effective answer. An examination of the data did not show any measurable effects of the script presentation although the means did show a slight improvement in both skill sets with the script conditions. The data makes apparent that the script presentation affordance of CATHIE should be continued and more data collected to see if this is a necessary part of training in CATHIE. Also, researchers will compare the provision of feedback to see if there is a significant impact with this affordance.

#### *Participant Perceptions of Efficacy*

Participant perceptions of CATHIE's efficacy are positive. This is consistent with previous evaluations. (Authors, 2006) Participants consistently find CATHIE motivating, believable, helpful, and encouraging and report a perceived improvement in helping skills after interacting with the system. This is the most encouraging aspect of the system so far. Although affective response is not necessarily associated with increased skill acquisition, it is important in terms of motivation to work with the system (Lepper & Chabay, 1987). Researchers are planning future changes such as the ability to author different scenarios for use in CATHIE and a variety of characters and situations to increase motivational qualities of CATHIE.

#### *Future Research on CATHIE*

In most respects, CATHIE is an effective web-based communication skills practice module. It appears from the analysis of the system, there are still issues in acquiring discrimination skills. Researchers will continue revising the system and evaluating the effects until optimal skill acquisition is reached. Some of the plans for the next version of CATHIE include a debriefing session with information specific to the participants' interaction after their interactions, comparisons of the effects of the text based feedback, and more data collection to further inform the effects of the best practices script. These revisions are all targeted towards the improvement of discrimination skills as this is a critical component of training HSPs (Carkuff, 2000).

The next version of CATHIE will have two other affordances that are intended to increase the efficacy and expand the scope of the system. The first is the insertion of interactive learning modules (ILMs) within the simulation environment. Described as effective learning aids (Wolfe, 1997), ILMs have the potential to assist students in their understanding and application of knowledge to real-world situation. The opportunity to manipulate items on a screen allows for learning through active engagement. In addition, multiple choice activities and immediate feedback contribute to learning by allowing students to immediately see the impact of their choice (Kim, Williams, & Datillo, 2002). We are also in the process of constructing a user friendly authoring tool so that scripts can be constructed to fit other related content areas such as student affairs and counseling.

Along with answering the needs of students and teachers needing to practice communication skills at a distance, the CATHIE system also informs the design of interactive web-based simulations and new tools for distance education. CATHIE is a database system, which allows researchers to track aspects of participant behaviors in the system. By continuing to track participants through knowledge tests, student modeling, and perceptions of efficacy,

researchers can continue to explore which affordances work for different skill sets. Traditionally, educational simulations have been used to teach procedural skill sets such as navigation, interview procedures and protocols. By using an interactive simulation to teach communication skills, we are repurposing an effective instructional strategy (i.e., the ability to practice in a contextual environment with real consequences) in a new direction.

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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.