TEACH (Training To Enable/Achieve Culturally Sensitive Healthcare)

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Abstract. Personnel from diverse ethnic and demographic backgrounds come together in both civilian and military healthcare systems, facing diagnoses that at one level are equalizers: coronary disease is coronary disease, breast cancer is breast cancer. Yet the expression of disease in individuals from different backgrounds, individual patient experience of disease as a particular illness, and interactions between patients and providers occurring in any given disease scenario, all vary enormously depending on the fortuity of the equation of "which patient happens to arrive in whose exam room." Previously, providers' absorption of lessons-learned depended on learning as an apprentice would when exposed over time to multiple populations. As a result, and because providers are often thrown into situations where communications falter through inadequate direct patient experience, diversity in medicine remains a training challenge. The questions then become: Can simulation and virtual training environments (VTEs) be deployed to short-track and standardize this sort of random-walk problem? Can we overcome the unevenness of training caused by some providers obtaining the valuable exposure to diverse populations, whereas others are left to "sink or swim"? This paper summarizes developing a computer-based VTE called TEACH (Training to Enable/Achieve Culturally Sensitive Healthcare). TEACH was developed to enhance healthcare providers' skills in delivering culturally sensitive care to African-American women with breast cancer. With an authoring system under development to ensure extensibility, TEACH allows users to role-play in clinical oncology settings with virtual characters who interact on the basis of different combinations of African American sub-cultural beliefs regarding breast cancer. The paper reports on the roll-out and evaluation of the degree to which these interactions allow providers to acquire, practice, and refine culturally appropriate communication skills and to achieve cultural and individual personalization of healthcare in their clinical practices.

1. INTRODUCTION

There is a mismatch between the needed grasp of cultural expectations growing out of highly diverse patient populations in 21st century America, and the sensitivity that medical providers currently bring to bear to interact with those expectations. Through no fault of their own, health-providers often emerge from a training system that gives little attention to communication skills in general, not to mention those particular "soft people skills" requisite to effective clinical management of the many diverse (ethnically and gender) subpopulations that make up American society.

Virtually every medical specialty has called for specific, measurable improvements in providers' ability to confront diversity, partly to improve the care of specific patients and partly to reduce larger socio-cultural disparities [1].

Thus, a team of physicians, cognitive scientists, and usability engineers for this project approached the problem of cultural diversity training with the notion that there is minimal evidence to prove existing interventions provide lasting change in cultural understanding of patient needs, or that it modifies trainee attitudes or behaviors toward diverse patient-populations. With funding from the National Institutes of Health's (NIH) National Center on Minority Health and Health Disparities (NCMHHD), the project team created and performed preliminary evaluations of an extensible, malleable, case-authorable, tutoring and assessment system entitled TEACH (Training to Enable/Achieve Culturally Sensitive Healthcare), with an initial panel of interactive clinical cases that explores all aspects of the appropriate care of female African-American breast cancer patients (AABCPs). In the following content and in our conclusion, we characterize each of these desirable feature-sets, e.g., extensibility, as they have been engineered into the TEACH system.

To satisfy the "all aspects" requirement, we conducted exhaustive research on several spectrums of AABCPs' needs along several

relevant continua, including (a) the clinical spectrum from screening to advanced chemotherapy and prognosis, (b) the sociological spectrum from lower socioeconomic to higher socioeconomic personae; and, (c) the cultural spectrum from patient expectations about bodily appearance to spiritual belief-systems that may impact patient autonomy. Further below, we present several findings that address these continua, in terms of system technical features and the implications of such systems for their future expansion.

The appropriate target audience for TEACH is anyone on the training continuum, ranging from medical students to continuing medical education. In our pilot case-panel of the spectrum of AABCPs, however, we have concentrated thus far on house staff trainees—that is, interns and residents—with particular emphasis on surgical subspecialties most often responsible for coaching breast cancer patients. Our focus groups have, therefore, included predominantly surgeons, but also have representation from internal medicine and social work. Future instances of TEACH, as it is extended to other problems in cultural competency-training, will broaden this equation considerably.

As TEACH has developed, focus group members' views (those of healthcare providers and patients) have unanimously reflected the medical education literature's prevailing view: that there continues to be a mismatch between the gender and—especially—ethnic diversity of the caregivers and that of the populations they treat.

2. TRAINING APPROACH

Training for culturally competent communication requires not only knowledge of relevant cultural beliefs, barriers, and coping strategies, but also developing communication skills. To identify communication training objectives, we examined and synthesized literature on models of culturally competent communication and provider communication training in cancer care. A number of organizations published reports containing models or frameworks for training cultural communication (e.g., U.S. Department of Health and Human Services Office of Minority Health and Agency for Healthcare Research and Quality). We reviewed models presented in these reports and pared those down to include those likely to support communication with female AABCPs. An example of one model is Stuart and Leibermann's BATHE model [2].

Furthermore, we identified communication skills relevant to physicians who are working with patients who have chronic and sometimes terminal conditions [3]. This literature helped us identify specific communication skills during patient consultation that lead to positive outcomes. We were then able to derive specific learning objectives that are pervasive across any relevant cultural beliefs, barriers, and coping strategies. Additionally, we conducted an extensive literature review on stories of various female AABCPs to try to elicit the patient's viewpoint on dealing specifically with a breast cancer diagnosis. Finally, through related research, we identified clinical progression stages associated with a cancer diagnosis during which the needs of the patient may change, thus leading to changes in the relevant dialogue and adjustments to required communication skills.

2.1 TEACH Filter Concept

Stephen Krashen wrote extensively about his hypotheses on Second Language Acquisition. He identified his fifth hypothesis as the "affective filter" or a type of blockage. The three variables he identified were motivation, self-confidence, and anxiety. He stated that people whose affective filter was high, meaning, they possessed a negative attitude toward language learning with low levels of motivation and self-confidence and high levels of anxiety, would acquire less language and achieve less than those with a low affective filter [4]. His theory, although not completely proven, has gone mostly unchallenged.

For the purpose of developing a "patient profile" for the TEACH initiative, a parallel can be made with Krashen's "affective filter". We will call this the "patient-doctor filter effect". A patient, in this case a female AABCP, is associated with several filters. The higher these filters, the more "blockage" exists. When a blockage of any proportion exists, it is more difficult for a physician to achieve a successful interaction. TEACH is aimed at instructing the physicians (not the patients) the communication skills (which are strategic in nature); therefore, it is in relation to identifying the possible filter types that have come into play and to demonstrating verbal and non-verbal actions that appropriately work within those filters, and, thereby lead to a successful interaction.

After reading and summarizing several journal articles on the topic of female AABCPs and collaborating with Dr. Bonnie O'Connor, Subject Matter Expert on African American culture and folklore, seven filters were identified, which could come into play singularly or in combination with one or more other filters. These filters drive the patient's expectations of the conversation,

her behaviors, and her decoding of messages from the physician. These TEACH filters are:

- Healthcare Coverage equates with Quality of Care
- Breast Cancer Equates with a Death Sentence
- Breast Cancer = Treatment Causing Hair Loss or Loss of Sexuality
- God Works Through Doctors
- Discrimination
- Culturally Indispensable Roles as Caregivers
- In tragedy, preferred coping strategy method is "Positive Reappraisal" (positivism and spiritualism)

2.2 Training Interpersonal Skills

Oncologists are facing difficult conversations due to the patient's perspective of: fears about physical illness, psychological affects, death, treatment, friends and family, and finances, social status, and job [3]. Seemingly, when both the patient's and the doctor's perspectives are combined, behaviors are complex. In the case of TEACH, these perspectives are also joined with the cultural beliefs or filters that may be present.

Discrepancies and conflicts emerge by general rule across the entire filter concept with the typical behaviors, such as asking closed questions to gather information quickly, using judgmental responses, reassuring the patient before knowing her needs or concerns, forging ahead with the physician's agenda without consideration to the patient's agenda, and not exhibiting effective listening skills.

These above-mentioned behaviors reveal that the physician is overlooking who the patient is and where the patient is coming from. The interpersonal and communication skills learning objectives for TEACH are based on the learner exhibiting the opposing behaviors after the training is completed. In other words, the physician asks open questions in order hear the patient's concerns.

TEACH scenarios are designed such that the physician is given several opportunities to react in different ways to a patient's question or statement; one of those ways leads to the most successful interaction, whereas the other ways lead to either continued worry or even anger on the part of the patient. An example would be that the patient with the Positive Reappraisal Coping Strategy states, in a calm voice, that she can handle whatever the physician has told her. The physician has a choice to either comment on her strength or to ask if she really understands the gravity of her situation. The

former will lead to a successful interaction, whereas the latter may even anger the patient. This example demonstrates how TEACH combines both the filter concept and the effective physician communication skills. Additionally, when the filter concept and communication skills are joined by the clinical stages of progression, a comprehensive instructional model emerges as seen in the figure below.
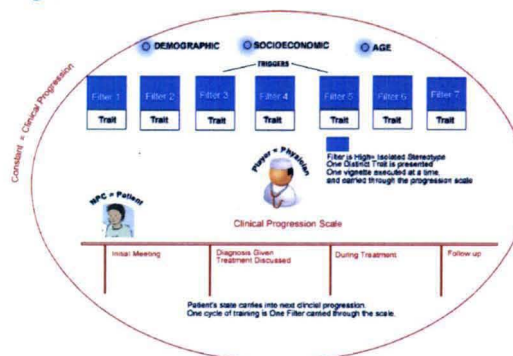

Figure 1: TEACH Instructional Model

Considering that the approach to learning objective derivation for TEACH was based on the filter concept and on identified relevant communication skills, TEACH lends itself to transfer the communication skills to a different set of filters. In other words, other minority populations and clinical contexts could also be analyzed in the same way, through literature review and subject matter expertise, in order to develop a set of filters related to that particular minority group.

3. TEACH VIRTUAL TRAINING ENVIRONMENT

TEACH includes a game-engine-based "player" that can execute interactive avatar-based scenarios for cultural skills training. The TEACH virtual training environment incorporates a library of cognitive-model-controlled Non Player Characters (NPCs) that facilitate the delivery of cultural-familiarization training. Through the use of a canonical cognitive model of NPC behaviors using a cognitive architecture and a generic scripting language, TEACH scenarios can be encoded and mapped to scenario-specific NPC dialog and behaviors, thereby providing a set of virtual NPCs with which the trainee can interact.

An important training requirement for TEACH was the use of avatars that possess adequate levels of visual and behavioral fidelity. This fidelity includes interactive avatars capable of a range of affect and expressivity. We utilized a pre-existing cultural training system, termed VECTOR [5], because it provided a great

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degree of flexibility while requiring only incremental modifications.

Of critical importance was the issue of avatar veracity for modeling the target population of female AABCPs. The requirements for TEACH training dictated that the scenarios should include voice-acted speech coupled with avatars capable of a range of paralinguistic expressivity. Because these features were not required in the creation of the VECTOR system, this need presented a technology gap. To address this gap, we integrated a high-fidelity character-animation and lip-syncing tool, FaceFX [6], in order to provide highly interactive avatars capable of conveying subtle, non-verbal cues. Using FaceFX provides a smooth pipeline for processing voice-acted .wav files against avatar speech (i.e., dialogue) and produces character asset files which are then used to drive high-realistic game avatars.

The TEACH VTE avatars serve as a form of "virtual" standardized patient and provide for simulated physician-patient interactions with female AABCPs. The trainee is expected to maintain trust with each avatar by communicating in ways that show deference for the patient's cultural norms (i.e., "filters") and communication expectations. The simulated patient speaks via a voice-actor while the physician-trainee selects responses from text presented on the screen. One of the forms of performance feedback provided dynamically to the trainee is a "trust bar" based on trainee responses (in the top left), and which is an aggregate measure of patient trust. Additional measures of performance are calculated and stored into the TEACH trainee database for off-line use by an instructor or training administrator.
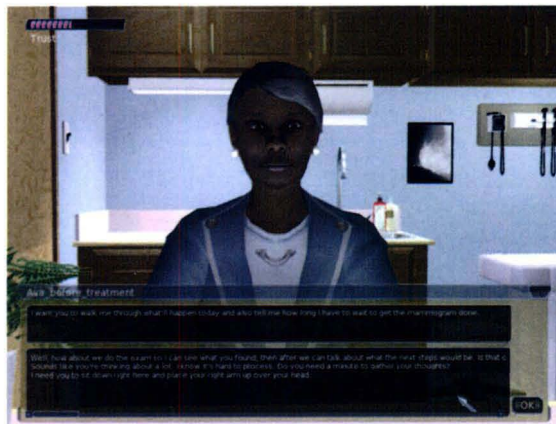

Figure 2: TEACH Patient-Trainee Interaction

3.1 Avatar Requirements

A range of dimensions were identified when considering the range of characteristics which would need to be accounted for in the design and development of the AABCP avatars.. Ideally, we wanted to be able to vary the avatars along this range in order to develop a group of representative prototypical avatars. Example dimensions are: visual appearances, behaviors and mannerisms, language and vernacular, and socio-demographic information.

3.2 Patient Interviews and Avatar Refinement

On May 6 and May 8, 2009, ten patients, who were all female AABCPs, participated in 45-minute to one hour interviews during which time the patients viewed two videos from the TEACH system, reviewed slides showing the avatars and physical setting, and participated in a lengthy discussion with the interviewer using a series of structured questions.

The length of each interview varied slightly as some patients provided more data than others, and some provided more feedback on the physical avatars. With patients who provided less information than others, the interviewer did not pressure the patient but rather let the interview move more quickly. With those patients who spoke more freely about personal feelings, the interviewer allowed the interview to last longer and extrapolated data for the study.

Overall, the patients had very positive feedback about the TEACH avatars in that their answers to the questions seemed to parallel with what we had been exploring and even, at times, had struggled with. With respect to the latter, the patients were able to shed some light on these aspects. No patient remarked that TEACH was totally unbelievable, and all patients remarked that the patients in the videos "reminded them of someone", whether this was physical and attitudinal or whether it was an actual conversation that either they have had with a physician or someone they know has had. Finally, based on responses, it was evident that several of the seven filters, representing various cultural beliefs, were a match to the beliefs held by the interviewees.

The categories of feedback from the patients relate to themes, such as visual additions/changes to the avatars, changes in avatar gestures, expressions, or movement, and environment/setting changes. Suggested changes and enhancements to the avatars included adding jewelry, changing body features, changing clothes, changing facial

expressions, and placing the patient in a doctor's office instead of an exam room.

3.3 TEACH Authoring Facility

Despite the successes in applying serious-games to soft-skills training, scenario content generation is often an obstacle in developing game-based training systems, particularly in terms of cost. Furthermore, a common criticism of serious games has been the lack of a systematic approach to linking learning objectives to scenario content. This is a noteworthy discrepancy as research has been suggested that if a scenario is linked with training objectives, trainees are more likely to learn the underlying content [7].

To this end, an important design and development challenge was including an authoring capability within TEACH. Such a facility provides two advantages: 1) it allows for systematic and repeatable manipulation of existing scenarios in order to support experimentation within this virtual training environment; and, 2) it provides the ability for end-users of the system to add content in a way that positions scenario creation in the larger context of training-objective articulation, performance measurement, and feedback/assessment.

Previously, a VECTOR scenario editor component was developed to allow for the efficient creation of new game-based scenarios and to integrate instructional design principles into the authoring process to promote more effective training scenarios [8]. To address this concern, the VECTOR scenario authoring tools were augmented to support the unique requirements of TEACH, such as voice-acting and Face-FX processing.

Figure 3: TEACH Scenario Editor

To facilitate consistent scenario creation, a process-model for scenario authoring is included within the TEACH scenario authoring tool. To make scenario authoring more accessible to a wider audience (i.e., beyond "game" engineers), a cinematic metaphor was used to create the design of the authoring tool interface. The use of cinematic metaphors has been successfully used in similar VTE paradigms [9],[10]. Scenario authoring within TEACH encompasses a number of training aspects, including training objective specification, scenario information, environment specification, plot organization, vignette creation, and scenario generation.

4. CONCLUSIONS

Next steps for the TEACH environment will include comparative-efficacy studies of the VE as essentially a "clinical intervention" for the training health of providers. The project team will deploy varying "doses" of TEACH, alongside traditional didactic or "paper" exposition of cultural-competency norms, to trainees in randomized controlled fashion. We will also seek to define the extent to which any effect, if observed, is sustained over time, probably by exposing our sub-populations of trainees, after their differential exposure to traditional or experimental training-interventions, to the same metrics at points in time both immediately following then at an appropriate point (six months or more) remote from the interventions. Hypotheses formed as a result of the TEACH experience are two-fold. From a clinical-effectiveness point of view, we hypothesize that clinician-trainees experiencing TEACH-like VE's will demonstrate a degree of sustained cultural awareness that is dependent on intensity and recency of VE exposure. From the standpoint of the expansion of audiences for TEACH and similar VE's, we hypothesize that the following four metrics will predict success:

1. *Scalability* allows for an application created for an initial small group training framework to be enlarged to a much greater 'N' of trainees without concomitant increase in cost.
2. *Extensibility* provides for addition of new types of virtual cases within previously-designed VE's, allowing new and different forms of norms and filters to be imparted and assessed.
3. *Evaluability* allows for the direct application of comparative-effectiveness metrics to a system. Such a feature prevents the simplistic aspect of some training programs' "show-it-and-trust-it" approach to any domain knowledge.
4. *Authorability* gives tools to non-technical domain experts, such as clinicians, permitting them to populate cases without having to supply code or

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otherwise contend with excessively technically-constrained requirements:

5. ACKNOWLEDGMENTS

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