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Intercultural Competence Game that Fosters Metacognitive Agility and Reflection

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Abstract. In this paper we describe the development of a multi-player computer game created to train the intercultural competence and metacognitive agility (self-awareness and self-regulated learning) of United States Army Special Forces team leaders. We describe a unique design that features a novel role for real-time, in-game peer performance assessment and feedback to encourage user reflection and self-explanation. We also discuss how the multiplayer game is successfully used in Special Forces intercultural communication education and offer user feedback results from a study conducted with 51 Special Forces officers.

Keywords: serious game, metacognitive agility, reflection, in-game performance assessment, peer learning, intercultural competence

1 Introduction

Special Forces are people-centric. Their unique strength is their ability to operate in cross-cultural contexts alongside host country nationals while exhibiting intercultural competence. Intercultural competence is expressed through openness, cognitive adaptability, and behavioral flexibility toward unfamiliar cultures. Thus Special Forces are trained in languages, regional expertise, intercultural communication, interpersonal skills, and critical thinking, or metacognition. Honing one's metacognitive agility is integral to intercultural competence [1]. Metacognitive agility is the ability to actively control the learning process [2] such as possessing the ability to reflect and analyze the way oneself or others think, discern when different cognitive strategies are needed, and employ those strategies to enhance one's learning and performance [1]. Operating competently in cross-cultural settings requires the ability to be aware of oneself and others, reflect on salient experiences, evaluate or assess situations, and act purposefully on those evaluations.

The U.S. Army John F. Kennedy Special Warfare Center and School (schoolhouse) approached Sandia National Laboratories (Sandia) with the following question: "How can we train troops to think critically, to sense opportunities when at first glance there appear to be none, or to make good decisions regardless of the complexity of a socially and ethically ambiguous situation?" Since the users operate shoulder-to-

shoulder with host country nationals in unfamiliar multicultural contexts, our particular challenge was to create a memorable classroom training experience that could engender a transfer of training from the virtual environment to the real world.

The Special Forces schoolhouse knew they wanted to address the question above and also knew they wanted to inject experiential technology into their training pipeline, but they did not know how to start. Therefore we spent the next 12 months working closely with the schoolhouse. We conducted a 3-month; in-depth ethnographic study of Special Forces as participant observers [3] to understand their needs and requirements, and 9 months developing a serious game that would hone intercultural competence [4].

2 Special Forces Training Study

Involving ourselves as participant observers in the Special Forces Training Division entailed observing both classroom and field training such as squad-level live action role-play and large-scale events that incorporated civilian role-players. Our organizing structure and data collection process utilized ethnographic, or qualitative, methodologies [3]. We used a variety of techniques to familiarize ourselves with and analyze data including but not limited to participant observation, interviews with instructors, cultural experts and subject matter experts, field study, and naturalistic inquiry. Additional HCI research methods we employed included conducting design workshops, focus groups, and administering baseline questionnaires for identifying trainees' prior experience with games and attitudes toward using games to hone intercultural competence.

The classroom training we observed was generally attended by approximately 30 trainees. We noted that lectures and paper-based role plays (e.g. negotiating with others) as well as group/team problem solving activities were often used. On one occasion a cultural expert was brought in to role-play a negotiation scenario with members of the class. Four Special Forces team leaders had speaking roles in the session, and 26 others observed. It was difficult to see and even more difficult to hear for those in the back of the room. Following this activity the trainees participated in a large group debriefing with their instructor, although participation was limited primarily to those who had participated in the role-play. These classroom techniques were utilized across the curriculum. Special Forces classroom training can last up to one year depending on deployment schedules.

Finally, we conducted a baseline survey of Special Forces attitudes toward game technology. Most of the Special Forces team leaders we surveyed were between the ages of 26-38. While most of the 34 men (there are no women in US Special Forces) who participated in our baseline study reported being engaged by video games (especially sports and first-person shooters), not all of them were convinced they would learn intercultural competence skills in a virtual environment. It was counter-intuitive for some to see how communicating over a microphone in a virtual environment would help them improve communication skills ultimately used in face-to-face environments. We embraced their concerns and used their skepticism to push our game design toward offering unique learning opportunities focused on verbal

communication strategies (negotiation), observation and listening skills (cuing off of the virtual environment), and reflective self-explanation. We adopted a science-based approach to game design grounded in Experiential Learning Theory (Kolb) and Social Learning Theory (Bandura) that enhanced the user experience beyond that which was expected from a typical game. Listening to our users made us better designers.

Our ethnographic study determined that the design of the game would have to allow Special Forces to train the following objectives:

- Negotiation and consensus building
- Effective intercultural communication competence
- Ability to analyze socially ambiguous situations
- Self-awareness, reflection
- Innovative thinking, envisioning different courses of action, and effectively using critical thinking skills (adaptive thinking)

Sandia then assembled and led a team in the development of a multiplayer game. We proposed experiential game sessions as classroom activities that would allow trainees to practice and internalize skills taught in a lecture-based, didactic learning environment. Sandia collaborated with the Office of Economic Manpower & Assessment Army Game Project (contractor Virtual Heroes, Inc.). The Army Game Project is responsible for the internet-based multiplayer first-person shooter game called *America's Army* that hosts several million registered users worldwide (www.americasarmy.com). Collaborating with the Army Game Project allowed us to leverage substantial investments made by the U.S. Army in a game platform and visual art assets. However, to make the game a training environment, significant engineering changes needed to be made to support new instructor and player roles.

3 Serious Game and Role Development

The subsequent 9-month phase involved designing and developing a training game for use in the classroom which was based upon the learning objectives mentioned above. Rogers & Steinfatt indicate that “intercultural communication training must be highly experiential if it is to increase intercultural competence” [5]. Therefore the goal of the game was to serve as a highly engaging virtual sandbox within which trainees could role-play and practice the content they learned from classroom instruction and exercise intercultural competence and metacognitive agility. Metacognitive agility is key to developing intercultural sensitivity [6].



Figure 1. Screen shot of *America's Army Adaptive Thinking & Leadership* cultural environment. Image courtesy of JFKSWCS.

The game content was based on real world stories and lessons learned from culturally diverse subject matter experts involved in socially ambiguous situations that had a number of “right” answers. Our content design involved creating roles for soldiers, host country civilians, and diverse members of non-governmental organizations (see Figure 1). The scenarios we developed focused on intercultural negotiations, trust and rapport building, and decision-making in unexpected, high stress situations.

We used a variety of methods to develop the roles and game content including the HCI persona methodology [7]. Instead of referring to an unidentified “user” in a scenario, a specific persona of a Special Forces team leader was constructed to guide the design process. The game design also involved content storyboarding, creating single-player and multiplayer mini-games, motion capture, animating cross-cultural nonverbal gestures, incorporating culturally relevant ambient sounds and voiceovers, scenario scriptwriting, and developing new interfaces for reflective observation & evaluation [8]. Some trainees did not role-play game characters, but instead observed and evaluated other trainees’ performance from camera views that they could switch independently or track trainees in-game.

As shown in Figure 2, each trainee, instructor, observer/evaluator, or subject matter expert playing a role in the scenario, was equipped with a client on a laptop along with a mouse and headphone/microphone set. A self-paced single-player tutorial was developed to practice multiplayer game navigation and operation of a nonverbal gesture menu. We created 5 different game levels (e.g. hospital, courtyard, etc.) and over 15 different mission scenarios. In each of the different multiplayer sessions, trainees played roles for characters or peer observer/evaluators. Trainees role-playing as game characters communicated on a private VOIP channel, or communicated to all on a public channel. They also communicated using nonverbal gestures (such as culturally appropriate greetings) selected from a pull-down menu. The game used scripted non-player characters (NPCs) in the scenarios, but all primary roles were played by trainees or experts. The game environment was designed without any language cues (neither visible nor audible) so that role-play sessions could be conducted in a variety of foreign languages, or with multicultural groups. Voice

communications were also slightly distorted to preserve trainee anonymity among peer evaluators.



Figure 2: Members of Special Forces Directorate of Training Division (DOTD) demonstrate the game. Image courtesy of JFKSWCS, Public Affairs Office, Ft. Bragg.

Observer/evaluators listened to all communications on the VOIP channels, but did not speak directly to game characters. They could text chat with the instructor or others in the evaluator role. Their evaluations were both quantitative and qualitative. The aggregate scores across all persons evaluating different trainees' intercultural competence performance on a 5-point Likert-type scale and free text feedback were displayed by the debriefing tool on all computers immediately following the game session. Our design goal with the introduction of this new role for reflective learning (observation/evaluation) was to encourage growth toward intercultural sensitivity [6] and cultural relativism [5], or the ability to reflect and evaluate phenomena relative to cultural context. Therefore our intent was to expand trainees' solution set for ill-defined and novel problems through their game session and subsequent participation in a follow-up discussion. The new role and interface for reflection and evaluation are discussed in greater detail in the following section.

In each role, the trainees learned how team communication, cultural expectations, negotiating from different perspectives, and being self-aware are relative to the cultural context [6, 8]. The different roles we created provided increased replayability, authentic scenarios that engaged trainees emotionally, and free-play options that could be cued off the environment [9]. In particular, learning could be accelerated when trainees rotated among the different roles to better understand negotiating from diverse points of view and providing constructive feedback [8].

Finally, a debriefing tool (known as after action review) was created to augment large group discussions. The debriefing tool recorded each game session using time-stamped, synchronized sound and video sequences for playback and analysis of peer evaluations.

4 Reflective Observer/Evaluator Role

No one would have objected had we merely delivered a high adventure game to Special Forces and left it at that, but we took a risk and exceeded expectations by introducing a reflective observer/evaluator role. During our ethnographic investigation, we learned that role-playing, observing others model behavior, reflecting to analyze best practices, and providing constructive peer feedback were key elements to the way Special Forces trained across their education curriculum. It was appropriate that our game mechanics be inspired by these values as well as Special Forces' penchant for high adventure.

The reflective observer/evaluator role is based on the patent-pending Real-time In-Game Assessment, Evaluation and Feedback system [1, 8] which consists of a method and role for making in-game evaluations of player's actions, decisions, communications, etc. as they occur in real-time and as they correspond to competencies and learning objectives. In one example during a game session evaluators observed a trainee's performance in a scenario. Evaluators assessed performance by selecting the appropriate value on a Likert-type scale that appeared in the evaluator's interface. Some evaluators also entered annotations in the interface text field. Following the game session, participant roles could be switched for the subsequent session.

Evaluators' feedback is both quantitative and qualitative and corresponds to logged, time-stamped game events. These evaluations are aggregated and statistical analyses performed on the individual and group evaluations. Team and individual assessments can be displayed either in real-time or during group debriefings. The debriefing tool allows trainees to verify decision points and discuss them in detail by rewinding the playback to a particular moment (time stamped) that corresponds to the mean score of aggregate evaluations across any number of observer/evaluators. A report form of the feedback can also be given to trainees or instructors following each game session. Displaying the peer assessments in the debriefing tool ensures that the content of evaluation (e.g. measures of intercultural competence) and the products of reflection are a prominent focus of the discussion [8]. Peers in the reflective role help focus and teach others participating in the debriefing to connect theories and/or concepts to actions demonstrating stages of intercultural competence and sensitivity [6, 8]. Trainees in the reflective role were therefore held accountable for explaining criteria of intercultural competence to others after observing modeled behaviors and thus learned better. They internalized the concepts and new vocabulary more quickly than others.

By training in roles that allow Special Forces to act (character roles) and reflect (reflective Observer/Evaluator role) the trainees performed different cognitive tasks. More concrete, active experimentation (e.g. negotiating from a different point of view) took place with character role participation, while abstract conceptualization and reflection was fostered by the reflective Observer/Evaluator role (e.g. pause, look at the problem in light of the cultural context, critically consider best practices, and communicate solutions to others). Thus our intercultural competence game was grounded in the development of intercultural sensitivity [6] and experiential learning theory—namely concrete experience, active experimentation, reflective observation, and abstract conceptualization [10].

5 Preliminary User Feedback

Focus groups and interviews with Special Forces instructors and subject matter experts were conducted throughout the iterative design and development process. These data were used by the development team to design the game and are not reported in the present paper. End user characteristics and their feedback are discussed below.

To date, 85 Special Forces Officers who were also team leaders have participated in our user feedback studies. All respondents were male, ranging between 26-38 years old. They varied in degrees of field experience and familiarity with the content of the course. The respondents reported playing computer games 0-5 hours per week. Younger officers were more familiar with computer games (played more often) than those who were over age 30. Of those who played computer games, most preferred first-person shooters, sports, role-playing, and strategy games.

Feedback questionnaires on general simulation use were administered to end users over a 3-month period. Responses were used to inform the project team about the expectations of Special Forces Officers. Thirty-four Special Forces Officers participated in the baseline feedback of their perceptions of general simulation use in the classroom. In general, these Officers anticipated being engaged by a simulation, and believed that they would learn more about their strengths and weaknesses from participating in a simulation than they would if they did not participate.

Upon delivery of the simulation and its deployment in the classroom in December 2004, focus groups were conducted and questionnaires administered on the same topics above as well as usability of the simulation. Fifty-one Officers completed questionnaires on their experience with the game after its use in the classroom and before participating in the feedback focus group sessions. The questionnaires were self-report, Likert-type scale instruments measuring the participants' attitudes toward their simulation experience. Frequency statistics on the two items described above indicate positive user expectations after having participated in the simulation (Figures 3-4).

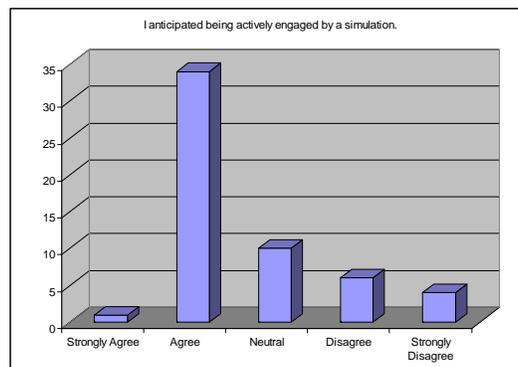


Figure 3. Frequency Statistics on item "I anticipated being actively engaged by a simulation."

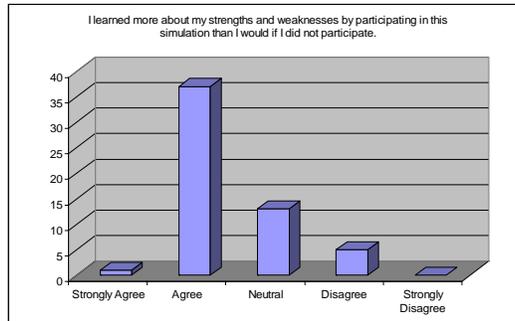


Figure 4. Frequency statistics on item "I learned more about my strengths and weaknesses by participating in this simulation than I would if I did not participate."

In addition, 18 Officers evaluated the culturally-relevant content and scenario of the single-player tutorial. They agreed that the interface was easy to use and that they learned how to navigate the game environment and use the nonverbal gesture menu. They indicated that the scenario depicted in the simulation was realistic (Figure 6).

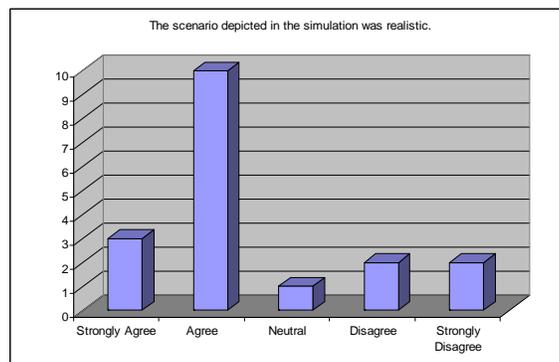


Figure 6. Frequency Statistics on "The scenario depicted in the simulation was realistic."

In summary, the initial feedback collected has been very positive although further study is needed. The Officers were engaged with realistic scenarios and they reported that they learned more about their strengths and weaknesses by participating in the game/simulation than they would have learned had they not participated. Focus group sessions with the 51 Officers have also identified interface enhancements that were subsequently incorporated into our second release such as the enhancement of VOIP communications, additional negotiation practice environments, and the expansion of the task and role definitions in the game.

One of the limitations of the present work is that we did not have an opportunity to conduct an empirical study of how trainees learned using the game. As our research program in the area of game-based training or serious games is ongoing, we are

currently exploring how novices learn in experiential environments that present opportunities to learn via reflective observation and active experimentation.

6 Conclusion

Our *America's Army Adaptive Thinking & Leadership* game (ATL) supports classroom training with engaging experiential learning game sessions. Our system includes different methods, roles, and interfaces including those especially designed to support the organization's emphasis on learner reflective observation [1,8].

Our game-based approach to training intercultural competence leverages community and peer learning [8]. The roles for players and reflective observer/evaluators allow trainees to develop metacognitive agility, discover their strengths and weaknesses, expand their solution space, and understand the consequences of their actions on others. The design of this game and innovative role created can be generalized to leadership training, multicultural education for children and adults, and domain-specific interpersonal relationship training (e.g. healthcare, Peace Corps, etc.).

Since the development and delivery of our government game title *America's Army Adaptive Thinking & Leadership*, the Special Forces game has been used to augment classroom education for three different groups of learners—Special Forces team leaders, PSYOP, and Civil Affairs. In the case of Civil Affairs the game is used with multicultural groups to engender out-of-game discussions of cultural differences and diverse approaches to problem-solving.

Finally, we have developed modules exploring similar topics with similar software engineering instantiations in another game application that is used to train thousands of soldiers world-wide. Our current activities include investigating whether these approaches accelerate intercultural competence and learning. We continue to strive to create memorable classroom training experiences that engender a successful transfer of training from the virtual environment to the real world.

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