# Adaptive Thinking & Leadership Simulation Game Training for Special Forces Officers

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## ABSTRACT

Complex problem solving approaches and novel strategies employed by the military at the squad, team, and commander level are often best learned experientially. Since live action exercises can be costly, advances in simulation game training technology offer exciting ways to enhance current training. Computer games provide an environment for active, critical learning. Games open up possibilities for simultaneous learning on multiple levels; players may learn from contextual information embedded in the dynamics of the game, the organic process generated by the game, and through the risks, benefits, costs, outcomes, and rewards of alternative strategies that result from decision making.

In the present paper we discuss a multiplayer computer game simulation created for the Adaptive Thinking & Leadership (ATL) Program to train Special Forces Team Leaders. The ATL training simulation consists of a scripted single-player and an immersive multiplayer environment for classroom use which leverages immersive computer game technology. We define adaptive thinking as consisting of competencies such as negotiation and consensus building skills, the ability to communicate effectively, analyze ambiguous situations, be self-aware, think innovatively, and critically use effective problem solving skills. Each of these competencies is an essential element of leader development training for the U.S. Army Special Forces.

The ATL simulation is used to augment experiential learning in the curriculum for the U.S. Army JFK Special Warfare Center & School (SWCS) course in Adaptive Thinking & Leadership. The school is incorporating the ATL simulation game into two additional training pipelines (PSYOPS and Civil Affairs Qualification Courses) that are also concerned with developing cultural awareness, interpersonal communication adaptability, and rapport-building skills. In the present paper, we discuss the design, development, and deployment of the training simulation, and emphasize how the multiplayer simulation game is successfully used in the Special Forces Officer training program.

## ABOUT THE AUTHORS

**Elaine M. Raybourn**, Ph.D. in intercultural communication with an emphasis on human-computer interaction brings an expertise in understanding culture and communication to the design of serious games & experiential simulations, collaborative training systems, and context aware groupware. Her research and design concern topics such as novel after action review (AAR) systems, and designing learning applications that stimulate cross-cultural communication, intercultural awareness, and cognitive agility (adaptive thinking). Elaine was an ERCIM (European Consortium for Research in Informatics and Mathematics) 2002-04 Fellow, and is a principal member of Sandia National Laboratories and a National Laboratory Professor at the University of New Mexico's Department of Communication & Journalism, Institute for Organizational Communication.

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**Jerry Heneghan** is the founder and CEO of Virtual Heroes Inc., located in Cary, North Carolina. Virtual Heroes Inc. creates collaborative simulation learning solutions for government, military, and corporate clients that enable users to learn by doing. Before Virtual Heroes, Jerry was a Game Producer at Tom Clancy's Red Storm Entertainment. Prior to work in the interactive entertainment industry, Jerry served as a U.S. Army Aviator (AH-64 pilot), in assignments all over the world. Jerry holds an MBA from the Fuqua School of Business at Duke University and a BS in Engineering from the U.S. Military Academy.

**Kip Mendini**, MSW, is the senior program analyst for training development and future concepts at the USAJFKSWCS and is a licensed clinical social worker, specializing mental health and trauma therapy. Mr. Mendini retired from active duty after 24 years as a commissioned officer in the U.S. Army, serving in a myriad of combat arms, intelligence, and special operations positions.

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## INTRODUCTION

Non-governmental organizations (NGO) and government organizations such as the military and first responders are confronted with uncertain times and resources to operate in a perplexing geopolitical world. These uncertain times are characterized by vague and ambiguous situations across a broad spectrum of activities. An essential element to meeting this challenge is the development of the appropriate leader competencies. Leaders at all levels and across different disciplines or agencies require specific competencies to succeed such as languages, regional and technical expertise, cross-cultural communications, interpersonal skills, and *adaptive thinking*. In this paper, adaptive thinking is defined as consisting of competencies such as negotiation and consensus building skills, the ability to communicate effectively, analyze ambiguous situations, be self-aware, think innovatively and critically, and exercise creative problem solving skills. Each of these competencies is an essential element of leader development training for the U.S. Army Special Forces Officers.

Computer games provide an environment for active, critical learning. Through games one learns to appreciate the inter-relationship of complex behaviors, signs (images, words, actions, symbols, etc.) systems, and the formation of social groups (Gee, 2003). Games are not only used for entertainment purposes. Games and social simulations are often used for training and teaching in management science, economics, psychology, sociology, intercultural communication, political science, military strategy, interpersonal skill development, and education. Games open up possibilities for simultaneous learning on multiple levels; players may learn from contextual information embedded in the dynamics of the game, the organic process or story generated by the game, and through the risks, benefits, costs, outcomes, and rewards of alternative strategies that result from decision making (Raybourn & Waern, 2004b).

Complex problem solving approaches and novel strategies employed by first responders, emergency and catastrophe managers, or the military are often best learned experientially through exercises, role-plays, or live action simulation. Since live action exercises can be costly, advances in simulation game training technology offer exciting ways to augment current training. Since 2003 Sandia National Labs has led a team comprised of the U.S. Army Office of Economic Manpower Analysis (OEMA), Virtual Heroes Inc., and U.S. Army JFK Special Warfare Center and School (USA JFKSWCS) in the design, development, and deployment of a multiplayer simulation training system that fosters cultural awareness, adaptability, flexible problem solving, and leadership development.

The objective of our training approach is to create immersive digital environments in which participants share lessons learned and create new knowledge via experiential training that hones their critical thinking, mental agility, interpersonal adaptability, cultural acumen, and observational skills. It is our goal to create interactive environments that sharpen participants' focus by unleashing their cognitive abilities and compelling them to make critical decisions. In designing a simulation for use by U.S. Army Special Forces Officers, we carefully considered the efficacy of technology-enhanced training in the context of existing training techniques and curricula. Our goal was to focus on training participants to think on their feet while confidently and consistently making good decisions—especially when faced with stressful settings, novel situations and ambiguous phenomena. In short, the focus of the simulation is on learning "*how to think"* not "what to think."

In the present paper, we discuss the project background, simulation design approach, training system description, and user feedback from the deployment of an immersive multiplayer training simulation that is used in the U.S. Army Special Forces Officer Qualification Course at Ft. Bragg, North Carolina.

## ADAPTIVE THINKING & LEADERSHIP

Special Forces are people-centric. Though fully capable and skilled in high technology operations, their unique strength is their ability to accomplish goals and objectives by operating in cross-cultural contexts alongside host nationals. As mentioned above, Special Forces soldiers are trained in languages, regional and technical expertise, cross-cultural communications, interpersonal skills, and adaptive thinking.

In 2003 Sandia National Laboratories was sponsored by the U.S. Army John F. Kennedy Special Warfare Center and School to lead and assemble a team to develop interactive, leadership training technologies. The team consists of Sandia National Laboratories, USA JFKSWCS, OEMA, Virtual Heroes Inc. (a.k.a. Army Game Project Government Applications), and the University of Central Florida Institute for Simulation & Training. The Army Game Project is directed by the U.S. Army Office of Economic Manpower Analysis (OEMA) and best known for its development of an internet-based multiplayer game called *America's Army* that currently enjoys over 5 million registered users worldwide (Wardynski, 2004).

## PROJECT APPROACH

In nine months, a single-player tutorial and multiplayer computer simulation was created for adaptive thinking & leadership (ATL) training and skill development in intercultural and interpersonal communication among teams and in cross-cultural settings with host nationals. Sandia provided the theoretical approach, new human performance measurement techniques, novel AAR techniques, and culturally relevant game content design. We drew upon previous experience with designing simulation games for interpersonal and intercultural communication, and intelligent multicultural, collaborative groupware systems (Raybourn, 2001, 2003, 2004a). USA JFKSWCS provided subject matter expertise, instructional and development feedback, along with simulation testing. The Army Game Project Government Applications provided game production and networking capability. UCF IST served as consultants for the development of the After Action Review (AAR). Together the team was able to produce a collaborative virtual learning system that met the needs of the end users and project sponsors.

The Adaptive Thinking & Leadership (ATL) training simulation game currently consists of a scripted single-player and an immersive multiplayer environment for classroom use which leverages both Epic's Unreal Tournament game engine and the *America's Army* Game Platform (Figures 1-3). Instructors and students are provided an initial set of scenarios and may also create their own and/or modify scenarios easily in real-time.

The After Action Review (AAR) of individual performance was informed by 5 years of research conducted by the Army Research Institute and the University of Central Florida (Knerr et. al., 2002). An AAR allows instructors and students to critically review the decisions made and actions taken in the game.

**Figure 1. ATL Single-Player Level Student View**

## INTERACTION & SIMULATION DESIGN

During the first 3-month phase of project work, Sandia National Labs (Sandia) worked closely with USA JFKSWCS by conducting an in-depth study of the organization's training program in order to best determine how simulations could reinforce existing training content & efforts, as well as provide an innovative approach to learning. Throughout the collaboration USA JFKSWCS ensured that Sandia gained an intimate understanding of their complex qualification courses, assessment, and training program as well as expected training outcomes. Research methods included observing experiential field exercises, live action role-plays, and classroom training; and conducting design workshops, focus groups, interviews with instructors and subject matter experts, and administering feedback questionnaires.

The second 9-month project phase consisted of designing and developing a training simulation for use in the classroom which was based upon the learning principles mentioned in previous sections. The simulation content is based on real world lessons learned and stories from subject matter experts that reinforce the need for adaptive thinking in cross

cultural contexts. The content and interaction design efforts included working closely with subject matter experts and incorporating diverse content into a virtual environment in a unified manner such that the simulation facilitates participant experimentation with decision making and communication under stressed conditions while in a relatively safe setting. Our goal was for participants to hone their ability to anticipate the ramifications of different courses of action to problems that may not have a "right" answer by role-playing in a dynamically changing environment.

The design of the multiplayer simulation environment involved the development of *personas* (Cooper, 1999); 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 the AAR, student, and instructor interfaces which are discussed in more detail in subsequent sections (Figures 1-3).

The third phase of the project (currently underway and discussed in more detail in subsequent sections) involves a formal evaluation of the efficacy of the multiplayer simulation game and its deployment and use in classrooms at training facilities. Preliminary user feedback is presented later in this paper. The subsequent section describes our simulation design methodology and approach.

**Simulation Experience Design Method.** The Simulation Experience Design methodology advanced by Raybourn for the design of simulations and other collaborative technologies (2001; 2003a,b; 2004) was employed in the design of the ATL simulation environment and scenarios. This design method is based on the notion that the one's total experience in the simulated environment, or crucible, is integral to the learning process. A "crucible" experience is "…a defining moment that unleashes abilities, forces crucial choices, and sharpens focus" (Bennis & Thomas, 2002; p.16; Wong, 2004). Simulation Experience Design lies in purposefully weaving players' interactions with all entities and variables in the game environment in order to guide certain communication events. The system of interactions executed in the simulation game guides players to experience the *effects* or *consequences* of behaving, responding, thinking, identifying, acting, and feeling in certain ways. The consistent patterns of our interaction with artifacts, our physical environment, and other individuals over time provide cues that we use to interpret culture, situations, and environments to reduce uncertainty (Raybourn, 2004). One's simulation experience is unpredictable, and has no right or wrong approach. Thus the Simulation Experience Design Method focuses on creating problem-solving opportunities in open-ended, culturally relevant environments in which users build awareness of the problem domain, internalize strategic thinking and hypothesis building, discover their own strengths and weaknesses, develop intercultural communication skills, and hone the perceptual sensitivity to confidently navigate complex phenomena.

## SYSTEM DESCRIPTION

The Adaptive Thinking & Leadership Training (ATL) Simulation Game currently supports classroom training for up to 24 players and one instructor (includes players and observer roles—although observer roles may easily be increased to accommodate the size of the class). The goal of the ATL environment was to serve as a virtual sandbox within which participants can role-play and practice the content they learn from classroom instruction and related activities throughout their training program. The ATL system consists of the following interfaces:


**Figure 2. ATL Multiplayer Instructor Interface (Student Viewpoint)**

**Instructor Interface (Figure 2-3).** From the instructor interface one can assign students to different roles of the multiplayer session as well as set a time limit for the scenario role-play. The instructor client initiates and sets the ATL game server, manages the training session, and operates the AAR playback. The instructor is able to communicate with each team privately, broadcast to all on a public channel, or participate in text chat with persons who are observing and evaluating the session. The instructor may alter or introduce certain events in the game scenario in real-time (such as initiating a helicopter flyover, celebration fire etc.) that are designed to impact the rapport

building and negotiation role-playing. The instructor is also able to monitor the role-playing session from ten different fixed camera views (including student view). The instructor's views are recorded and serve as the AAR playback. The instructor may bookmark events that occur during role-play with text or an icon in order to facilitate reference during the AAR.

**Student Interfaces.** Each Special Forces team leader, instructor, or subject matter expert playing in a student role is equipped with a Student client on a laptop along with a mouse and headphone/microphone set. Students may participate in a self-paced single-player tutorial where they learn multiplayer game navigation and operation of the nonverbal gesture menu in a relevant cross-cultural context. In the multiplayer session, students play the roles of either Special Forces soldiers or host nationals. In either case, they learn about team communication, cultural expectations, negotiating from different perspectives, and how to be more self-aware. Students may communicate to others on their team on a private VOIP channel, or communicate to all on a public channel. They also communicate using nonverbal gestures selected from a pull-down menu. The simulation was designed such that it could be conducted in foreign languages as required. Voice communications are slightly distorted to preserve trainee anonymity. Finally, some students do not role-play, but instead observe and evaluate the game play from fixed camera views that they can switch between independently from the instructor or other students. They are able to listen to all communications on the VOIP channels, but not speak. They may also text chat with other observers and the instructor. Their evaluation statistics and text feedback are included in the AAR replay sessions.


**Figure 3. ATL Multiplayer Instructor Interface (Student Viewpoint)**

**After Action Review.** An AAR provides the mechanism by which instructors and trainees discuss the outcomes of each simulation experience or session using time-stamped, synchronized sound and video sequences, statistical analyses of actions taken, and evaluations of observers. The AAR system allows users to verify decision points and discuss them in detail. AAR sessions are stored and may be provided to individuals for personal, team, or peer review later.

## SIMULATION DEPLOYMENT IN CLASSROOM

The ATL simulation was deployed in the USA JFKSWCS training program for a 3-½ day course for Special Forces Officers called *Adaptive Thinking & Leadership* in December 2004. Officers participate in three different 30-minute simulation/AAR sessions over the 3-½ day course which includes interface and cultural awareness training in a single-player tutorial, negotiations practice in the multi-player environment, and a final formal negotiation exercise in the simulation environment with members of the training cadre or host national role-players. Observer evaluation statistics are calculated and displayed by the AAR system. This assessment feedback is an integral learning and teaching component of the AAR. The group discusses decision-making, communication strategies employed, and actions taken or not taken.

Participants are provided user feedback questionnaires upon conclusion of the simulation exercise. Due to the dynamic changes that occur during the wartime program of instruction currently in effect at USA JFKSWCS, gathering quantitative longitudinal or experimental data has proven to be a challenge. All feedback is collected with Special Forces Officers participating in the *Adaptive Thinking & Leadership* course. Therefore while current feedback discussed in the present paper is focused on user attitudes and usability of the simulation, future feedback will also be gathered on the simulation's ability to foster intercultural discovery learning (Raybourn, 2004).

In summary, the simulation augments and enhances current training methods used throughout the Officer Qualifications Course training program and builds on content the Officers are exposed to through traditional instruction or live action role-plays. The use of virtual simulations does not replace training efforts currently underway in the USA JFKSWCS program—instead these efforts are leveraged and reinforced.

## 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 simulation and are not reported in the present paper. End user characteristics and their feedback are discussed below.

To date, 85 Special Forces Officers who are also Team Leaders have participated in our user feedback studies. All respondents are male, ranging between 26-38 years old. They vary 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 simulation after the simulation's 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 4-5).

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 simulation environment and use the nonverbal gesture menu in an engaging manner. They also indicated that the scenario depicted in the simulation was realistic (Figure 6).

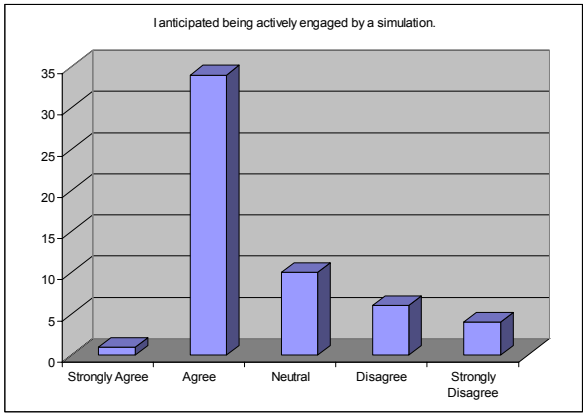


**Figure 4. "I anticipated being actively engaged by a simulation"**

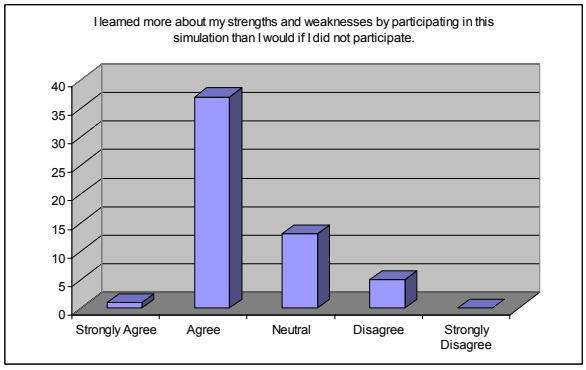


**Figure 5. "I learned more about my strengths and weaknesses by participating in this simulation than I would if I did not participate."**

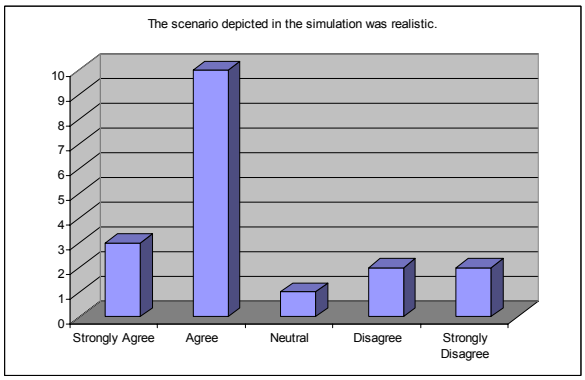


**Figure 6. "The scenario depicted in the simulation was realistic."**

In summary, the initial feedback collected has been very positive although further study is needed. The Officers are engaged with realistic scenarios and they believe they learned more about their strengths and weaknesses by participating in the ATL simulation than

they would have learned had they not participated. Focus group sessions with the 51 Officers have also identified interface enhancements that will be incorporated into our next steps such as enhancing Voice Over IP communications, creating additional negotiation practice environments, and expanding the task and role definitions in the simulation.

## FUTURE DIRECTIONS

The ATL system is currently designed to support classroom training. Multiplayer Online Role Playing Gaming (MORPG) support is among the options under consideration for future phases of the ongoing project. Current enhancements include expanding the AAR, mini-games, and human performance measurement. Additionally, the simulation may be used in embedded training, virtual, or augmented reality systems. JFK SWCS will use the simulation in Civil Affairs and Psychological Operations Qualification Courses also concerned with developing Team Leader interpersonal communication and rapport-building skills.

## CONCLUSIONS

The ATL multiplayer simulation game training environment is aimed to assist the participant through its focus on problem-solving in open-ended, culturally relevant settings which can help build awareness of the problem domain, internalize strategic thinking and hypothesis building, develop cultural recognition skills, and hone the perceptual sensitivity to confidently navigate complex phenomena. Now that we have completed the careful development of the system we can begin a formal evaluation in cooperation with the Special Forces training school. We will evaluate whether our careful design of unobtrusive reasoning principles in computer games may help guide participants to have "aha" experiences in context. Representing culture in simulations cannot be prescribed (there is no recipe, or standard format), nor should any *one* cultural perspective be enforced. According to Mudur (2001, p. 304), "interactive digital technology is a covert carrier of cultural values." Therefore, as designers, it behooves us to guide culturally-relevant simulation design to emerge from the end user's co-creation of narratives and the subsequent communication events transpiring in the virtual space.

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