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Assessment Of The Contribution Of Game-based Simulation In The Advancement Of Individual Soldier Intelligence Gathering Skills

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ASSESSMENT OF THE CONTRIBUTION OF GAME-BASED SIMULATION IN THE ADVANCEMENT OF INDIVIDUAL SOLDIER INTELLIGENCE GATHERING SKILLS

by

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ABSTRACT

Self-directed Learning Internet Modules based on gaming technology are making tremendous strides as tools to current training system for our military services. Currently, the US Army is testing the Every Soldier is a Sensor Simulation software (ES3) as part of the Every Soldiers a Sensor program that focuses on intelligence gathering and maintaining situational awareness. The primary training goal of this simulation is the training of individual soldiers on conducting "Active Surveillance" and "Threat Indicator Identification" where the soldier is an active participant in the process. Traditional training in intelligence gathering is based largely on cold war models. As a direct result of post 9 -11 activities and the Global War on Terrorism, changes to our process for intelligence gathering are continuing to be made to meet the challenges of the asymmetrical battlefield.

This thesis assesses the contribution of game-based simulation in the advancement of individual soldier intelligence gathering skills by investigating performance as it relates to information processing, self-directed learning, and transfer. Specifically, this research will examine whether various combinations of directed and self-directed learning modules enhance soldier performance during intelligence gathering operations by determining the time, proportion of correct detections, weighted significance of detections, and accuracy of detections while participating in a live threat indicator lane as part of an experiment. The assessment is from a user and expert evaluator perspective and may be used to improve current and future gaming applications associated with individual training and intelligence gathering.

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LIST OF ACRONYMS/ABBREVIATIONS

AAR	After Action Review
ARI	Army Research Institute
CCIR	Commanders Critical Information Requirements
COE	Contemporary Operating Environment
COTS	Commercial off The Shelf
CTT	Common Task Test
DoD	Department of Defense
ES2	Every Soldiers a Sensor
HIP	Human Information Processing
HUMINT	Human Intelligence
ICT	Institute for Creative Technologies
IED	Improvised Explosive Devices
IPB	Intelligence Preparation of the Battlefield
LFX	Live Fire Exercise
LTM	Long-Term Memory
M&S	Modeling and Simulation
MDMP	Military Decision Making Process
MTP	Mission Training Plan
NCO	Non-Commissioned Officer
OIF	Operation Iraqi Freedom
PC	Personal Computer

PLT	Platoon
SDT	Signal Detection Theory
STM	Short-Term Memory
TTP	Tactics, Techniques, and Procedures

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CHAPTER 1
INTRODUCTION

Background

Lessons learned in Operation Iraqi Freedom (OIF) and the Global War on Terrorism has shown disconnects between the various sources that provide intelligence information (Lopez, 2006). As a direct result, our military has become a more reactive force versus a proactive force against the current tactics, techniques, and procedures (TTPs) used by insurgents. Based on the contemporary operating environment (COE), the soldier faces a range of threats from smaller, lower-technology opponents using more adaptive, asymmetric methods to larger, modernized forces able to engage deployed U.S. forces in more conventional, symmetrical ways (DA, FM 3-0, 2001). Intelligence gathering at the soldier level is known as human intelligence (HUMINT) and has been a critical part of the successes and failures of all military operations. This task can be defined as collecting and reporting data based on the commanders critical information requirements (CCIR) in order to identify threats and targets. The trigger for the need for the training was brought about by the continuous loss of life due to Improvised Explosive Devices (IED) attacks and direct engagements from insurgents on soft targets (see fig 1). These actions required a paradigm shift and change in philosophy by the U.S Army that focused on everyone as an intelligence officer and everyone that one comes in contact with has intelligence value (Army Association "ES2: Every Soldier a Sensor", 2004). This change in philosophy brought about the design of the ES2: Every Soldier is a Sensor Program.

Figure 1 IED Attack Outside U.S. Base Camp

PC-based game technology and advancements in commercial off-the-shelf (COTS) synthetic environments have provided another source for enhancing human performance and training utility (Morris & Tarr 2). The goal of training is to produce a combat-ready unit capable of defeating a known or suspected enemy force (ARTEP 7-8). Traditionally, the military used direct interface of trainers to trainees in accomplishing unit and mission training task. Recently, the military began using a combination of virtual and live simulation to assist commanders in training mandatory training task in preparation for combat operations.

Military Transformation and Training

Due to increases in technology, the United States military has been able to do more with less and increase lethality. As a direct result, the military is undergoing the transformation from a large robust difficult to move fighting force; to a smaller easier to deploy and support fighting force. President Bush has stated that:

> *"…..a future force that is defined less by size and more by mobility and swiftness, one that is easier to deploy and sustain, one that relies heavily on stealth, precision weaponry and information technologies."* (Office of the Secretary of Defense, 2003).

The U.S Army is transforming in the midst of the Global War on Terrorism. Transformation is “a process that shapes the changing nature of military competition and cooperation through new combinations of concepts, capabilities, people and organizations that exploits our nation’s advantages and protects against our asymmetric vulnerabilities (Office of the Secretary of Defense, 2003). As the transformation process continues, the Army must change the current mindset in all areas readiness and training.

Specifically, as a focus of this study, training needs to be more adaptive, maximize resources, and gain efficiency without a loss in performance and realism. The military classifies training into three domains: institutional, operational, and self-development as part of the Army Training and Leader Development Model (DA, FM 7-0, 2002).

Figure 2 The Army Training and Leader Development Model

At the operational level, training is further broken down into individual and collective training that is achieved through a combination of associated and supporting tasks. Individual training is defined as training which prepares the soldier to perform specified duties or tasks related to an assigned duty position or subsequent duty positions and skill level (DA, FM 7-1, 2003). Collective training is defined as training that prepares cohesive teams and units to accomplish their missions on the battlefield and in operations other than war (DA, FM 7-1, 2003). To effectively train our military, it takes a lot of time, money, and valuable resources. With the advances in digital games and use of COTS technology, the Army has continued to use simulation as a tool to solve the problem of doing more with less and achieving the same high level of readiness.

Assessment of Simulation for Military Training

The Department of Defense has made an enormous investment in the area of simulation for the use of military training. A simulation is defined as a method of implementing a model over time (Sherman and Craig, 2002). The need for simulation has increased substantially over the past several years due to an increase in OPTEMPO and reduction in the size of our military force. Arguably, the primary driving force behind simulation in the military is for its training application (Kelly, 1998). The use of simulation in the military is not a new process and is broken down into three categories: Virtual, Live, and Constructive.

Recently, the majority of research and development has been dedicated in the area of "virtual training". Virtual training refers to real people operating in a synthetic natural environment that injects human-in-the-loop as its central role by exercising decision making, motor control skills and communication (Sherman and Craig, 2002). The application of a virtual environment to train soldiers is proving to be a highly viable alternative to training soldiers live for the obvious reasons of lower cost, resources and time. To meet this need, the development of simulation software and use of COTS games has moved to the forefront as a tool to assist in the training of our soldiers, today.

Game-based Simulation

Game-based simulation is gaining popularity across the military for the purposes of education and training. The reason behind military support is the fact that games boast intuitive interfaces, which is one reason kids spend hours playing games across the world (Zyda and Mayberry, 2003). The basic definition of a *"game"* is an activity that provides entertainment or amusement. People respond differently when mentioning the term "*games"* depending on your generation and if you played games when you were younger (Zyda and Mayberry, 2003). Another reason for games is the feeling of immersion. Games provide immersion at a greater level than a training simulator (Zyda, 2005). For a training simulator to achieve an equivalent level of immersion requires a heavy monetary investment into the story and design. As a result, training based on a game basis is proving to be a strong alternative. The current generation has been exposed to games their entire lives. Games along with the interfaces have become a large part of our culture and are second nature to our youth.

Across the simulation community, an acceptable term for gaming when applied to training is serious games. A "*Serious game"* is defined as: a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives (Zyda, 2005). A key difference between a game and a serious game is the ability to infuse pedagogy: activities that educate or instruct, thereby imparting knowledge or skill (Zyda, 2005).

SLIM ES3

In an effort to improve intelligence gathering, the Army adopted the Every Soldiers a Sensor program (ES2). The goal of ES2 is for every soldier to be constantly aware of his or her surroundings, to understand the need to report what is out of place, and to convey that information to the right people who can do something about it (Ray, 2005). In support of the ES2 program, the Institute for Creative Technologies (ICT) created a prototype game-based simulation for the Army called the ES2 Simulation (ES2Sim) or unofficially "ES3" for short (*Army Releases "Every Soldier a Sensor" Training Tool*, 2005). The ES3 simulation targets four specific tasks defined by the Every Soldier a Sensor (ES2) program: 1) active surveillance; 2) threat indicator identification; 3) report; and 4) threat prioritization. ES3 builds on the Every Soldier a Sensor training concepts by focusing on the "bottom up" feedback from soldiers on the ground in the collecting of Commander's Critical Information Requirements (CCIR). Using a patrol scenario in an urban environment, styled after cities in the Middle East and Southeast Asia, ES3 trains soldiers to actively scan and observe their environment for details related to the CCIR, indicators and report or act in a concise and accurate manner (TRADOC, 2005).

In line with the first person shooter concept for most military game-based simulation, ES3 is considered a first-person "thinker" game-based simulation set in and urban environment (Campbell, 2005). Training is conducted within a PC-based first-person game environment using real-world photographic imagery embedded in a real-time 3D synthetic environment (Ray, 2005). At the start of ES3, the soldier receives a mission brief and the CCIR, to locate during the simulation run. The soldier may click on objects or agents in order to gain information useful to their mission (Campbell, 2005). During the simulated presence patrol, a soldier may choose one of the following actions: "Talk," "Search," "Report," and "Take a Photo" (see fig 3).

Figure 3 ES3 Screen Shot of Available Responses during Civilian Interaction

As discussed earlier, a presence patrol is a timed event and as the soldier takes action during the simulated run he or she is using up time based on an action taken. The soldier is evaluated by the game on their success in finding the CCIR and other possible threat indicators within the environment through award system ranging from the classification of a "Rock" to the classification as a "Great American". The simulation concludes with an After Action Review that allows the soldier to view objects found and missed, provides information on Army doctrine and procedure for some objects, and reveals each object on the map (*ICT Delivers First SLIM*, 2005).

Problem

The Army is currently conducting a pilot program at Fort Jackson that incorporates ES3 as a part of the Every Soldiers a Sensor program in efforts to train the skill of intelligence gathering. A previous study has been conducted from a user perspective by Julie Campbell from ICT on perceived value. Building upon this initial research, the question remains: Does the contribution from ES3 train the skills required for effective intelligence gathering?

This thesis will assess the contribution of ES3 through external pre and post evaluations along with corresponding surveys from the user perspective. A review of the current literature on information processing, individual training performance, and transfer may indicate whether this training tool is actually contributing to training intelligence gathering.

CHAPTER 2
LITERATURE REVIEW

Purpose

Observations while assessing the contribution of game-based simulation in the advancement of individual soldier intelligence gathering pose several questions. (1) How do soldiers process information? (2) How do soldiers perceive the environment? (3) What is the intelligence gathering process? (4) How is individual performance improved? (5) How is individual performance measured? The purpose of this review is to provide insight into these questions and to identify gaps in the current research literature.

The current literature on human performance provides information on improving and measuring individual performance in relation to information processing, the use of self-directed learning modules, and the use of game-based simulation as a viable alternative to traditional military training. Recent research conducted by ICT has shown perceived value of game-based simulation for intelligence gathering from the user perspective. In addition, there has been evidence, though subjective, that game-based simulation may possess the potential for use as educational and training aids. However, there is a lack of empirical evidence at this time as to the contribution of game-based simulation, specifically SLIM ES3, in training the actual skills required for intelligence gathering.

Human Information Processing System

How do soldiers process information?

In cognitive psychology, information processing is an approach to the goal of understanding human thinking. There have been numerous models and theories put forth to describe how humans process information, but most are traceable to the model of Atkinson and Shiffrin (see fig 4) (Harris and Leahey, 1985). The four major components of this human information processing (HIP) model are:

1. Input
2. Sensory Memory
3. Short Term Memory
4. Long Term Memory

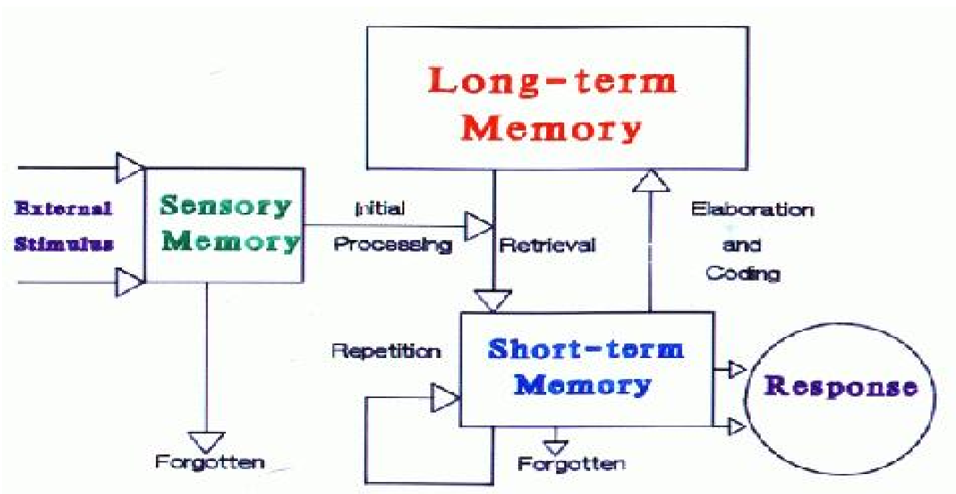

Figure 4 Overview of Information Processing System

In the first stage of the HIP, all environmental inputs are sent to the sensory memory containing everything related to our senses. Sensory memory holds the information for a short period of time and can be further broken down into iconic memory (visual), and echoic memory (hearing). Even though in theory additional senses are a part of sensory memory; the remaining senses have received little examination with results being a minimal effect on the storage of information (Harris and Leahey, 1985). The sensory memory is a critical part of HIP and holds information long enough for some to be further processed by the short term memory.

The short-term memory (STM) or "working memory" refers to the holding of information for immediate use (Bourne and Loftus, 1986). It is characterized by a limited capacity and an ability to be easily overtaxed. Information begins to decay in the STM around 20 seconds. As a result, it is generally thought of as containing only items we are attentive to at the moment (Bourne and Loftus, 1986). In 1956, George Miller showed the human memory span as 7 ± 2 "bits" of information able to be stored in the STM (Harris and Leahey, 1985). As a way of compensating and increasing the storage size of a bit; the process of "chunking" by which information is grouped together came into play. Because STM presents limits on the amount of information that can be held in mind simultaneously and on the duration it can be accessed, STM has been described as the bottleneck of the HIP. In an attempt to keep information active in the STM, several techniques may be used such as pattern recognition and rehearsals (Harris and Leahey, 1985).

In general terms, the long-term memory (LTM) is the relatively permanent memory store in which one holds information even when one is no longer attending to it. The information stored in the LTM is the most lasting and comes in one of three distinct forms (Bourne and Loftus, 1986):

1. Episodic - memory of one's personal history
2. Semantic - memory of one's general factual knowledge

3. Procedural - memory storehouse of what one can do with facts, concepts or episodes (usually appears reflexive)

The interaction between STM and LTM has been a major area of research and discussion as it relates to memory loss and transfer of information for permanent storage (Oulasvirta and Saariluoma, 2006). When understanding LTM, it is understood that before information is processed to the LTM it passes through the sensory and STM. In a dynamic environment multiple interruptions may occur, but most are not disruptive to task performance. Even though interruptions are not disruptive to task performance, the results may lead to memory loss unless there are enough mental skills and resources to encode task representations to retrieval structures in the LTM (Oulasvirta and Saariluoma, 2006). Once information is encoded to the LTM it is available for retrieval and additional information processing.

The soldier processes information in the same traditional model outlined by Atkinson and Shiffrin. In relation to military operations, the accurate and timely analysis of information on the battlefield often will play a key role in mission success or mission failure. Currently, the maturation of information processing technology is impacting and overwhelming the soldiers' ability to process additional information available. As a result, the organizations are evolving in order to provide the versatility needed to succeed on a variety of information age battlefields (Sullivan and Dubik, 1995). Four basic forms of information will be the core upon which America's information age Army processes and organizations will be built (Sullivan and Dubik, 1995):

- Content information-simple inventory information about the quantity, location and types of items.
- Form information-descriptions of the shape and composition of objects.

- Behavior information-three-dimensional simulation that will predict behavior of at least physical objects, ultimately being able to "war-game" courses of action.
- Action information-information that instantly converts to action.

Leveraging these forms of information will allow Army organizations to maintain quality, increase "productivity" and effectiveness, even while reducing in size-similar to civilian corporations o£ the information age.

General Human Perception

How do soldiers' perceive the environment?

In designing a human training system it is important to consider the initial design from a human factors perspective and understand the role of human perception as it relates to the system design. In general, human perception involves the sensing of stimuli and the interpretation of that which is sensed (Sanders and McCormick, 1993). The human perceives the environment primarily through a series of continuous subjective visual and auditory cues (see fig 5). One of the basic forms of perception used is simple detection (Sanders and McCormick, 1993). The figure below depicts the human perception of the information process as it relates to system design.

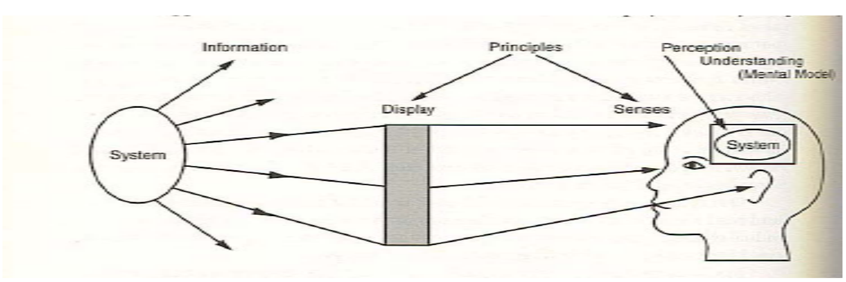

Figure 5 Information Processing as Related to System Design

As a part of detection, the signal detection theory (SDT) may be used to describe a task that requires identification and recognition in a complex environment.

SDT can be used when assessing the decision making process of the soldier while determining if a signal is present. When working with SDT, we often describe performance in terms of hit and false alarm rates (Sanders and McCormick, 1993). If the soldier correctly identifies the stimulus, then it is made a 'hit'. However, if the stimulus is absent and the team displays that the signal is present, then it is a 'false alarm'. If a stimulus is presented and the subject says no, it is a "miss" and gives information on the subject's ability to detect the stimulus. Finally, if no stimulus is presented and the subject says no, it is a correct rejection. Based on these two possible states; there are four possible outcomes (see fig 6):

1. Hit: Saying there is a threat (signal) when there is a threat.
2. False Alarm: Saying there is a threat when it is not.
3. Miss: Saying there is no threat when there is a threat.
4. Correct Rejection: Saying there is no threat when there is no threat.

	Yes	**No**
Present	**Hit**	**False Alarm**
Absent	Miss	Correct Rejection

Figure 6 Signal Detection Theory Outcomes

In a complex environment multiple distractions may occur both visual and auditory and must be taken into account. One such example that leads to distraction is the influence of background noise. Some common examples of noise are civilian by-standers, vehicles (ground and air), and insects. Failure to account for noise is undeniable because inevitably people make mistakes and responses on noise-alone trials may exceed the internal responses on signal-plus-noise trials, in some instances (Sanders and McCormick, 1993).

Intelligence Gathering Process

What is the intelligence gathering process?

Intelligence is the end product of the process of gathering data and then analyzing, evaluating, comparing, and integrating it with other information and existing intelligence to arrive at a conclusion relevant to the needs of the organization (Johnson, 2005). Effective intelligence collection and analysis depends on well-focused targeting, all-source synergism, and good communication links between intelligence officers and the individual intelligence gatherer. The individual solder is the most capable collector of intelligence in the modern Army (Army Association "ES2: Every Soldier a Sensor", 2004). During the task of intelligence gathering, the soldier is expected to be versatile, flexible, and capable of handling a myriad of task simultaneously when dealing with the civilian populous.   The intelligence gathering process is conducted at all levels and requires two-way communication to ensure mission success.

At the battalion organizational level the proponent for intelligence gathering and consolidation is the S2 section. This section is comprised of six to eight soldiers who work directly with the other battlefield operating systems for the sole purpose of gathering intelligence in order to predict the action and reaction of opposing forces.   The impacts of this section ultimately can reduce the number of attacks, focus friendly combat power, and reduce loss of American lives. Upon receipt of a mission, the S2 officer participates in a process known as the Military Decision Making Process (MDMP) to gather initial array of threat forces and background data. This is done in step two of the MDMP called mission analysis. The mission analysis portion for the S2 officer is called the Intelligence Preparation of the Battlefield (IPB) process that is used to enhance the battlefield visualization for the commander and remaining staff (FM 34-8-2). The requirements of the S2 are further broken down into four parts:

1. Define the battlefield
2. Describe the battlefield effects (terrain analysis)
3. Evaluate the threat
4. Determine enemy course of action

These areas allow the commander with the assistance of the S2 to prepare a Recon and Surveillance Plan that will focus all intelligence gathering assets. During the cold war, this process did not require extensive use of the individual soldier during the identification and location of enemy forces based on open terrain and large forces (Marks, 2005). Now, it is critical because the individual soldier goes in areas most intelligence equipment may not cover. Soldier interaction with the civilian element adds to the intelligence gathering capability that is now required in the COE (Marks, 2005). As part of the organizational component and training system, a link between the S2 section and intelligence nodes are required for continuous updates and two way communication.

The constraints imposed upon the organizational level are time and the availability of resources (Lopez, 2006). Even though intelligence gathering is a continuous process, there is a limited amount of time where data may become obsolete. It is critical for the S2 section to push out and receive information in a timely manner. The second constraint is the availability of resources. Currently in support of Operation Iraqi Freedom, American forces can not cover the entire country, so prioritizing targets and target acquisition becomes critical (Lopez, 2006).

The presence patrol is the model used for the soldier to collect intelligence in the current COE (Marks, 2005). It is conducted in order to project military presence and gather HUMINT that meets the commanders' intent. The components that make-up the system are the command post (CP), patrols, civilians, and urban environment. Most presence patrols are done on foot for a maximum of one hour. Based on the human movement rate and interaction with the civilian population, the majority of the area does not get covered during one presence patrol. Inconjuction with these components, the soldier is expected to be an active observer with the ability to report experiences and use judgment in a concise, accurate manner. The format used by the soldier for reporting is the standard SALUTE format.

1. Size
2. Activity
3. Location
4. Uniforms
5. Time
6. Equipment

In a training system, the conduct of intelligence gathering must be in line with the CCIR and areas that assist in protecting the force.

Human Performance

How is individual performance improved?

Although advances in military technology have changed the nature of warfare in the 21^{st} century, the individual soldier remains an intricate part in determining mission success or mission failure. As humans become involved in a system, their abilities and limitations are manifested in their performance of mission tasks (Lee and Higgins, 1988).

In general, human performance is engaging in goal directed activity and is measured by the cognitive/motor skills required to do the defined task. Research on performance enhancement has been conducted by several organizations within the military to include the U.S. Military Academy's (USMA) Center for Enhanced Performance at West Point. The USMA Center for Enhanced Performances defines performance enhancement as the deliberate cultivation of an effective perspective on achievement and the systematic use of effective cognitive skills (Zinnser and Perkins, 2004). The individual soldier can improve performance by mastering thinking, emotion, and physical states. These training methods applied in sport psychology are used in the training of professional and Olympic athletes and are transferable to the individual soldier (Zinnser and Perkins, 2004).

The USMA Performance Enhancement Program integrates five key elements of applied psychology into a systematic approach to empower individuals and organizations (Zinnser and Perkins, 2004):

- Understanding cognitive foundations to gain confidence and operate in the most effective manner.

- Using goal setting to identify long-term performance objectives
- Utilizing attention control in order to execute repetitive tasks to attain optimum focus and concentration.
- Understanding stress management and the effects on the human system in order to master techniques of energy management
- Utilizing imagery and visualization as a method of seeing, feeling, and experiencing desired outcomes and taking actions to attain them

These elements listed above improve individual performance by empowering individuals to perform with confidence, focus their attention, control their emotions, and operate with a sense of clarity.

There are several factors one must consider that influence human performance. For the purpose of this paper, we will focus on human behavior, situational awareness, and decision making. In a previous study of human performance involving nuclear power plants, techniques for improving performance were based on five guiding principles (Davis, 2002):

- people are fallible-even the best make mistakes
- error-likely situations are predictable
- organizational processes and values influence individual behavior
- people achieve high levels of performance based largely on the encouragement and reinforcement received from leaders, peers and subordinates
- events can be avoided by understanding root causes of mistakes

These guidelines are transferable and can be used to further understand how to improve human performance in intelligence gathering operations.

Measuring Individual Performance

How is individual performance measured?

The elements of human performance around which our intelligence gathering system assessment model may be developed and measured are human-performance characteristics, and task requirements. The cornerstone of our assessment model is human action and can be related to the Norman's (1986) model of action describing human activity in two distinct phases: execution (where human action brings about changes in the world) and evaluation (where the changes in the world are evaluated) (Stanton, 2004). The model describes seven stages of user activity:

– Establishing the Goal

– Forming the Intention

– Specifying the Action Sequence

– Executing the Action

– Perceiving the System State

– Interpreting the State

– Evaluating the System State with respect to Goals and Intentions

An approach that integrates what has been suggested in the literature and measures the process of interactions is required. The event based approach to training (EBAT) meets the requirement and is used to guide the design of simulation based training. This approach seeks to engineer training opportunities by identifying and introducing events within training exercises that provide known opportunities to observe behaviors that have been targeted for training (Fowlkes, Salas, and Burke, 2004). Figure 7 below depicts the process for implementing EBAT.

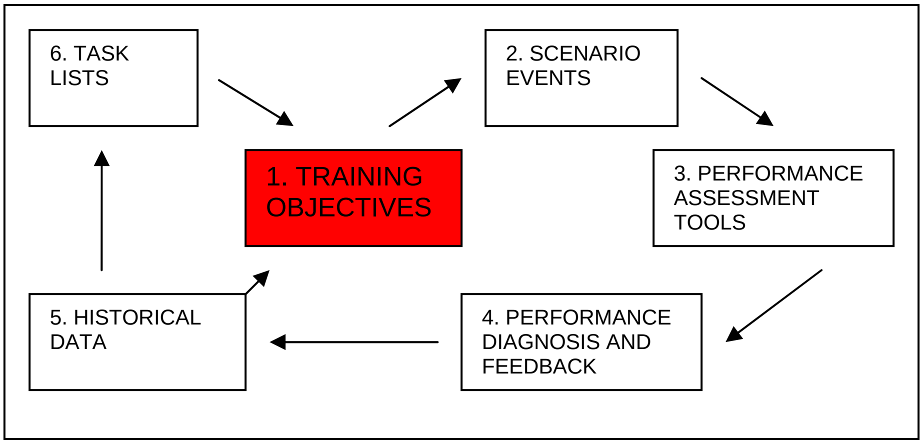

Figure 7 Steps for Implementing EBAT

The EBT approach uses performance measures developed in step 3 of EBAT model to assess task performance during each event. When an event occurs, the task performance related to the event is assessed and provides a direct measurement to the event and learning objective (Fowlkes, Salas, and Burke, 2004). The performance measures developed assess both outcome and process.

Relating Theory to Military Training

The Army utilizes two manuals, FM 7-0 and FM 7-1, to provide the training doctrine and application "how to" guidelines for officers and noncommissioned officers (NCO), including techniques and procedures for planning, preparing, executing, and assessing training (DA, FM 7-1, 2003). As stated by General Eric K. Shinseki:

"Every day in the Army we try to do two things well—train soldiers and grow them into Leaders." (DA, FM 7-1, 2003).

The proponent for intelligence gathering is the Military Intelligence community. To identify outcome measures for intelligence gathering the Army uses a combination of the Army Training and Evaluation Program (ARTEP), Mission Training Plan (MTP) and Training Support Package (TSP). Task standards in the ARTEP are the Army's standards for executing those tasks and the MTP provides the active and reserve component training manager with a descriptive, performance-oriented training program to assist leaders in training their units (ARTEP 34-396-30 MTP, 2003). The TSP further focuses on the performance task at hand along with criteria or measures with required standards for successful completion.

To identify process variables, the Targeted Acceptable Responses to Generated Events or Tasks (TARGET) performance measurement methodology (Fowlkes, Salas, & Oser, 1994) was selected because of its reliance on an event-based approach to training. The TARGET instrument uses a behaviorally focused checklist format for recording observations of team behaviors, but with little modification can suit the individual aspect of intelligence gathering. Note, the task consist of some team components especially in the reporting task to higher.

Research Question

After a review of the current literature, the following research question is determined to be pertinent to assessing the contribution of game-based simulation in the advancement of individual soldier intelligence gathering skills.

Does the nature of training influence student intelligence gathering and dissemination performance?

CHAPTER 3
METHODOLOGY

Research will be conducted in order to make observations, analyze data, and make recommendations as to the contribution of game-based simulation in the advancement of individual soldier intelligence gathering skills. Further, this research will also examine the contribution that length of exposure to the game contributes in terms of student performance as well as the contribution that an instructor adds to student performance.

The ES3 simulation software is currently in use as a combat basic training tool for the 1st Battalion, 13th Infantry Regiment, Fort Jackson, South Carolina. The testing of ES3 is being conducted at the Soldier is a Sensor University (SSU) as apart of a pilot program for the U.S. Army. Initial entry soldiers are the target of the program and conduct ES3 training during the early phases of basic training prior to their capstone exercise called “Victory Forge”. While described in more detail below, the four treatment groups will be: (1) a control group that experiences training using traditional methods; (2) a treatment group that experiences one hour of instructor-led ES3 training; (3) a treatment group that experiences a combinations of self directed and instructor-led ES3 training; (4) a treatment group that experiences two hours of self directed ES3 training only. The data for the experiment will be collected from the normal training of active duty basic training units within the SSU facility.

Participants

The research participants will be sixty soldiers from Alpha Company 1/13th Infantry Regiment out of Fort Jackson, South Carolina. The soldiers will undergo training in gathering information useful for military intelligence. This research will simply involve four different training approaches to this training wherein the training treatments involve different levels of gaming-based and instructor led simulation. The treatment groups are 1^{st}, 2^{nd}, 3^{rd}, and 4^{th} that are formed into platoons with the control group being <u>1^{st}</u> platoon. The control group plus treatment groups will have 15 soldiers evenly distributed based on pre-evaluation survey and testing. All test subjects will be evaluated as patrol members as part of a presence patrol being conducted in an OIF environment.

Apparatus

The Self-Directed Learning Internet Module—Every Solder a Sensor Simulation (SLIM-ES3) a Web-delivered and Web-enabled combat patrol training tool will be assessed as part of this experiment. The hardware configuration used for this experiment included a personal computer (PC) system, and a single channel audio system (see fig 8).

Figure 8 ES3 Components and Configuration

The soldier communicates through key board text messaging and receives feed back through a combination of text and audio. The audio system consists of a light-weight head set and embedded microphone that allows for one-way communication from agent to soldier. The minimum hardware specification for this application is 1.5-GHz, 256-MB RAM, and a 64-MB graphics controller. After evaluating several developmental and player applications for three-dimensional (3D) virtual environments, the contractor and ICT decided Virtools[TM] software was the most appropriate for their needs (*ICT Delivers First SLIM*, 2005). The Software Virtools™ works much like Windows Media Player by playing the game file with a unique, 3D visualization capability. ES3 uses a unique blend of 3D terrain, objects, and figures with 2D "sprites" (bitmaps of real-world images). When developing a scenario, the trainer can manipulate the database in Microsoft[R] Access can alter and replace the objects, or observables, that populate the user's "world." This allow for current updates to be added and outdated material to be removed.

Tasks

Three specific tasks were selected that required the execution of individual behaviors in intelligence gathering operation. The tasks selected were: (1) Conduct a Presence Patrol (171-300-0016), (2) Perform Surveillance without the Aid of Electronic Devices (071-710-0016), and (3) Report Intelligence Information (301-371-1000) (Department of the Army, ARTEP 34-117-30 MTP).

Scenarios

Two scenarios will be used in this research as part of the ES3 game-simulation training. The simulation currently offers 10 different levels that allow soldiers to explore a range of scenarios for various types of patrols and encounters in an urban environment (Ray, 2005).

These scenarios have been developed by military intelligence SMEs along with instructional system design experts at ICT. The two scenarios used for the experiment are “the market revisited,” and “hunting for explosives (see fig 9 and 10).

Figure 9 Local Boy Selling Bananas at Market

Figure 10 Locals Cause Car Accident Avoiding Known IED

These two scenarios require soldiers to interact with the populous and provide task cues and conditions a soldier would encounter in an actual combat presence patrol. The individual is required to patrol across the asymmetric battlefield, communicate with local civilians, collect CCIR, prioritize, and report to higher. During the process cues will be given that may require search and civilians to be detained.

Procedure

General

The nature of the ES3 simulation tested in this thesis is so that a soldier with little to no experience in intelligence gathering can be trained on the fundamental skills required to conduct intelligence gathering operations. In this experiment it was therefore decided to vary the amount of digital training and method of presentation received by each treatment group in the experiment. The conduct of this experiment will occur in three phases: pre-digital training, digit training, and live execution. In Phase one, all subjects will be given a pre-training survey, change detection drills, and an evaluation on keep in mind (KIM) training to ensure an even distribution of soldiers amongst the control and treatment groups. The KIM game is designed to test memory recall and will be implemented in the barracks prior to Phase two of this experiment. Drill Sergeants will conduct the KIM game and change detection exercises by placing, removing, and switching objects in the bay where soldiers live and sleep. Soldiers will enter the bay and be given 60 seconds to observe and identify new items, of different sizes, and different placement of objects. The soldiers will be asked to report any changes to their living environment immediately after the 60 second exercise. The KIM portion of the exercise involves soldiers viewing a number of objects on a table, and soldiers are asked to recall the items by writing them down later in the day. There will be 10 items placed on the table for evaluation and scores to be recorded for each soldier. The entire test subject pool will be segmented based on the KIM game results so that each treatment group will have similar distribution. At the conclusion of Phase 1 each treatment and the control group will be broken down into four 15 soldier platoons.

In Phase 2, each treatment group receives the specified level of ES3 training. The 1st platoon, control group, receives the current non-game based method of traditional training in intelligence gathering. This training consists of power point lecture and a terrain walk through. The 2nd platoon receives one hour of instructor-led ES3 training only. The 3rd platoon receives one hour of instructor-led and one hour of self-directed learning ES3 training. The 4th platoon receives a total of two hours of self-directed learning ES3 training only; which requires only familiarization of key controls and soldiers to work independently.

In Phase 3, each treatment group conducts a live threat indicator lane, where the soldier conducts an actual presence patrol, gather intelligence information, and reports information to higher. Each soldier from the four treatment groups participates in the lane and will be evaluated by Drill Sergeant Crow and Drill Sergeant Frietas, both SME who served over two years in support of OIF and OEF. The soldiers' performance will be based on the correct number of indicators identified and reported to higher. In addition, any false or misleading indicators reported that is not a threat indicator will be annotated and later used in applying the application of signal detection theory to gain an understanding of soldier decision making in the presence of uncertainty.

Pre-Training Survey

A pre-training survey will be issued to each soldier two days prior to the ES3 digital training and indicator lane. The survey is divided into two sections consisting of demographic data and questions associated with individual training. The purpose of the survey is: (1) Identify experience amongst the sample size to ensure even distribution and (2) Determine self-assessment level of the individuals proficiency in behaviors required to conduct effective intelligence gathering.

The individual training section of the survey employs fixed responses on a five point Likert scale with 1 being "Strongly Disagree" and 5 being "Strongly Agree" (see Appendix B). Section 2 presented an opportunity to collect data on computer experience and soldier training media preference. One example of a question in Section 2 is "I prefer to work independently at my own pace."

_____ Strongly Agree
_____ Agree
_____ Neutral
_____ Disagree
_____ Strongly Disagree

Experiment Design

The experiment will be conducted in order to make observations, analyze data, and make recommendations as to the contribution of four different modes of instruction in the advancement of individual soldier intelligence gathering skills. Four treatment groups 1st through 4th will be used. The 1st platoon, the control group, receives an hour block power point presentation on conducting a presence patrol, indicators, and current operation in OIF and OEF. The 2nd platoon receives one hour of instructor-led intelligence gathering training using the ES3 software as a training aid. Soldiers will be seated in a classroom setting with projector screen displaying the ES3 software (see fig 11).

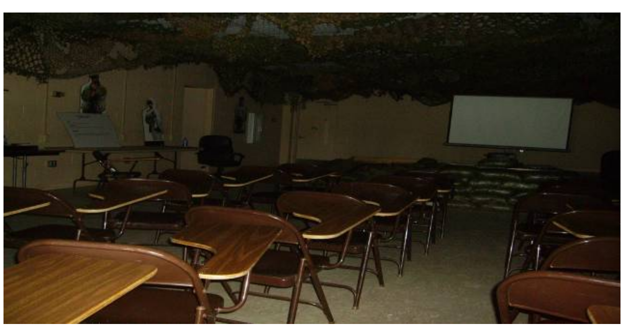

Figure 11 ES3 Instructor Led Classroom Training

The instructor will use the "market revisited" and "hunting for explosives" training scenarios. The instructor operates the ES3 software as a walk through patrol periodically stopping to identify key procedures and observations during intelligence gathering. The total amount of instruction time is one hour. After the one hour instruction, each subject proceeds to the indicator lane to conduct the live presence patrol. The 3rd platoon receives one hour of instructor-led and one hour of self-directed learning training in ES3. The instructor utilizes the "market revisited" scenario for the instructor-led and the "hunting for explosives" for the one hour of self directed learning that allows for two runs. The 4th platoon receives two-hours of self directed learning training in ES3 for the two scenarios listed above. They are given 10 minutes to familiarize themselves with the keys required to maneuver through the scenario and communicate with civilian agents. The 4th platoon receives 1 hour for each scenario allowing for two runs per scenario. At the conclusion of the digital training, each platoon proceeds to the live indicator lane for performance evaluation which will be discussed further below.

At the live indicator lane, each subject receives a mission brief with corresponding CCIR and will be given a maximum of 1 hour to complete the lane. The live lane will contain setup based on the following weighted indicators with 1 being the most obvious and 3 least obvious to identify as a threat indicator:

SET UP: Weight 1, 2, 3

- One Mannequin sitting in abandoned car 1
- One IED (Pipe Bomb) 1
- Group (three or more) of people in Arab Clothes Praying 1
- Semi-abandoned Civilian Vehicle with Radio and Lights on 1
- Como Wire running along the side of the road partially buried 2
- Mound of Dirt off to the Side 2
- Dead Animal (Fake) 2
- Baby Crib with no Baby in it sitting off by itself 3
- Posters in Arabic/Graffiti along the Tactical Road March 3
- Civilian on Cell Phone Looking Suspicious 3

At the conclusion of the lane, each subject is given twenty minutes to gather thoughts and report intelligence information to higher for evaluation.

The independent variable is the type of training received and the following two levels of simulation runs in ES3: Run One “market revisited” and Run Two “hunting for explosives”. The dependent variables are the individual behaviors ratings, individual performance ratings, and a user pre-training and post training survey.

Performance Measures and Evaluation

For three event based task, it was necessary to (a) obtain individual behavioral ratings, (b) ratings of individual mission performance in ES3, and (c) determine the number of indicators identified by the individual during live scenario. Based on behavior, the dimensions measured will be initiative, adaptability, situational awareness, and communications. These dimensions are adapted from the research of Fowlkes and Salas; which studied team behavior and the effects on team training. The objective measures for the experiment will be (1) the number and proportion of indicators detected; and (2) the number of misleading or false alarm indicators identified. Every soldier is given one hour to complete the lane and report to higher. Thus time is not an objective measure for this experiment.

Post Training Survey

A post training survey will be issued to each soldier after completion of the ES3 digital training and indicator lane. The survey is divided into three sections consisting of individual post training attitude and additional post evaluation questions on training effectiveness. The purpose of the survey is: (1) Determine self-assessment level of the individual proficiency in intelligence gathering post training and (2) Gather opinions on the training effectiveness of the SLIM ES3 and intelligence gathering post evaluation training process. The post survey employs fixed responses on a five point Likert scale with 1 being "Strongly Disagree" and 5 being "Strongly Agree" (see Appendix B). Additionally, open ended questions will be used to capture views and opinions of the individual soldiers that are not captured in the other survey questions. Statistical analysis associated with the post training survey will be conducted using a series of Kruskal Wallis non parametric test. Estimated mean and median analysis will be used to determine perceived value and training effectiveness from the individual soldier perspective.

Hypothesis Testing

A one-way ANOVA test with a p-value of .05 will be used to test the hypothesis that all groups are equal. The Independent-Samples T Test will be used to compare means for two groups of cases. Based on the research question "Does the nature of training influence student intelligence gathering and dissemination performance?" listed at the end of Chapter 2, the following hypotheses are derived and tested:

1. Ho: The treatment group demographics do not affect the overall student performance during the training evaluation.

$$Ho: \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The treatment group demographics do affect the overall student performance during the training evaluation.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

2. Ho: The nature of training does not influence student intelligence gathering and dissemination performance.

$$Ho: \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The nature of training does influence student intelligence gathering and dissemination performance.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

3. Ho: The training treatment does not influence student intelligence gathering and dissemination identification for a given indicator during conduct of the live post training exercise.

$$Ho: \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The training treatment does influence student intelligence gathering and dissemination identification for a given indicator during conduct of the live post training exercise.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

4. Ho: Individual task performance for traditionally trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was greater than or equal to performance of student soldiers trained using Instructor-led ES3.

$$Ho: \mu_1 \geq \mu_2$$

Ha: Individual task performance for traditionally trained student soldiers as measured by number of correct indicators detected and proportion of correct indicators of the total presented during the live post-training exercise was less than the performance of student soldiers trained using Instructor-led ES3.

$$Ha: \mu_1 < \mu_2$$

5. Ho: Individual task performance for instructor-led ES3 trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was greater than or equal to performance of student soldiers trained using self directed ES3 only.

$$Ho: \mu_2 \geq \mu_4$$

Ha: Individual task performance for instructor-led ES3 trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was less than performance of student soldiers trained using self directed ES3 only.

$$Ha: \mu_2 < \mu_4$$

6. Ho: Individual task performance for instructor-led ES3 trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was greater than or equal to performance of student soldiers trained using a combination of instructor-led and self directed ES3 training.

$$Ho: \mu_2 \geq \mu_3$$

Ha: Individual task performance for instructor-led ES3 trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was less than performance of student soldiers trained using a combination of instructor-led and self directed ES3 training.

$$Ha: \mu_2 < \mu_3$$

7. Ho: Individual task performance for self directed ES3 only trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was greater than or equal to performance of student soldiers trained using a combination of instructor-led and self directed ES3 training.

$$Ho: \mu_4 \geq \mu_3$$

Ha: Individual task performance for self directed ES3 only trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was less than performance of student soldiers trained using a combination of instructor-led and self directed ES3 training.

$$Ha: \mu_4 < \mu_3$$

8. Ho: The observed frequency of hits in each treatment group is equal to the expected frequency for a passing grade.

$$Ho: \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The observed frequency of hits in each treatment group is not equal to the expected frequency for a passing grade.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

9. Ho: The student's attitude toward different types of training treatments for intelligence gathering are equal based on categorical data as perceived by the soldier being trained.

$$Ho: \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The student's attitude toward different types of training treatments for intelligence gathering are not equal based on categorical data as perceived by the soldier being trained.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

CHAPTER 4
DATA ANALSIS RESULTS

Summary of Data Results

This experiment collected data on individual performance and training system effectiveness in the area of intelligence gathering. Significant differences did exist in the individual measures suggesting that the ES3 software has a significant effect in reducing the number of intelligence indicators missed by student soldiers. Also, instructor influence, using ES3 with a facilitator as part of a scenario, yielded some statistical significance in the improving of individual performance in intelligence gathering. A hybrid approach, using a combination of ES3 Digital Training and Instructor Influence, yielded the highest intelligence gathering scores on the indicator lane showing a significant increase in performance. A confidence interval of 95.0% and $\alpha = 0.05$ were used throughout the calculations of statistical information.

Sixty test subjects were broken down into four treatment groups of fifteen soldiers each. To ensure an even distribution, all soldiers were given a pre-evaluation test using the KIM (Keep in Mind) game format. The soldiers were given 60 seconds to review 10 items on a table and 30 minutes later had to write down all items they could remember. A rating scale of 1 to 5 was used with 5 being the highest amount found and 1 being the lowest. Soldiers, who scored a 5 identified between 9 and 10 items, a 4 being 7 to 8 items, and 3 being 5 to 6 items. All soldiers scored between 3 and 5 with the following result totals listed in Table 1. As a direct result, the treatment groups were broken down into four evenly distributed groups listed in Table 2.

Table 1 Summary of KIM Score Ratings

Ratings	**Total**
5	12
4	37
3	11

Table 2 Comparison of Means for Each Treatment Group

Subjects	**Group 1**	**Group 2**	**Group 3**	**Group 4**
1	5	4	3	4
2	3	5	4	5
3	4	3	5	4
4	4	3	5	4
5	3	4	4	5
6	5	5	4	4
7	4	4	4	4
8	4	3	3	4
9	4	4	4	3
10	4	3	4	4
11	4	4	4	3
12	4	4	3	4
13	5	5	3	3
14	4	4	5	3
15	3	4	4	5
Mean	**4**	**3.93**	**3.93**	**3.93**

The test subjects completed a demographic survey with the following descriptive statistics shown in Table 3.

Table 3 Demographic Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age (years)	60	18	36	21.31	3.67
Computer Experience (years)	60	0	10	5.86	3.61
Valid N (list wise)	60				

The demographic data was used to test for statistical differences between treatment groups and answer the following hypothesis.

Ho: The treatment group demographics do not affect the overall student performance during the training evaluation.

$$Ho: \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The treatment group demographics do affect the overall student performance during the training evaluation.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

An ANOVA test was run on each of the treatment groups, $F_{(3, 56)}$ and α= .05 and there was no significant difference between groups for Age (F=.676, p =.57), or Computer Experience (F=.665, p=.577). This was based on the p-value being greater than alpha and the F –value being less than the critical value of 2.76; which is in the acceptable region. These test showed there is no statistical difference between the treatment groups and demographics would not be a factor during collection of performance data between the groups. As a result, we fail to reject the null hypothesis and show an equal distribution between treatment groups.

Table 4 One-way ANOVA (Age)

ANOVA

Age

	Sum of Squares	D of f	Mean Square	F	Sig.
Between Groups	27.78	3	9.26	.67	.57
Within Groups	767.20	56	13.70		
Total	794.98	59			

Table 5 One-way ANOVA (Computer Experience)

ANOVA

Computer Experience

	Sum of Squares	d of f	Mean Square	F	Sig.
Between Groups	26.53	3	8.84	.66	.57
Within Groups	744.40	56	13.29		
Total	770.93	59			

Individual task performance ratings were collected and evaluated using the following metrics: number of correct hits, number of misses, and mean difference between groups. Each individual in a treatment group went through the 20 minute indicator lane as stated in Chapter 3. Each item on the lane was a stand alone indicator. The soldier received 1 for a correct identification of an indicator and 0 for a miss of an indicator. Listed below is a summary of group performance by indicator. Based on 15 soldiers per group, the sum of each indicator was identified and received the following color coded rating: "Red" 0 to 5, "Amber" 6 to 10, and "Green" 11 to 15.

Table 6 List of Indicators

1	One Mannequin sitting in abandoned car 1
2	One IED (Pipe Bomb) 1
3	Group (three or more) of people in Arab Clothes Praying 1
4	Semi-abandoned Civilian Vehicle with Radio and Lights on 1
5	Como Wire running along the side road partially buried 2
6	Mound of Dirt off to the Side 2
7	Dead Animal (Fake) 2
8	Baby Crib with no Baby in it sitting off by itself 3
9	Posters in Arabic/Graffiti along the Tactical Road March 3
10	Civilian on Cell Phone Looking Suspicious 3

Treatment Group 1 was the control group and received the current form of traditional training using power point slide presentation.

Table 7 Summary of Group 1 Indicator Lane Results

Participants	1	2	3	4	5	6	7	8	9	10	Hits
1	1	1	1	0	1	0	0	0	0	0	4
2	1	1	1	0	0	0	0	0	0	0	3
3	1	1	1	0	1	0	0	0	0	0	4
4	0	1	1	0	0	0	0	0	0	0	2
5	1	1	1	0	0	0	0	0	0	0	3
6	1	1	1	1	0	0	0	0	0	0	4
7	1	1	1	1	0	0	0	0	0	0	4
8	1	1	1	1	0	1	0	0	0	0	5
9	1	0	1	0	0	0	0	0	0	0	2
10	1	1	1	1	0	1	0	0	0	0	5
11	1	1	1	0	0	0	0	0	0	0	3
12	1	1	1	1	0	1	0	0	0	0	5
13	1	1	1	0	0	1	0	0	0	0	4
14	1	1	1	1	1	0	0	0	0	0	5
15	1	1	1	0	0	0	0	0	0	1	4
Totals	**14**	**14**	**15**	**6**	**3**	**4**	**0**	**0**	**0**	**1**	**57**

Treatment Group 2 received one hour of instructor-led ES3 training, where the instructor used the ES3 software to facilitate the discussion on IED threats and indicators. The instructor had the ES3 scenario on a projector screen and walked the students through a presence patrol with him as the controller of the ES3 simulation.

Table 8 Summary of Group 2 Indicator Lane Results

Participants	1	2	3	4	5	6	7	8	9	10	Hits
1	1	1	1	1	1	0	0	0	0	1	6
2	1	1	1	0	1	1	0	0	0	1	6
3	1	1	1	1	0	0	1	0	0	1	5
4	1	1	1	0	0	1	0	0	0	0	4
5	1	1	1	0	1	1	0	0	0	1	6
6	1	1	1	0	1	1	1	0	0	1	7
7	1	1	1	1	1	0	0	0	0	0	5
8	1	1	1	1	1	1	0	0	0	0	6
9	1	1	1	0	0	0	0	0	0	0	3
10	1	1	1	0	1	0	0	0	0	0	4
11	1	1	1	0	1	0	0	0	0	0	4
12	1	1	1	1	1	0	0	0	0	0	5
13	1	1	1	1	1	0	0	0	0	0	5
14	1	1	1	0	1	0	0	0	0	0	4
15	1	1	1	0	1	0	0	0	0	0	4
Totals	**15**	**15**	**15**	**6**	**12**	**5**	**2**	**0**	**0**	**5**	**75**

Treatment Group 3 received a combination of one hour of instructor-led ES3 training and one hour of self directed ES3 training, where the instructor used the ES3 software to facilitate the discussion on IED threats and indicators. The soldiers were allowed to execute one hour of self directed ES3 training with the instructor there to answer any questions and give additional guidance. Students maneuvered through the synthetic environment periodically engaging in conversions with civilians to gain intelligence while conducting the presence patrol.

Table 9 Summary of Group 3 Indicator Lane Results

Participants	1	2	3	4	5	6	7	8	9	10	Hits
1	1	1	1	1	1	1	0	0	1	1	8
2	1	1	1	1	1	1	0	0	0	1	7
3	1	1	1	1	0	0	1	0	0	1	6
4	1	1	1	1	0	1	0	0	0	1	6
5	1	1	1	1	1	1	0	0	0	1	7
6	1	1	1	0	1	1	1	0	1	1	8
7	1	1	1	1	1	0	0	0	0	1	6
8	1	1	1	1	1	1	0	0	0	1	7
9	1	1	1	1	1	1	1	0	0	1	8
10	1	1	1	1	0	1	0	0	0	1	6
11	1	1	1	1	1	1	0	0	0	1	7
12	1	1	1	1	0	1	1	0	0	0	6
13	1	1	1	1	1	0	1	0	0	1	7
14	1	1	1	1	1	0	0	0	0	0	5
15	1	1	1	1	1	1	1	0	1	1	9
Totals	**15**	**15**	**15**	**14**	**11**	**11**	**6**	**0**	**3**	**13**	**103**

Treatment Group 4 received two hours of self-directed ES3 training only. The students received a 15 minute block of instruction on how to use the keys and maneuver through the synthetic environment. The time allotted for the students to complete two scenarios with two iterations per scenario. At the conclusion, the students proceeded to the live indicator lane for evaluation.

Table 10 Summary of Group 4 Indicator Lane Results

Participants	1	2	3	4	5	6	7	8	9	10	Hits
1	1	1	1	1	0	1	0	0	0	1	6
2	1	1	1	1	1	0	0	0	0	0	5
3	1	1	1	1	0	1	0	0	0	1	6
4	1	1	1	1	0	1	0	0	0	0	5
5	1	1	1	1	1	1	0	0	0	1	7
6	1	1	1	1	1	1	0	0	0	1	7
7	1	1	1	1	1	1	0	0	0	0	6
8	1	1	1	1	0	1	0	0	0	0	5
9	1	1	1	1	1	1	0	0	0	0	6
10	1	1	1	1	1	1	0	0	0	1	7
11	1	1	1	1	0	1	1	1	0	1	8
12	1	1	1	1	0	0	1	0	1	0	6
13	1	1	1	1	1	1	0	0	0	0	6
14	1	1	1	1	0	1	0	0	0	0	5
15	1	1	1	1	0	0	0	0	0	1	5
Totals	**15**	**15**	**15**	**15**	**7**	**12**	**2**	**1**	**1**	**7**	**90**

Listed below is a summary table of all treatment groups that compares the total number and hits and misses by each group. This data will be later used to compare the difference in the means amongst the treatment groups and determine any statistical significance.

Table 11 Summary of Treatment Group Indicator Lane Results

Participants	1	2	3	4	5	6	7	8	9	10	Hits
Group 1	14	14	15	6	3	4	0	0	0	0	57
Group 2	15	15	15	6	12	5	2	0	0	5	75
Group 3	15	15	15	14	11	11	6	0	3	13	103
Group 4	15	15	15	15	7	12	2	1	1	7	90
Totals	**59**	**59**	**60**	**41**	**33**	**32**	**10**	**1**	**4**	**25**	**325**

Analysis of Task Performance Assessments

The primary goal of this experiment was to assess the ES3 simulation software and determine whether the nature of training influence student intelligence gathering and dissemination performance. In order to improve performance and determine the effectiveness of training, an increase in the frequency of hits during a presence patrol is the desired outcome. The effect of the simulation software was addressed in the following hypotheses.

Ho: The nature of training does not influence student intelligence gathering and dissemination performance.

$$Ho: \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The nature of training does influence student intelligence gathering and dissemination performance.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

An ANOVA test was run on each of the treatment groups, $F_{(3, 56)}$ and α= .05 and there was significant difference between groups for Total Hits (F=25.07, p =.00). This was based on the p-value being less than α; which is in the rejection region. These test showed there is a statistical difference between the treatment groups and the nature of training is a factor in determining the frequency of hits during the evaluation of soldiers' performance while executing the indicator lane. As a result, we show there is initial evidence to support the rejection of the null hypothesis and show a difference in training effectiveness in identifying indicators.

Table 12 Analysis of Variance for Total Lane Indicators

ANOVA

Total Hits

	Sum of Squares	d of f	Mean Square	F	Sig.
Between Groups	79.33	3	26.44	25.07	.00
Within Groups	59.06	56	1.05		
Total	138.40	59			

After determining level of significance between groups, we further focused on each indicator to determine which indicators were causing us to reject the previous null hypothesis. In order to analysis each indicator, the following hypothesis was developed and tested.

Ho: The training treatment does not influence student intelligence gathering and dissemination identification for a given indicator during conduct of the live post training exercise.

$$Ho : \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The training treatment does influence student intelligence gathering and dissemination identification for a given indicator during conduct of the live post training exercise.

$$Ha : \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

Each indicator was analyzed separately using a one-way ANOVA test run on each of the treatment groups, $F_{(3, 56)}$ and $\alpha = .05$ and there was significant difference between groups for Indicators 4,5,6,7, and 10. Based on Indicators 4,5,6,7, and 10, we reject the null hypothesis. Based on Indicators 1,2,3,8, and 9, we fail to reject the null hypothesis. Note: Even though will fail to reject the null hypothesis for Indicators 8 and 9; we see from results in summary Table 13 that the percentages of Indicators 8 and 9 found were very low across all treatment groups.

Table 13 Summary of Analysis of Variance for Each Separate Indicator

Indicator	**Hypothesis (reject or fail to reject)**	**Frequency of Hits**	**F Test ;Level of Sig**	**P-val < .05**
1	Fail to reject the null Ho.	98.4%	F=1, p=.40	No
2	Fail to reject the null Ho.	98.4%	F=1, p=.40	No
3	Fail to reject the null Ho.	100%	F=0, p=.50	No
4	**Reject the null Ho.**	68.3%	F=11.13, p=.00	Yes
5	**Reject the null Ho.**	55%	F=5.51, p=.002	Yes
6	**Reject the null Ho.**	53.3%	F=5.36, p=.003	Yes
7	**Reject the null Ho.**	16.7%	F=3.35, p=.025	Yes
8	Fail to reject the null Ho.	1.7%	F=1, p=.40	No
9	Fail to reject the null Ho.	6.7%	F=2.24, p=.094	No
10	**Reject the null Ho.**	43.3%	F=9.58, p=.000	Yes

From the previous hypotheses, there was evidence that showed a difference in training effectiveness between the treatment groups. This led to the questions: how much improvement a certain treatment group actually made and how different treatment groups compare to each other. In order to compare performance between treatment groups, the following hypotheses were derived:

Ho: Individual task performance for traditionally trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was greater than or equal to performance of student soldiers trained using Instructor-led ES3 .

$$Ho: \mu_1 \geq \mu_2$$

Ha: Individual task performance for traditionally trained student soldiers as measured by number of correct indicators detected and proportion of correct indicators of the total presented during the live post-training exercise was less than the performance of student soldiers trained using Instructor-led ES3

$$Ha: \mu_1 < \mu_2$$

A comparison between groups one and two yielded the following group statistics.

Table 14 Summary of Group Statistics between Groups One and Two

Group Statistics

	Group12	N	Mean	Std. Deviation	Std. Error Mean
Scores12	1.00	15	3.8000	1.01419	.26186
	2.00	15	4.9333	1.09978	.28396

The Independent-Samples T Test was used to compare the means of the two groups. The test was based on a 95% confidence interval and α= .05. There was a significant difference between the two groups with the p-value of .007 being less than α, and a mean difference of 1.13 between the groups. As a result, **we reject the null hypothesis** and show Instructor-led ES3 training yields a higher level of performance when identifying intelligence indicators versus traditional power point alone.

Table 15 Independent Samples T Test for Groups One and Two

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Scores12	Equal variances assumed	.133	.718	-2.934	28	.007	-1.13333	.38627	-1.92458	-.34209
	Equal variances not assumed			-2.934	27.818	.007	-1.13333	.38627	-1.92481	-.34186

.

Ho: Individual task performance for instructor-led ES3 trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was greater than or equal to performance of student soldiers trained using self directed ES3 only.

$$Ho : \mu_2 \geq \mu_4$$

Ha: Individual task performance for instructor-led ES3 trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was less than performance of student soldiers trained using self directed ES3 only.

$$Ha : \mu_2 < \mu_4$$

A comparison between groups two and four yielded the following group statistics.

Table 16 Summary of Group Statistics between Groups Two and Four

Group Statistics

	Groups24	N	Mean	Std. Deviation	Std. Error Mean
Scores24	2.00	15	4.9333	1.09978	.28396
	4.00	15	6.0000	.92582	.23905

The Independent-Samples T Test was used to compare the means of the two groups. The test was based on a 95% confidence interval and α= .05. There was a significant difference between the two groups with the p-value of .008 being less than α, and a mean difference of 1.09 between the groups. As a result, **we reject the null hypothesis** and show a self directed digital ES3 training yields a higher level of performance when identifying intelligence indicators versus instructor-led ES3 alone.

Table 17 Independent Samples T Test for Groups Two and Four

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Scores24	Equal variances assumed	.897	.352	-2.874	28	.008	-1.06667	.37118	-1.82700	-.30633
	Equal variances not assumed			-2.874	27.200	.008	-1.06667	.37118	-1.82800	-.30533

Based on the previous hypothesis, we can see self directed ES3 training is better the instructor-led ES3 training only. The next hypothesis we took a look at was a combination of self-directed and instructor-led ES3 training to see if there was any statistical difference between the groups.

Note: the self-directed training was reduced by one hour versus two of self-directed training received by treatment group four. This led to the following hypothesis being tested.

Ho: Individual task performance for instructor-led ES3 trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was greater than or equal to performance of student soldiers trained using a combination of instructor-led and self directed ES3 training.

$$Ho : \mu_2 \geq \mu_3$$

Ha: Individual task performance for instructor-led ES3 trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was less than performance of student soldiers trained using a combination of instructor-led and self directed ES3 training.

$$Ha : \mu_2 < \mu_3$$

A comparison between groups two and three yielded the following group statistics.

Table 18 Summary of Group Statistics between Groups Two and Three

Group Statistics

	Group23	N	Mean	Std. Deviation	Std. Error Mean
Scores23	2.00	15	4.9333	1.09978	.28396
	3.00	15	6.8667	1.06010	.27372

The Independent-Samples T Test was used to compare the means of the two groups. The test was based on a 95% confidence interval and α= .05. There was a significant difference between the two groups with the p-value being less than α, and a mean difference of 1.93 between the groups. As a result, **we reject the null hypothesis** and show a combination of instructor-led and self directed digital ES3 training yields a higher level of performance when identifying intelligence indicators versus instructor-led ES3 training alone.

Table 19 Independent Samples T Test for Groups Two and Three

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Scores23	Equal variances assumed	.055	.816	-4.902	28	.000	-1.93333	.39441	-2.74124	-1.12543
	Equal variances not assumed			-4.902	27.962	.000	-1.93333	.39441	-2.74129	-1.12538

Based on the previous hypothesis, we can see a combination of self directed and instructor-led ES3 training is better the instructor-led ES3 training only. The next hypothesis we took a look at was a combination of self-directed and instructor-led ES3 training versus self-directed digital training only to see if the instructor played a vital role in the training and if there was any statistical difference between the groups. This led to the following hypothesis being tested.

Ho: Individual task performance for self directed ES3 only trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was greater than or equal to performance of student soldiers trained using a combination of instructor-led and self directed ES3 training.

$$Ho : \mu_4 \geq \mu_3$$

Ha: Individual task performance for self directed ES3 only trained student soldiers as measured by number of correct indicators detected, and proportion of correct indicators of the total presented during the live post-training exercise was less than performance of student soldiers trained using a combination of instructor-led and self directed ES3 training.

$$Ha : \mu_4 < \mu_3$$

A comparison between groups four and three yielded the following group statistics.

Table 20 Summary of Group Statistics between Groups Four and Three

Group Statistics

	Groups34	N	Mean	Std. Deviation	Std. Error Mean
Scores34	4.00	15	6.0000	.92582	.23905
	3.00	15	6.8667	1.06010	.27372

The Independent-Samples T Test was used to compare the means of the two groups. The test was based on a 95% confidence interval and α= .05. There was a significant difference between the two groups with the p-value of .024 being less than α, and a mean difference of .867 between the groups. As a result, **we reject the null hypothesis** and show a combination of instructor-led and self directed digital ES3 training yields a higher level of performance when identifying intelligence indicators versus self directed ES3 training alone. When taking in account missed indicators cause lives a .867 difference between groups is tremendous. Even though the data shows a hybrid approach is the best, there were significant problems with **Indicators 8 and 9** showing little to no improvement.

Table 21 Independent Samples T Test for Groups Four and Three

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Scores34	Equal variances assumed	.497	.487	-2.385	28	.024	-.86667	.36341	-1.61107	-.12226
	Equal variances not assumed			-2.385	27.502	.024	-.86667	.36341	-1.61168	-.12166

In addition, a Post Hoc Test was conducted to determine which means were different from each other amongst all treatment groups. The Post Hoc Test used was the Tukey's Honestly Significant Difference or HSD test which is one of the most widely used post hoc test in Psychology and the behavioral sciences. As a direct result, treatment group three was identified as the best form of training out of the four treatment groups.

Table 22 Summary of Mean Comparison using Post Hoc Test

Scores

Tukey HSD[a,b]

Groups	N	Subset		
		1	2	3
1	15	3.80		
2	15		4.93	
4	15			6.00
3	15			6.87
Sig.		1.000	1.000	.108

.

Listed below is a summary of the treatment groups as they compare to each other using the Tukey Post Hoc Test. From this table, we see treatment groups two, three, and four all did significantly better than the control group (treatment group one). This table also shows us treatment group two was better than treatment group one, but not better than treatment groups three and four. Finally, it shows us treatment group four was significantly better than treatment group one and two, but not better than treatment group three. Thus identifying treatment group as the best form of treatment out of the four groups tested.

Table 23 Tukey's Post Hoc Test Comparing Each Treatment Group

Multiple Comparisons

Dependent Variable: Scores
Tukey HSD

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-1.13*	.375	.019	-2.13	-.14
	3	-3.07*	.375	.000	-4.06	-2.07
	4	-2.20*	.375	.000	-3.19	-1.21
2	1	1.13*	.375	.019	.14	2.13
	3	-1.93*	.375	.000	-2.93	-.94
	4	-1.07*	.375	.031	-2.06	-.07
3	1	3.07*	.375	.000	2.07	4.06
	2	1.93*	.375	.000	.94	2.93
	4	.87	.375	.108	-.13	1.86
4	1	2.20*	.375	.000	1.21	3.19
	2	1.07*	.375	.031	.07	2.06
	3	-.87	.375	.108	-1.86	.13

Based on observed means.

*. The mean difference is significant at the .05 level.

Additionally, a Chi Square distribution was used to test the summary of group performance categorically using numbers of individuals who passed-failed, where 8 or more indicators identified as a pass and 7 or less as a fail. Traditionally, a 70% success rating is used for a pass assessment, but based on soldiers' lives 100% would be ideal and 80% more appropriate based on feasibility. At 70% identification rate the observed N was 14 students passed and 46 fail. At 80% identification rate the observed N was 5 pass and 55 fail. Listed below is a summary of the descriptive statistics of all treatment groups at a 70 and 80 percent identification rate.

Table 24 Summary of Descriptive Statistics at 70% Pass Rate

Groups	**N**	**Mean**	**Std. Dev**	**Min**	**Max**
All at 70% identify	60	.23	.427	0	1
Group 1 70%	15	0	0	0	0
Group 2 70%	15	.07	.258	0	1
Group 3 70%	15	.6	.51	0	1
Group 4 70%	15	.27	.46	0	1

The chi-square goodness-of-fit test was employed to test the hypothesis of each group categorically at an identification rate of 80% (Sheskin, 2000). Based on the previous data the following hypothesis is derived.

Ho: The observed frequency of hits in each treatment group is equal to the expected frequency for a passing grade.

$$Ho: \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The observed frequency of hits in each treatment group is not equal to the expected frequency for a passing grade.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

The Critical Value of Chi^2 at alpha = 0.05 with one degree of freedom is 3.84. Based on an N of 15 and an 80% identification rate our expected values are 12 pass and 3 fail. As a result, we

reject the null hypothesis of each treatment group that the observed distribution of soldiers passing is not consistent with the expected requirements of soldier required survival rates. Group 3 had 9 pass and 6 failures at a 70% identification rate which has an expected values of 11 pass and 4 fail, **we fail to reject the null hypothesis for treatment group 3** with a chi square value of 1.36 which is less than the critical value of 3.84. Hence the Hybrid approach appears to be the ONLY technique that has the expectation of yielding at least a 70% identification rate for 70% of the student soldiers.

Table 25 Summary of Descriptive Statistics at 80% Pass Rate

Groups	**N**	**Mean**	**Std. Dev**	**Min**	**Max**
All at 80% identify	60	.08	.279	0	1
Group 1 80%	15	0	0	0	0
Group 2 80%	15	0	0	0	0
Group 3 80%	15	.27	.46	0	1
Group 4 80%	15	.07	.258	0	1

Survey

A post training survey was issued to each soldier after completion of the ES3 digital training and indicator lane. The survey is divided into three sections consisting of individual post training attitude and additional post evaluation questions on training effectiveness. The post training survey assessed opinions of the soldiers on the effectiveness of training received in intelligence gathering. The soldiers were asked to rate the quality of training based on a five point Likert scale with responses ranging between “Strongly Agree” and “Strongly Disagree”.

Listed below is a summary of each group rating on the quality of training. Based on fifteen soldiers, five critical attributes and the five point Likert scale; the total number of soldiers was annotated in each category.

Treatment Group 1 was the control group and received the current form of traditional training using power point slide presentation.

Table 26 Group 1 Post Training Assessment of the Effectiveness of Training Received

Training Effectiveness	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
Able to clearly understand the information provided	2	3	5	3	2
Content provided a realistic view of possible actions needed for gathering military intelligence.	1	1	2	6	5
Training provided stimuli allowing a feeling of immersion in a presence patrol.	0	1	3	5	6
Able to understand how to communicate with civilians	1	2	4	6	2
Knowledge and experience gained will improve my intelligence gathering during future presence patrol.	2	2	8	2	1

Treatment Group 2 received one hour of instructor-led ES3 training, where the instructor used the ES3 software to facilitate the discussion on IED threats and indicators. The instructor had the ES3 scenario on a projector screen and walked the students through a presence patrol with him as the controller of the ES3 simulation.

Table 27 Group 2 Post Training Assessment of the Effectiveness of Training Received

Training Effectiveness	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
Able to clearly understand the information provided	2	2	7	4	0
Content provided a realistic view of possible actions needed for gathering military intelligence.	3	3	9	0	0
Training provided stimuli allowing a feeling of immersion in a presence patrol.	0	1	8	5	1
Able to understand how to communicate with civilians	1	1	5	5	3
Knowledge and experience gained will improve my intelligence gathering during future presence patrol.	3	4	6	2	0

Treatment Group 3 received a combination of one hour of instructor-led ES3 training and one hour of self directed ES3 training, where the instructor used the ES3 software to facilitate the discussion on IED threats and indicators. The soldiers were allowed to execute one hour of self directed ES3 training with the instructor there to answer any questions and give additional guidance. Students maneuvered through the synthetic environment periodically engaging in conversions with civilians to gain intelligence while conducting the presence patrol.

Table 28 Group 3 Post Training Assessment of the Effectiveness of Training Received

Training Effectiveness	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
Able to clearly understand the information provided	4	4	6	1	0
Content provided a realistic view of possible actions needed for gathering military intelligence.	3	2	6	4	0
Training provided stimuli allowing a feeling of immersion in a presence patrol.	1	4	6	3	1
Able to understand how to communicate with civilians	2	2	5	5	1
Knowledge and experience gained will improve my intelligence gathering during future presence patrol.	4	3	7	1	0

Treatment Group 4 received two hours of self-directed ES3 training only. The students received a 15 minute block of instruction on how to use the keys and maneuver through the synthetic environment. The time allotted for the students to complete two scenarios with two iterations per scenario. At the conclusion, the students proceeded to the live indicator lane for evaluation.

Table 29 Group 4 Post Training Assessment of the Effectiveness of Training Received

Training Effectiveness	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
Able to clearly understand the information provided	0	2	5	4	4
Content provided a realistic view of possible actions needed for gathering military intelligence.	1	2	7	3	2
Training provided stimuli allowing a feeling of immersion in a presence patrol.	1	3	6	3	2
Able to understand how to communicate with civilians	0	1	5	5	4
Knowledge and experience gained will improve my intelligence gathering during future presence patrol.	1	3	7	3	1

Assessment of Training Effectiveness

After receiving training in intelligence gathering, the soldiers' assessed the training effectiveness as it pertained to ability to understand information presented, realism training, stimuli for feeling of immersion, ability to understand how to communicate with civilians, and overall opinion of knowledge gained during the training. In order to determine the effectiveness of training treatments, the following hypothesis was derived.

Ho: The student's attitude toward different types of training treatments for intelligence gathering are equal based on categorical data as perceived by the soldier being trained.

$$Ho : \mu_1 = \mu_2 = \mu_3 = \mu_4$$

Ha: The student's attitude toward different types of training treatments for intelligence gathering are not equal based on categorical data as perceived by the soldier being trained.

$$Ha: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$$

To test the ordinal data of the four independent samples, the Kruskal-Wallis non parametric test and Tukey's Post Hoc test was used to determine if at least two of the samples represent populations with different mean values (Sheskin, 2000). The test statistic for the Kruskal-Wallis is a chi-square distribution. The Critical Value of Chi^2 at alpha = 0.05 with three degrees of freedom is 7.81. As a direct result, attributes 1, 2, and 3 are greater than the chi-square value of 7.81, **thus rejecting the null hypothesis**. We can conclude there is a significant difference between at least two of the four groups exposed to the different levels of treatment for attributes 1, 2, and 3.

Table 30 Summary of Kruskal-Wallis Test for Attributes 1-5

Attribute	**Group 1 Mean**	**Group 2 Mean**	**Group 3 Mean**	**Group 4 Mean**	**Chi-Square Test Statistic**
Attribute 1	29.90	31.13	40.43	20.53	10.55
Attribute 2	18.27	40.50	34.50	28.73	14.37
Attribute 3	19.57	30.40	37.63	34.40	9.95
Attribute 4	31.10	29.23	35.97	25.70	2.94
Attribute 5	27.37	33.63	35.57	25.43	3.95

Table 31 Tukey Post Hoc Test for Attributes 1-5

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Attribute 1 Rating	1	2	-.13	.390	.986	-1.17	.90
		3	-.73	.390	.249	-1.77	.30
		4	.67	.390	.329	-.37	1.70
	2	1	.13	.390	.986	-.90	1.17
		3	-.60	.390	.423	-1.63	.43
		4	.80	.390	.183	-.23	1.83
	3	1	.73	.390	.249	-.30	1.77
		2	.60	.390	.423	-.43	1.63
		4	1.40*	.390	.004	.37	2.43
	4	1	-.67	.390	.329	-1.70	.37
		2	-.80	.390	.183	-1.83	.23
		3	-1.40*	.390	.004	-2.43	-.37
Attribute 2 Rating	1	2	-1.47*	.386	.002	-2.49	-.44
		3	-1.13*	.386	.024	-2.16	-.11
		4	-.67	.386	.320	-1.69	.36
	2	1	1.47*	.386	.002	.44	2.49
		3	.33	.386	.824	-.69	1.36
		4	.80	.386	.175	-.22	1.82
	3	1	1.13*	.386	.024	.11	2.16
		2	-.33	.386	.824	-1.36	.69
		4	.47	.386	.624	-.56	1.49
	4	1	.67	.386	.320	-.36	1.69
		2	-.80	.386	.175	-1.82	.22
		3	-.47	.386	.624	-1.49	.56
Attribute 3 Rating	1	2	-.67	.356	.251	-1.61	.28
		3	-1.13*	.356	.012	-2.08	-.19
		4	-.93	.356	.053	-1.88	.01
	2	1	.67	.356	.251	-.28	1.61
		3	-.47	.356	.560	-1.41	.48
		4	-.27	.356	.877	-1.21	.68
	3	1	1.13*	.356	.012	.19	2.08
		2	.47	.356	.560	-.48	1.41
		4	.20	.356	.943	-.74	1.14
	4	1	.93	.356	.053	-.01	1.88
		2	.27	.356	.877	-.68	1.21
		3	-.20	.356	.943	-1.14	.74
Attribute 4 Rating	1	2	.13	.398	.987	-.92	1.19
		3	-.33	.398	.837	-1.39	.72
		4	.40	.398	.748	-.65	1.45
	2	1	-.13	.398	.987	-1.19	.92
		3	-.47	.398	.647	-1.52	.59
		4	.27	.398	.908	-.79	1.32
	3	1	.33	.398	.837	-.72	1.39
		2	.47	.398	.647	-.59	1.52
		4	.73	.398	.266	-.32	1.79
	4	1	-.40	.398	.748	-1.45	.65
		2	-.27	.398	.908	-1.32	.79
		3	-.73	.398	.266	-1.79	.32
Attribute 5 Rating	1	2	-.40	.368	.698	-1.37	.57
		3	-.53	.368	.474	-1.51	.44
		4	.13	.368	.984	-.84	1.11
	2	1	.40	.368	.698	-.57	1.37
		3	-.13	.368	.984	-1.11	.84
		4	.53	.368	.474	-.44	1.51
	3	1	.53	.368	.474	-.44	1.51
		2	.13	.368	.984	-.84	1.11
		4	.67	.368	.278	-.31	1.64
	4	1	-.13	.368	.984	-1.11	.84
		2	-.53	.368	.474	-1.51	.44
		3	-.67	.368	.278	-1.64	.31

Based on observed means.

*. The mean difference is significant at the .05 level.

Analysis of Table 31 indicates that treatment 3 student attitudes are statistically more positive than treatment 4 student attitudes are about Attribute 1. Further analysis of Table 4.31 indicates that treatments 2 and 3 student attitudes are statistically more positive than treatment 1 student attitudes are about Attribute 2. Further analysis of Table 31 indicates that treatments 3 student attitudes are statistically more positive than treatment 1 student attitudes are about Attribute 3. No other statistical differences between treatments were found in attributes 4 or 5. The final question is whether or not the responses each treatment group is different from neutrality for each attribute. A Chi Square distribution was used to test each attribute versus neutrality with an assumed normal distribution of across the five categories resulting in 1,3,7,3,1 for 15 individuals in each treatment. This was done to determine if there was any statistically significance difference of the responses of the soldiers from neutrality. The Critical Value of Chi^2 at alpha = 0.05 with four degrees of freedom is 9.48. As a direct result for attribute one, groups 1 and 2 critical values fell in the acceptable region and groups 3 and 4 are greater than the chi-square value of 9.48 and fell in the rejection region. We can conclude there is a significant difference between at least two of the groups for attribute 1 versus normality.

Table 32 Summary of Chi Square Test for Attribute 1 versus Normality

Test Statistics Attribute 1

	Group1	Group2	Group3	Group4
Chi-Square[a]	2.571	2.667	11.810	11.238
df	4	4	4	4
Asymp. Sig.	.632	.615	.019	.024

a. 4 cells (80.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.0.

As a direct result for attribute two, groups 2, 3, and 4 critical values fell in the acceptable region and group 1 critical value greater than the chi-square value of 9.48 fell in the rejection region. We can conclude there is a significant difference in treatment group 1 with responses being abnormal.

Table 33 Summary of Chi Square Test for Attribute 2 versus Normality

Test Statistics Attribute 2

	Group1	Group2	Group3	Group4
Chi-Square[a]	23.905	8.571	5.810	1.333
df	4	4	4	4
Asymp. Sig.	.000	.073	.214	.856

a. 4 cells (80.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.0.

As a direct result for attribute three, groups 2, 3, and 4 critical values fell in the acceptable region and group 1 critical value greater than the chi-square value of 9.48 fell in the rejection region. We can conclude there is a significant difference in treatment group 1 with responses being abnormal.

Table 34 Summary of Chi Square Test for Attribute 3 versus Normality

Test Statistics Attribute 3

	Group1	Group2	Group3	Group4
Chi-Square[a]	30.952	3.810	.476	1.143
df	4	4	4	4
Asymp. Sig.	.000	.432	.976	.887

a. 4 cells (80.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.0.

As a direct result for attribute four, groups 1, 2, and 3 critical values fell in the acceptable region and group 4 critical value greater than the chi-square value of 9.48 fell in the rejection region. We can conclude there is a significant difference in treatment group 4 with responses being abnormal.

Table 35 Summary of Chi Square Test for Attribute 4 versus Normality

Test Statistics Attribute 4

	Group1	Group2	Group3	Group4
Chi-Square[a]	5.619	7.238	3.238	13.238
df	4	4	4	4
Asymp. Sig.	.229	.124	.519	.010

a. 4 cells (80.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.0.

As a direct result for attribute five, groups 1, 2, and 4 critical values fell in the acceptable region and group 3 critical value greater than the chi-square value of 9.48 fell in the rejection region. We can conclude there is a significant difference in treatment group 3 with responses being abnormal.

Table 36 Summary of Chi Square Test for Attribute 5 versus Normality

Test Statistics Attribute 5

	Group1	Group2	Group3	Group4
Chi-Square[a]	1.810	5.810	11.333	.000
df	4	4	4	4
Asymp. Sig.	.771	.214	.023	1.000

a. 4 cells (80.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.0.

CHAPTER 5
CONCLUSION

This experiment was conducted in an attempt to validate the SLIM ES3 Simulation Software's ability to adequately train our soldiers in the area of intelligence gathering. ES3 was developed by ICT and further refined by the Army Research Development and Engineering Command in an effort to assist soldiers E1-E4 in intelligence gathering operation training. The study was conducted using initial entry basic training soldiers out of Fort Jackson, South Carolina in March 07. The performance evaluations and survey responses of the treatment groups were compared to the control group, which received current tradition training and compared to each other to determine any statistical significance. The feedback on training effectiveness in relation to performance by use of an instructor versus self directed or combination of the two, resulted in improvements of the retention and transfer of knowledge. These results should prove useful to the Army as it continues to combat terrorisms and development of its IED defeat strategy for the Future Force.

Summary of Findings

The findings of this experiment revealed favorable results concerning the use of ES3 for the training of intelligence gathering. Based on the data analysis, self directed training alone conducted by treatment group four showed positive results, but did not achieve the highest results amongst all treatment groups. A hybrid approach, combining a combination of instructor-led facilitation using the ES3 as a training tool and self directed individual ES3 training yielded the highest results in performance during the indicator lane evaluation. This was an important finding because it showed the significance of the instructor in the loop and interaction with the soldiers based on instructor combat experience that could not be replicated by the ES3 system alone. On the converse, instructor-led facilitation alone yielded the second lowest amongst the treatment groups. This showed the significance of self directed training as reinforcement to information disseminated by the instructor using ES3. However, a combination of instructor-led and self directed ES3 training may have yielded the highest in performance and efficiency between the treatment groups; it still proved ineffective on indicators related to Arabic language warning soldiers of eminent danger, and indicators related to children specifically using babies and baby devices as possible IEDs.

Although the combination of instructor-led and self directed ES3 training did not achieve the ideal results and standard of 80% pass, it did show it is the best form of training we currently have in intelligence gathering. The instructor enhances the training by using his or her combat experience to train soldiers to look for indicators while maintaining situational awareness. The design of instructor influence is not to train the soldier to identify a certain indicator, but to train the soldier to look for items that are out of place or to look for something that just doesn't look right.

The findings based on soldier perception of the training showed a difference between the treatment groups on the attributes associated with information processing, training realism, and system immersion and stimuli. Though we could not determine which treatment groups were significantly different based on the non parametric testing of the categorical data; we could see from the overall response numbers that a soldier receiving a combination of the training tended to agree more with first three attributes than the other treatment groups.

In addition, the findings based on soldier perception of the training showed no difference between the treatment groups on the attributes associated with communication with civilians and overall knowledge received. Communicating with the local civilian populous is perhaps one of the toughest tasks in intelligence gathering, but yields some of our best intelligence. This perhaps is something we are not training well enough and requires additional focus. In relation to the overall knowledge received, we must keep in mind these are initial entry basic training soldiers and any knowledge received on intelligence gathering and IEDs would be looked upon as favorable by all.

In summary, it appears fruitful to take a hybrid approach to training intelligence gathering with ES3, considering performance evaluations and instructor-user input. Furthermore, it appears certain behaviors in information processing are strongly related to the skills required in intelligence gathering. On the other hand, the question arises on what is the optimal or most efficient mix of the instructor and self directed ES3 training required to effectively train our soldiers.

Recommendations and Areas of Future Research

Future research should concentrate on investigating the relationship between information processing and soldier performance as it relates to conducting intelligence gathering in the operational environment. There are several techniques used to train memory ranging from pattern association to data retrieval; all which could improve intelligence gathering. Therefore, the following recommendations in the area of intelligence gathering using ES3 are:

1. Development or refinement of a continuous system to directly feed the most current and updated trends in the operational environment directly into the ES3 training system.

2. Include additional memory training to the current KIM (keep in mind) training that focuses on transfer of data from sensory to short term to long term memory for storage.

3. Conduct additional experiments at unit level to determine the appropriate mix of instructor-led and self directed ES3 training and send back to all basic training units in order to start immediate implementation.

APPENDIX A
COMMON TASK TEST FOR CONDUCT OF PRESENCE PATROL

171-300-0016 - Conduct a Presence Patrol

Conducted a presence patrol so that the military presence of US troops is projected, and all appropriate human intelligence (HUMINT) information is gathered and the commander's intent is met. Interaction with local or foreign civilians, law enforcement, governmental officials or military is conducted in a manner that did not incite aggression against US forces or our allies. Maintained force protection, as appropriate, for the threat situation. Conducted actions on contact. Maintained situational awareness by monitoring FM communications and/or the FBCB2/IVIS

Conditions: In a tactical environment as the section leader, given an operations order (OPORD) or fragmentary order (FRAGO) to conduct a presence patrol either mounted or dismounted, an operational vehicle, maps with graphic control measures, signal operation instructions (SOI), and the requirement to conduct a presence patrol through populated terrain and/or urban built-up area. Your vehicle may be equipped with the Force XXI Battle Command Brigade-and-Below (FBCB2) system/ intervehicular information system (IVIS) with the current map, operational overlay, and order displayed.

Standards: Conducted a presence patrol so that the military presence of US troops is projected, and all appropriate human intelligence (HUMINT) information is gathered and the commander's intent is met. Interaction with local or foreign civilians, law enforcement, governmental officials or military is conducted in a manner that did not incite aggression against US forces or our allies. Maintained force protection, as appropriate, for the threat situation. Conducted actions on contact. Maintained situational awareness by monitoring FM communications and/or the FBCB2/IVIS.

Performance Steps

NOTE: The primary purpose of the presence patrol is to be seen by military forces and civilians in the area of operations. Although this patrol does perform limited reconnaissance and security functions; it should be planned and conducted as a combat patrol.

1. Initiates and controls presence patrol movement toward the start point (SP).
    a. Directs mode of transportation IAW OPORD/FRAGO.
        (1) Mounted.
        (2) Dismounted.
    b. Directs patrol to begin movement using the designated formation, movement technique, interval and speed IAW the OPORD/FRAGO.
    c. Positions himself where he can best control the movement of the patrol.

2. Supervises the patrol.
    a. Crosses the SP at the designated time.
    b. Reports control measures IAW the OPORD/FRAGO.
    c. Directs 360-degree security with air and ground surveillance.

3. Conducts scheduled halts, as directed in the OPORD/FRAGO.
   a. Establishes local security.
   b. Posts guides to direct traffic, as necessary.
   c. Conducts reconnaissance, as necessary.
   d. Mounted only:
      (1) Performs during-operation maintenance.
      (2) Refuels, if scheduled.
   e. Sends a Situation Report (SITREP).

4. Conducts unscheduled halts, as necessary.
   a. Conducts actions on contact.
      (1) Deploy and report.
      (2) Develop the situation.
      (3) Recommend and choose a course of action.
      (4) Execute a course of action.
   b. Maintains situational awareness.
   c. Maintains 360-degree security.
   d. Sends a SITREP.

5. Interacts with the local civilians as the OPORD or situation dictates. This includes local or foreign civilians, law enforcement and governmental officials, and other forces located in the area. Act in a manner that will not incite aggression against U.S. forces or our allies.
   a. Uses the patrol's HUMINT collector (Military Intelligence personnel), or HUMINT collection techniques.
   b. Maintains situational awareness of local activities, civilians, military forces, and other potential threats to the patrol.

NOTE: Due to the interaction the patrol may have with the local civilians, and other personnel in the area along the route, progressive levels of force protection may be necessary.

6. Conducts continuous reconnaissance during and after the patrol. Make note of suspicious activity, persons, vehicles, etc.

7. Reports all suspicious activities to higher headquarters.

8. Conducts reentry into friendly areas.
   a. Contacts friendly units.
   b. Confirms the coordination of the passage with the friendly unit.
   c. Executes reentry.

9. Completes the patrol report.
   a. Debriefs the patrol members and compile the reconnaissance information.
   b. Prepares the patrol report.
   c. Reviews the patrol report with the patrol members for accuracy and completeness.
   d. Submits the completed report to commander or tactical operations center (TOC). Use FBCB2/IVIS, if equipped.

10. Maintains situational awareness by monitoring FM communications and/or FBCB2/IVIS .

Performance Measures	**GO**	**NO GO**
1. Initiated presence patrol and controls movement toward the SP.	____	____
2. Supervised the patrol.	____	____
3. Conducted scheduled halts as directed in the OPORD/FRAGO.	____	____
4. Conducted unscheduled halts, as necessary.	____	____
5. Interacted with the local citizenry as the OPORD or situation dictates. This includes local or foreign civilians, law enforcements officials, governmental officials, and other forces located in the area. Acted in a manner that will not incite aggression against U.S. forces or our allies.	____	____
6. Conducted continuous reconnaissance during and after the patrol. Made note of suspicious activity, persons, vehicles, etc.	____	____
7. Reported all suspicious activities to higher headquarters.	____	____
8. Conducted reentry into friendly areas.	____	____
9. Completed the patrol report.	____	____
10. Maintained situational awareness by monitoring FM communications and/or the FBCB2 system.	____	____

Evaluation Guidance: Score the Soldier GO if all steps are passed. Score the Soldier NO-GO if any step is failed. If the Soldier scores NO-GO, show him what was done wrong and how to do it correctly.

APPENDIX B
PRE-TRAINING AND POST TRAINING SURVEYS

Pre-Training Survey

All information will be kept in strict confidence. Only aggregate data will be reported. Please provide the following information:

Last Four SSN: _______ Platoon ________

A. **Pre-training Demographic and Experience Data:**

What is your current rank?

_____ E1
_____ E2
_____ E3
_____ E4/Other

What is your age?

_____ 17 to 19
_____ 20 to 22
_____ 23 to 25
_____ 26 to 32

Have you ever participated in an experiment or field study?

_____ None
_____ One to Three
_____ Four to Six

How many years of gaming experience do you have? (Play Station; Computer; etc)

_____ None
_____ One to Three
_____ Four to Six
_____ Seven to Nine
_____ Ten or greater

Have you ever had training on military intelligence gathering prior to your current basic training program?

…..______ None
_____ Yes during prior military service
_____ Yes during prior police training
_____ Yes during other prior training

B. **Individual Pre-Training Attitudinal Questionnaire:**

1. Based on previous change detection drill training, I am able to recall changes in an environment.
   _____ Strongly Agree
   _____ Agree
   _____ Neutral
   _____ Disagree
   _____ Strongly Disagree

2. I can communicate with the chain of command on military intelligence without fear of being wrong.
   _____ Strongly Agree
   _____ Agree
   _____ Neutral
   _____ Disagree
   _____ Strongly Disagree

3. I am able to clearly articulate recalled items in a written format.
   _____ Strongly Agree
   _____ Agree
   _____ Neutral
   _____ Disagree
   _____ Strongly Disagree

4. I am able to clearly articulate recalled items in a drawing or diagram format.
   _____ Strongly Agree
   _____ Agree
   _____ Neutral
   _____ Disagree
   _____ Strongly Disagree

5. I prefer to work independently at my own pace using computer software.
   _____ Strongly Agree
   _____ Agree
   _____ Neutral
   _____ Disagree
   _____ Strongly Disagree

6. I prefer to learn in a controlled instructor-led environment.
   _____ Strongly Agree
   _____ Agree
   _____ Neutral
   _____ Disagree
   _____ Strongly Disagree

Post-Training Survey

Individual Post Training Attitudinal Questionnaire:

1. I was able to clearly understand the information provided during training
______ Strongly Agree
______ Agree
______ Neutral
______ Disagree
______ Strongly Disagree

2. After the training, I now know what constitutes military intelligence
______ Strongly Agree
______ Agree
______ Neutral
______ Disagree
______ Strongly Disagree

3. After the training, I feel more comfortable articulating military intelligence to my chain of command
______ Strongly Agree
______ Agree
______ Neutral
______ Disagree
______ Strongly Disagree

4. The content of the training provided a realistic view of possible actions needed for gathering military intelligence.
______ Strongly Agree
______ Agree
______ Neutral
______ Disagree
______ Strongly Disagree

5. The training provided stimuli allowing a feeling of immersion in a presence patrol through use of visual and audio display.
______ Strongly Agree
______ Agree
______ Neutral
______ Disagree
______ Strongly Disagree

6. The knowledge and experience I gained from the training will improve my intelligence gathering during future presence patrol.
_____ Strongly Agree
_____ Agree
_____ Neutral
_____ Disagree
_____ Strongly Disagree

7. I was able to understand how to communicate with civilians during the training to the degree that it would assist in the identification of actionable intelligence during the live presence patrol.
_____ Strongly Agree
_____ Agree
_____ Neutral
_____ Disagree
_____ Strongly Disagree

Additional Post Evaluation Survey for Simulation Participants

1. What is your opinion of the use of computer virtual simulation as a tool to assist in the training of individual tasks?

2. Will additional training on the ES3 increase your proficiency in gathering actionable intelligence? If so estimate how many more interactions?

3. Did the ES3 simulation software provide additional motivation to execute the task live after doing the task in a virtual environment?

4. I was able to maneuver throughout the synthetic natural environment using the keyboard
_____ Strongly Agree
_____ Agree
_____ Neutral
_____ Disagree
_____ Strongly Disagree

5. If you could make any improvement to the simulation at all; what would you change or add?

Post-Evaluation Survey for all participants

<u>Individual Post Evaluation Attitudinal Questionnaire:</u>

1. The amount of time spent in training was adequate enough to help me identify actionable intelligence during the live presence patrol.

_____ Strongly Agree
_____ Agree
_____ Neutral
_____ Disagree
_____ Strongly Disagree

2. The insights gained from the training helped me improved my performance identify actionable intelligence during the live presence patrol.

_____ Strongly Agree
_____ Agree
_____ Neutral
_____ Disagree
_____ Strongly Disagree

3. Check any of the following possible subtasks that you performed both during training and while conducting the live presence patrol.

_____ Communicate with locals
_____ Identified CCIR
_____ Report
_____ Search
_____ Translate
_____ Detain
_____ Other ____

APPENDIX C
INSTITUTIONAL REVIEW BOARD APPROVAL

University of Central Florida

Office of Research & Commercialization

January 25, 2007

Carlos A. Wiley
2037 Darlin Circle
Orlando, FL 32820

Dear Mr. Wiley:

With reference to your protocol #07-4123 entitled, "Assessment of the Contribution of Game-based Simulation in the Advancement of Individual Soldier Intelligence Gathering Skills," I am enclosing for your records the approved, expedited document of the UCFIRB Form you had submitted to our office. **This study was approved on 01/24/2007. The expiration date for this study will be 01/23/2008.** Should there be a need to extend this study, a Continuing Review form must be submitted to the IRB Office for review by the Chairman or full IRB at least one month prior to the expiration date. This is the responsibility of the investigator.

Please be advised that this approval is given for one year. Should there be any addendums or administrative changes to the already approved protocol, they must also be submitted to the Board through use of the Addendum/Modification Request form. Changes should not be initiated until written IRB approval is received. Adverse events should be reported to the IRB as they occur.

Should you have any questions, please do not hesitate to call me at 407-823-2901.

Please accept our best wishes for the success of your endeavors.

Cordially,

Joanne Muratori
Joanne Muratori
(FWA00000351 Exp. 5/13/07, IRB00001138)

Copies: IRB File
Michael Proctor, Ph.D.

JM:jt

12201 Research Parkway • Suite 501 • Orlando, FL 32826-3246 • 407-823-3778 • Fax 407-823-3299

THE UNIVERSITY OF CENTRAL FLORIDA
INSTITUTIONAL REVIEW BOARD (IRB)

IRB Committee Approval Form

PRINCIPAL INVESTIGATOR(S): Carlos Wiley (Supervisor: Michael Proctor, Ph.D.) #07-4123

PROJECT TITLE: Assessment of the contribution of game-based simulation in the advancement of individual soldier intelligence gathering skills

[X] New project submission
[ ] Resubmission of lapsed project #_____
[ ] Continuing review of lapsed project #
[ ] Continuing review of #
[ ] Study expires
[ ] Initial submission was approved by expedited review
[ ] Initial submission was approved by full board review but continuing review can be expedited
[ ] Suspension of enrollment email sent to PI, entered on spreadsheet, administration notified ______

Chair

[X] Expedited Approval

Dated: 1/24/2007
Cite how qualifies for expedited review: minimal risk and __________

[ ] Exempt

Dated: ___________
Cite how qualifies for exempt status: minimal risk and ___ ___

[X] Expiration Date: 1/23/2008

IRB Reviewers:

Signed: ______________________
Dr. Tracy Dietz, Chair

Signed: ______________________
Dr. Craig Van Slyke, Vice-Chair

Signed: Sophia F. Dziegielewski
Dr. Sophia Dziegielewski, Vice-Chair

Complete reverse side of expedited or exempt form

SFD [X] Waiver of documentation of consent approved
[ ] Waiver of consent approved
[ ] Waiver of HIPAA Authorization approved

NOTES FROM IRB CHAIR (IF APPLICABLE): FIRST Review. Clarifications needed. Sophia F. Dziegielewski 1/23/2007

PI clarified reviewer's requests SFD

Please read this consent document carefully before you decide to participate in this study.
You must be 18 years of age or older to participate.

Informed Consent Form – Group A,B,C,D

Project title: Thesis – "Assessment of the contribution of game-based simulation in the advancement of individual soldier intelligence gathering skills"

Purpose of the research study: The primary research goal for this thesis is to investigate relationships between information processing, self-directed learning modules, training system transfer and usability.

What you will be asked to do in the study: You will be asked to take two surveys: 1) Pre-Training Survey and 2) Post Training Survey. The data from these surveys will be used to generate statistical significance of game-based simulation in intelligence gathering. We will also ask you to provide the demographic data as part of the pre-training survey since factors like age, education, and gaming experience may be a factor in the intelligence gathering process. No other personal data will be collected and no data collected from the surveys will have your name associated with it.

Time required: four hours

Risks: The only direct risk is the physical training environment. This poses a minimal risk based of the controlled environment set in place by the Drill Sergeants who are conducting the training. Completed risk assessment is provided on site with medical personnel on stand-by if necessary. No one will be identified in the data or the published results. The raw data will not appear in the thesis or any published results.

Benefits/Compensation: There is no compensation for your participation. The direct benefit to the soldier is the insight acquired by reviewing and training a scenario that incorporates the contemporary operating environment the soldiers faces in Operation Iraqi Freedom.

Confidentiality: Your identity will be kept confidential. Your survey data and demographic data will be used in this study and it will not be associated with your name. Your name will not be used in any report or publication.

Voluntary participation: Your participation in this study is voluntary. There is no penalty for not participating. You have the right to withdraw from the study at any time without penalty.

Whom to contact if you have questions about the study: Carlos A. Wiley, Graduate Student, Modeling and Simulation Program, College of Engineering and Computer Science, University of Central Florida, Orlando, FL 32816, (407) 568-8874 or Dr. Michael Proctor, Associate Professor, Department of Industrial Engineering and Management Systems at (407) 823-5296 or by email at mproctor@mail.ucf.edu.

Whom to contact about your rights in the study: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (IRB). For information about participants' rights please contact: Institutional Review Board Office, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246. The telephone numbers are (407) 882-2276 and (407) 823-2901. The office is open from 8:00 am to 5:00 pm Monday through Friday except on UCF official holidays.

Your submission of the completed questionnaires constitutes your consent to participate in the study.

REFERENCES

Army Releases "Every Soldier a Sensor" Training Tool. (2005, October 27). U.S. Army Program Executive Office for Simulation, Training, and Instrumentation.

Department of the Army (DA) (2002). Training the Force. FM 7-0. Washington, D.C.: Author.

Department of the Army (DA) (2003). Battle Focus Training. FM 7-1. Washington, D.C.: Author.

Department of the Army (DA) (2001). Operations. FM 3-0. Washington, D.C.: Author.

Department of the Army (DA) (2003). Urban Operations. FM 3-06. Washington, D.C.: Author.

Department of the Army (DA) (2003). Intelligence Officer's Handbook. FM 34-8-2. Washington, D.C.: Author.

Department of the Army (DA) (2003). MTP Headquarters of the Military Intelligence Battalion. ARTEP 34-396-30 MTP. Washington, D.C.: Author.

Department of the Army (DA) (2002). Battle Drills for the Infantry Rifle Platoon & Squad. ARTEP 7-8. Washington, D.C.: Author.

ES2: Every Soldier is a Sensor. (2004, August 15). (Association for the United States Army Torchbearer Campaign issue paper 5, The Army's current force).

Feinstein, A.H. & Cannon, H.M. (2002). Constructs of simulation evaluation. *Simulation & Gaming*, 33, 425-440.

Garris, R. and Ahlers, R. (2001). *A Game-Based Training Modern Development, Application, and Evaluation.* Interservice/Industry Training, Simulation, and Education Conference 2001, Orlando, FL.

Hull, M. (2005, August). *Every soldier is a sensor*. Presentation given to the Initial Entry Training Conference, Fort Benning, GA.

LTC Kelly, J.M. (1998). *Advances in Training for Complex Operations Using Simulation Technology.* Washington, D.C.

Michael, D. & Chen, S. (2005). *Serious games: Games that educate, train, and inform*. Boston, MA: Thomson Course Technology, Inc

Morris, C.S. & Tarr, R.W. (2002). *Templates for selecting PC-based synthetic environments for application to human performance enhancement and training*. Proceedings of the IEEE Virtual Reality 2002 Conference, Orlando, FL.

Nash, S.S. (2004). *The Ethics of Video Game-Based Simulation.* http://elearnqueen.blogspot.com/2004.

Office of the Secretary of Defense (2003). Department of Defense, Transformation Planning Guidance. Washington, D.C.: Author.

Prensky, M. (2001). *Digital Game-Based Learning*. New York: McGraw Hill.

Ray, D.P. (2005). Every Soldier is a Sensor Simulation: virtual simulation using game technology. Military Intelligence Professional Bulletin, March 2005.

Rolland, R.J. (1998). *The Future of Military Simulation.* Winter Proceedings of the IEEE Virtual Reality 1998 Conference, Orlando, FL.

Roth, J.T. (1997). *Advances in Using Simulations to Enhance Military Training.* Proceedings of the IEEE Sixth Annual Human Factors Meeting, Orlando, FL.

Sherman, W. and Craig, A. (2002). Understanding Virtual Reality, New York, New York.

Tarr, R.W., Morris, C.S., & Singer, J. (2002). *Low-Cost PC Gaming and Simulation: Doctrinal Survey* (United States Army Research Institute for the Behavioral and Social Sciences Research Note 2003-03). Arlington, VA: ARI.

Zinssers, N. Bunker, L.K. & Williams, J.M. (2001). *Cognitive Techniques for improving performance and building confidence.* J.M. Williams (Ed.), Applied sport psychology: Personal Growth to Peak Performance. Mountain View, CA: May Field.

Zyda, M. (2005). *From Visual Simulation to Virtual Reality to Games.* USC Information Science Institute, Marina del Ray, CA.