Strategy Research Project

iLearning, The Game Changer

by

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United States Army

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USAWC STRATEGY RESEARCH PROJECT

iLEARNING, THE GAME CHANGER

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ABSTRACT

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iLEARNING, THE GAME CHANGER

With a smile of satisfaction on his face, 19 year old Johnny Jones folds his iPad case and reflects on his online interview. SSG Rock assured him joining the Army is the right decision, but Johnny wants to see Mom and Dad face-to-face before breaking the news. Johnny will digitally send documents to SSG Rock tonight. After swearing in, Johnny will receive a military issue iPad loaded with a suit of training applications ("apps", as they are commonly known). He will start learning many Soldier tasks even before entering Basic Training (Basic Combat Training (BCT) – 10 week common course all new enlisted Soldiers attend prior to learning their Army Military Occupational Specially (MOS)) during Advanced Individual Training (Advanced Individual Training (AIT)- course to teach Soldiers their MOS after attending BCT). Jump-starting his Army education will likely mitigate stress associated with starting a new lifestyle, build commitment in his decision to enlist, and improve his chances of successful. He may even graduate early and receive a bonus. Of course, Johnny could also opt for the advanced placement AIT that would advance him ahead of his peers with potential for early promotion. As it turned out, SSG Rock was correct. The app loaded iPad was particularly helpful in learning his job and Soldier skills. While not a "breeze," Johnny performed well through Basic and AIT. Johnny "aced" first aid, land navigation, basic rifle marksmanship (to include sight adjustments) and weapon system emplacement crew drills with first time "go's". He learned and repetitively practiced these skills countless times on his iPad, some before departing for Basic Training. Even though Initial Entry Training (comprised of BCT and AIT) was tremendously busy, there was still plenty of "hurry up and wait" time. This time included waiting in the dining facility line,

waiting for issue items, riding the bus to the range, and waiting at the dental office. During these previously unproductive times, Johnny utilized his iPad training programs. While not quite the latest video game, the iPad training games were engaging and fun. With Wi-Fi and 4G, he and his fellow Soldiers trained together in a collaborative gaming environment. Johnny took well to app training, as he'd grown up using them. Technology is a familiar way of life for Johnny and his friends. During IET, Johnny received training schedules directly to his phone, complete with map links and lesson training plans. Johnny received homework help at night via the on duty NCO thru digital black board and video chat. Networked software enabled cadre to assess Johnny's training and observe his screen view. His iPad interactive library was also very helpful, particularly the interactive maintenance manuals that enabled virtual maintenance procedures. Johnny also had the unexpected benefit of attending Basic with his high school friend, Dave. Dave took an interest and joined the Army after playing Johnny's training apps. In a way, you could say the apps recruited Dave. After Johnny sprained his ankle during land navigation, he was unable to physically perform crew drills on tactical equipment. Fortunately, he learned and practiced drills virtually on his iPad. He and his AIT partners practiced their collective crew drill together in a collaborative multi-player gaming environment. Once his ankle healed, he only required minor assistance to complete his drill on the actual piece of equipment. With minimal practice, he and his training partner passed with a first time go "Excellent." Consequently, they finished this module early and started the maintenance module faster than the rest of their group. Johnny is looking forward to this learning module; he already previewed the lessons on his iPad and they are in 3D. He will receive his wireless touch sensitive

gloves and 3D glasses in the morning. These peripherals will allow him a life-like maintenance experience without the danger, cost or availability of tactical equipment.

The above scenario illustrates the great potential SHHD offer the generating force. "The generating force is that part of the Army whose primary purpose is generating and sustaining operational Army units by performing functions specified and implied by law."[1] Generating force units do not fight wars but prepare those who will. SHHDs offer the Army strategic advantages in times of decreasing defense budgets, exponentially increasing environmental complexity, and reduced time to prepare. The Army's ability to learn and learn faster than its competitors has great national strategic importance. According to the Training and Doctrine Command's Army Learning Concept 2015, "…the U.S. Army's competitive advantage directly relates to its capacity to learn faster and adapt more quickly than its adversaries."[2] An exponentially more competitive global security environment, likely future operational realities, and a new generation of digitally savvy soldiers are the imperative to change how we educate and train Soldiers. If well executed, the Army achieves a strategic end of, "…soldiers and leaders who are technically and tactically proficient, can think critically, make sound decisions, interact across cultures, and adapt quickly to rapidly evolving situations in full spectrum operations."[3] In January 2011, the Army produced the Army Learning Concept 2015 as a way to address this strategic end. Within this strategic ends, ways, means argument, SHHDs are a means to accomplish the above stated ends. Further, SHHDs provide a unique medium that has great potential to revolutionize how we educate and train Soldiers in the Generating Force. Likely, the use of SHHDs will dramatically improve learning quality, increase the rate at which Soldiers learn, greatly

decrease the cost of training, “unhinge” learning from the classroom by enabling learning on the go conveniently. This paper will explore how the operational environment is driving an Army requirement to improve education and training, how SHHDs contribute to learning, how their mobility creates a new learning paradigm, and how SHHDs dramatically mitigate resource constraints.

The current and future operational environment is driving an Army requirement to improve Generating Force education and training. Principally, the United States faces an increased range of threats in an era of diminishing resources. The operational environment is characterized by an interconnectedness enabled by globalization and the internet. Events in one part of the world almost never survive in isolation. Rather, small events in opposite sides of the globe have propagating and rippling world-wide effects. Nations, non-governmental organizations (NGO), corporations, and communities are becoming increasingly dependent on each other economically. These factors have, and will continue to enable, non-state actors and organizations to have a far greater voice and impact in international affairs. Additionally, the international environment has become far less secure with the rise of extremist and terrorist groups. These groups use the enabling effects of global communications and internet to propagate their views and address a huge audience. However, the internet and instantaneous communications have increasingly informed previously uninformed portions of international society. This is particularly so in third world countries. Within this context, the United States faces significant security challenges including: transnational non-state actors, regional nuclear powers, and a rising China.[4] After a decade of conflicts in Iraq and Afghanistan, al Qaeda has been greatly weakened, but

terrorist and extremist organizations still threaten United States security requiring close vigilance. The United States must continue addressing these non-conventional threats, while simultaneously preparing for conventional threats. Along this thread, China has become a near peer competitor economically and is in direct competition for resources necessary for nation building. While not an enemy and great opportunity for cooperation exists, China has taken significant measures to strengthen their military, particularly in anti-access and area-denial (A2AD). These measures could challenge US traditional power projection and forward presence.[5] Additionally, new nuclear powers threaten regional stability and increase the threat of proliferation. Complicating these security challenges is the global economic crises causing the US and her allies to make difficult choices between domestic and security commitments. US strategic estimates indicate a coming decade characterized by persistent conflict, uncertainty, complexity and adaptive adversaries.[6] The dynamic of multiple mission sets, less resources and uncertainty will place tremendous strain on the Army.[7] This dynamic will also have a profound impact on training and education. Soldiers will need to learn more quickly, retain proficiency longer, and do so at less cost in terms of dollars and availability to the operating force.

With the release of the FY13 budget proposal, the Department of Defense (DoD) budget looses $487 billion over the next ten years.[8] Failure to resolve mandatory cuts associated with the congressional budget super committee sequestration stalemate represents an additional $500 billion. While cuts to the Army are not yet quantified, TRADOC will likely share prominently in the reduction. Accordingly, the dilemma for the Generating Force will be acute. Already under resourced due to the Army Force

Generation Model (ARFORGEN – a process used to manage the force and ensure availability and support demands for Army forces), TRADOC must determine how to educate Soldiers for an even greater range of skills, faster, and less expensively (in terms of dollar cost and availability to the operational force) than it does now. This problem is complicated by the Army's legacy outmoded education system. "Designed to support a peacetime Army, this decades-old model is bound by outmoded ways of doing business, outdated technology, and is only capable of limited innovation."[9] Typical IET experiences utilize tactical equipment and virtual training aids that require significant logistical support including: fuel, maintenance, storage, and transportation.[10] School budgets can be driven by the cost of tactical equipment upkeep, not just student education. This is particularly true for highly technical, equipment intensive schools such as the Patriot Air Defense School. In this case, the battalion school budget is $11.7 million, $10 million of which is allocated for Patriot equipment maintenance.[11] Additionally, Army training aids and tools have predominately been hardware based. Typically, training aids were designed to look and feel like tactical equipment. In this manner, Soldiers derived the physical association benefits without the full cost of tactical equipment. As technology improved, training aids evolved to include virtual devices. Virtual devices pair a physical device (usually a physical rendering of the actual equipment) with a computer interface. Examples include flight simulators, Engagement Skills Trainer (EST) 2000 marksmanship trainers, and Patriot Conduct of Fire Trainers (PCOFT). While virtual devices provide better training and are less expensive than tactical equipment, they too have significant initial and logistical costs.

Another factor complicating TRADOC's challenge is new Soldiers entering the force are wired different from those entering 15-20 years ago. Today's generation grew up using computers, elaborate video games, and collaborates well via cell phones and the internet. Information for this generation has only been a mouse click away. Consequently, traditional classroom environments involving PowerPoint and direct instruction can seem boring. Student boredom is associated with poorer learning and problem behaviors.[12] Rather, today's youth tend towards self directed learning. Self-directed learning is a continuous engagement in acquiring, applying, and creating knowledge and skills in the context of an individual learner's unique problems.[13] This fact is frequently illustrated by youths as they begin playing new video games. They do not read instructions and rarely follow tutorials. Rather, they load the disk in their game device and begin to play. It is through this non-instructor learning environment that many of today's youth are most comfortable.[14]

Yet another factor compelling the Army to train differently is the decreasing time available for education. Now, and in the future, there will be far less time available to educate Soldiers. Based on diverse mission sets, Soldiers will necessarily be required to transition rapidly from one type of mission, equipment, and tactics to another. Additionally, inherent uncertainty about the future may require forces to shift flexibly on the move. In this complex environment, predictions about the future become very difficult. As GEN Robert Cone, TRADOC Commander, asserted in his article discussing shaping the Army for 2020:

> …we should recognize the difficulty of accurate prediction and the likelihood of getting it wrong. We have learned that adopting an iterative "learn, adapt, learn, and adapt" approach to modernizing the force is the best means to shape the Army of 2020. Moving away from processes

> dominated by long-term sequential planning, the Army can become more adaptable and flexible.[15]

Juxtaposed potential future threats (conventional vs unconventional) present enormous challenges for military planners and the Generating Force which must train, equip, and posture those forces. This idea speaks volumes for how the Army must pursue development, training aids, and acquisition in the future. According to GEN Cone, the uncertainties of conflict require us to be flexible in our development and acquisition activities so that we can adjust quickly if those assumptions turn out to be wrong. Acquisition efficiency and flexibility must become a routine part of how the Army does business. Based on the learn-adapt, learn-adapt methodology, acquisition strategies must pursue more flexible, less costly options that buy less more frequently.[16] Following this logic trail, ideal training solutions would include multi-use, low cost flexible training aids that are easily adapted to changing conditions and training requirements.

Another Challenge facing the Generating Force is its significant "people bill." It takes significant manpower to educate Soldiers, particularly in today's highly technical fields. Programs of Instruction (POI) well define the number of instructors and support personnel required. As the Generating Force draws down, it will struggle to balance these requirements with lower authorized personnel strength. Additionally, this personnel bill is expensive to the Army as a whole. For every Soldier involved in the Generating Force, they are by definition unavailable for the Operating Force. Again, required force reductions will challenge not only the Generating Force, but its strength relative to the Operating Force.

These complex challenges clearly indicate the need to educate better, faster, and less expensively. However, better, faster, less expensive seems to violate the "Golden

Triangle" (that with better, faster, and less expensive, you can have only two of the three simultaneously). So how then does the Army accomplish the seemingly impossible? Perhaps as the hero of science fiction's Star Trek, Captain Kirk, did by beating the "Kobiashi Maru Scenario" (the fabled "unwinnable scenario"), it must change the rules of the game. In this case, the game changer is technology.

Small hand held gaming within a blended learning environment will help solve the above stated TRADOC challenges along four fundamental fronts: the learner, the instructor, access/portability, and resource mitigation. This methodology allows the Army to conquer the golden triangle by training and educating Soldiers faster, retaining and comprehending better, and training far less expensively than current methods allow. Small handheld gaming aids the learning in four specific ways. It tends to individual learning preferences, allows repetition, increases interest, and can replicate hazardous or other situations not suited for live exercise.

Generally, people learn more successfully in one of three ways: aural, visual, or physical kinesthetically. Auditory learners' best receive and process information by hearing what is presented. Visual learners' best learn by reading or seeing information (text, pictures, video, etc), while those inclined toward the physical domain, learn best by physically doing or participating in physical activity.[17] Incredibly, SHHD gaming appeals to each of these learning preferences. Gaming simultaneously provides audio, visual and physical kinesthetic (provided virtually) in a single platform.[18] This becomes valuable in the school environment by reducing repetitive material that covers the same topic in different learning preferences. This time reduction could shorten a course, provide opportunity for more in depth or tangential learning.

As ALC 2015 laments, Initial Military Training (IMT) is woefully devoid of task repetition opportunity required to master the skill.[19] This is due to a host of reasons including: insufficient equipment, lack of time, inadequate student to equipment rations, or the critical task has been shifted to the operational force for mastery. With SHHD, Soldiers have the opportunity to practice (in a virtual environment) repetitively those step-wise procedure driven tasks critical to their MOS. Thru an engaging crew drill game app, a SHHD (or computer or laptop) can sufficiently replicate any tactical piece of equipment the Army possesses. Executing a drill is now not constrained to the motor pool, tactical site, field, or school. Rather, Soldiers may perform drill at any place or time of their choosing, repetitively, until well learned.[20]

Another significant SHHD advantage is the interest they generate in the user, which leads to a greater propensity and desire for use.[21] For the vast majority of youths, gaming has been a way of life and prominent pastime.[22] A gaming App uses a format which they already enjoy and applies it to constructive learning. "Games can provide the motivation to learn, increasing the likelihood that the desired learning outcomes will be achieved."[23] Gaming enjoyment comes in part from the competitive environment of the game.[24] Army learning games and apps should likewise follow this principle. In this regard, SHHD games that teach Army drills should include rewards for doing things correctly and penalties for improper execution. These rewards should closely mirror those consequences likely to be followed in real life. For example, students improperly connecting a trailer to a prime mover would experience the trailer slipping off the truck and falling to the ground; a likely consequence to improper hook-up in real life. Additionally, games could be scored based on proper sequence, time, safety

observance, etc. This could produce a “game score” to which other iterations by the same Soldier or other Soldiers could be compared. Soldiers would likely compete for best score amongst each other. In the process of this competition, a Soldier would self elect to play (run the drill) repetitively to improve his score. This is precisely what occurred in a test of crew drill software in 3-6 ADA (PATRIOT), an IET ADA School Battalion for enlisted, officer, warrant officer and allied students. As students worked thru their virtual crew drills, they began to compare each other’s results. On their own accord, with zero prompting from instructors, they began competing to beat each other’s time and accuracy mark. Interestingly, “… results of this repetition directly translated to an improvement in performance and proficiency when the soldiers transitioned to live equipment.”[25] As the amount of time spent on a task is an important component to learning, “…the more you spend, rehearsing, exploring options, and studying outcomes, the better you will become at a skill. Games can add to that by encouraging soldiers to spend more time learning a skill,” says Dr Roger Smith, Chief Technical Officer of Program Executive Office for Simulation Training and Instrumentation (CTO PEO STRI).[26] Additionally, exit surveys indicated a near two fold level training interest when SHHD gaming was used versus conventional direct instruction. [27] Soldiers who used gaming crew drills fundamentally outperformed those who did not. When transitioning to live equipment, skills learned in gaming translated directly to the live environment. In other words, Soldiers able to perform the gaming crew drill were able to perform the crew drill on live equipment with only minor exceptions. Those who followed traditional power point instruction were unable to perform the live drill without significant help and instructor prompting.[28] While this test was not conducted under strict experimental

protocols, it clearly indicated significant potential. A formal experiment using these tools has been approved and is being conducted by the Army Research Institute (ARI) in conjunction with Clemson University.

Gaming SHHDs in a blended learning environment will be a tremendous aid to instructors, enabling them to transcend conventional direct learning models in favor of more powerful inquiry based models of learning. With direct learning models, "…learning is focused on mastery of content, with less emphasis on the development of skills and the nurturing of inquiring attitudes."[29] Typically, the instructor provides information about what is known and focuses on the importance of the one right answer.[30] This method is quite limited in its application to today's complex environment. "Memorizing facts and information is not the most important skill in today's world. Facts change, and information is readily available. What is needed is an understanding of how to get and make sense of the mass of data."[31] This method does not teach or reinforce to Soldiers how to think, find information, or interact with their environment/resources to understand and solve problems; all skills critical to success on the battle field.[32] On the contrary, such instruction ill prepares Soldiers for complexity and takes the responsibility for learning off the learner and places it on the instructor. This concept runs directly counter to the objectives outlined in both ALC 2015 and the Army Leader Development Strategy, which highlights essential elements necessary for future leader development.

Inquiry Based Learning (IBL) is a learner centric process that, "…focuses on using and learning content as a means to develop information-processing and problem-solving skills."[33] The essence of inquiry based learning is embodied by the old adage,

"Tell me and I forget, show me and I remember, involve me and I understand." In direct learning models, instructors provide the answers to the students. In IBL, instructors provide information and problems to their students; students find answers thru inquiry, experimentation, and involvement. Context is extremely important in IBL as it helps provide the "why" and potential future application of what is being learned. The outcomes of IBL include understanding (not simple retrieval of facts) of how things are organized, how they change, and how they are interrelated.[34] This understanding is exactly what the Army seeks as it defines the desired qualities of a thinking, adaptive, agile warrior. Understanding is precisely what SHHD gaming provides. Instructors using these devices will truly involve their students in a contextually driven, self-learning and immersive experience that generates understanding.

SHHD training enables instructors to better focus their efforts in two fundamental ways. First, SHHD enables more interesting and digestible pre-work or homework than thru conventional methods such as reading or video. Consequently, students will likely have a better basis of knowledge of basic material. This allows instructors to build on basic understanding, cover more advanced topics, relay context, and answer questions.

SHHD enabled instruction also gives instructors the ability to monitor and evaluate student progress in real-time. Through a dash-board like display, instructors can monitor progress, note students who are excelling, and take notice of students who are lagging behind. In this manner, instructors may focus their efforts by advancing those that excel (perhaps validating their skills on live equipment), and remediate those who require extra help.[35] Importantly, instructor priority and focus would be informed by quantitative data in addition to their own qualitative judgment. Additionally, these same

feedback mechanisms can be used by the student as an after action review (AAR) and feedback. In this manner, Soldiers can correct performance and self remediate.

Accessibility and portability is another critical enabler inherent to SHHD and gaming solutions. Contrary to legacy Army training aids that require specialized high powered computing, SHHD and or laptop computers can utilize commercial off the shelf (COTS) hardware as established by TRADOC's Army Training Support Directorate.[36] In effect, this "unhinges" learning from the classroom and allows Soldiers to effectively train anywhere, anytime, on almost any computer.[37] This facet of SHHD learning enables the institution to reclaim previously unusable blocks of time. Students can be given types of homework and outside of the classroom assignments previously not possible. Additionally, wasted time such as waiting in the dinner line, on a dentist appointment, or other time wasters can now be reclaimed as productive time. Students with medical, dental or other conditions that absent them from training will not necessarily fall behind their peers. This will effectively increase class scores, graduation rates, and more importantly, performance at their first unit of assignment.

This "unhinging" of learning from the class room also opens a new and exciting IMT paradigm shift. Unhinged learning opens the realistic opportunity for accelerated progression (the ability to obtain and validate course requirements quicker and graduating AIT in a shorter period of time), advanced placement (the ability to study subjects in great depth and breadth based on quicker mastery of basic concepts), or broadening opportunity (the ability to study additional subjects of interest outside of the core curriculum such as language training, combatives, college courses, etc). This is not possible under the current IET construct. Current training is based on established

blocks of time on tasks as a function of class load, available equipment, average learning rates, etc. In essence, IMT is a “least common denominator” method of instruction. However, SHHD and gaming may well obviate the need for rigid time blocks. So ingrained is this style of instruction, that TRADOC courses receive resources and “earn” its number of instructors based on Instructor Contact Hours (ICH)’s. The longer and more intensive a course, the more resources the school receives. Based on this dynamic, schools have no incentive to reduce course requirements. On the contrary, schools have strong incentive to justify course length, hence increased resource levels.

In addition to universal access and unhinging learning from the classrooms, SHHD and gaming have the great potential to better link the generating force to the operational. As gaming SHHD tools and applications are developed, they will serve as the standard for what “right looks like.”[38] In essence, these tools will have an over arching standardization effect on the force. The tool first used in the IET environment may be used and expanded in the Operating Force. This standardization creates a great thread of continuity from generating through operating forces. Additionally, these same tools can and should be utilized routinely in the Operating Force. For soldiers performing non-standard extended duties away from their MOS (such as recruiting, drill sergeant, etc), these tools would be an invaluable refresh or “re-green” tool to maintain requisite skills. Additionally, these apps could facilitate new equipment training, mission specific training, etc. In a tactical setting, leaders could perform collective tasks and rock drills with each player of their organization linked via Wi-Fi or internet. This same methodology would stitch together our coalition partners involved in Foreign Military

Sales (FMS). Training apps could be adapted to enable learning in our partner's native language.

During the ARFORGEN cycle, SHHD gaming may mitigate equipment and personnel shortfalls. Units could begin collective training without all equipment or members of the team physically present to begin training. Internet Protocol (IP) based functions allow Soldiers to connect via the internet and participate in individual and collective training events. Training can be conducted and coordinated on the calendar despite physical constraints. Once physical hurdles have been resolved, team members would require little additional training to validate skills in a collective environment in context to future missions. Adding functionality such as terrain mapping, and levels of complexity will further mitigate contextual and real-life issues. The following two examples illustrate these benefits.

Units could better prepare Soldiers for follow on assignments by informing inbound Soldiers of future crew assignments. New members could train individual drills virtually as well as collective drills with their new team in a collaborative web-based environment prior to arrival. This capability could significantly reduce training time associated with condensed and short notice deployments or out of cycle individual replacements.

Units scheduled for deployment could recon, convoy to, and emplace on location virtually via terrain mapping software interface. In effect, units could war game the entire deployment from beginning to end. Leaders could also inject increasing levels of complexity or situations the unit expects to face given the situation. This could include equipment malfunction, fatigue rates, heat degradation, and enemy activity.

In essence, SHHDs become a critical component to a life-long-learning approach advocated by the Army Leader Development Strategy. Eventually, these apps could be made available for download on AKO under specific MOS pages. Each MOS would have a complement of apps and games essential to the performance of that MOS by grade and experience level. These tools would serve as a "cradle to grave" job proficiency resource. Soldiers entering the force would receive a SHHD or password to download apps to their own device. In this manner, Soldiers would begin learning the basic about their job even before entering Basic Training. This capability is dependent on the Army solving security issues associated with these devices. Currently, smart phones and other SHHD do not meet security certifications. Additionally, many well intentioned apps send superfluous data back to app developer servers that could potentially compromise security. As such, SHHD are at risk to hackers, virus, and similar compromise. However, government developers are working on software to be installed on commercially available smart phones that enable classified processing. A version has been authorized for storing classified data, but not yet for transmitting over a cell network.[39]

Perhaps the most compelling and powerful aspect of gaming SHHD is their ability to mitigate resources. Through software, any laptop, smart phone, SHHD has the ability to become virtually any tactical piece of equipment in the Army. It can be used to virtually conduct crew drills, trouble-shoot and perform maintenance procedures, or perform warrior tasks and battle drills (such as performing first aid). While gaming will never remove the need to perform drills on actual equipment, it can dramatically reduce the number required. As initial instruction and training can be accomplished virtually,

equipment requirements are reduced to sets needed for final practice and validation of skills. Equipment not required in the institutional force could be recapitalized back into the force. This lower equipment requirement also significantly reduces the cost of maintenance and the cost associated with future combat systems. SHHD gaming has potential to make modernization more affordable, particularly in an economically austere environment. Moreover, annual savings in terms of maintenance, fuel, storage, and transport will likely increase. From a conservative 30% savings estimate, the ADA Patriot School could likely save three million dollars annually.[40] In contrast to the cost of crew drill gaming applications ($55k for one crew drill; $500K+ for the full complement of march order and emplacement drills), SHHD gaming is a bargain the Army cannot afford to miss. In addition to these explicit costs, gaming has the potential to reap savings in improved safety, less wastage through poorly diagnosed maintenance problems (function of maintenance training) and other such areas.

The following presents an example of how SHHDs could be utilized within an IET Construct. SHHD are ideal in teaching how to perform crew drills. For this purpose, the game or app should utilize three training modes: Tutorial, First Person Game, and Multi-player Mode. The tutorial mode would be designed to walk Soldiers through all the steps associated with utilizing and operating tactical equipment. This tutorial should include narrative explanations (text and speech) coupled with a visual portrayal (animated and actual). The tutorial should be user focused and not instructor focused and includes incremental checks on learning and help functions. Help functions would include video segments of actual soldiers performing each discreet step of these drills in

context. Additionally, the tutorial should raise all salient required/needed knowledge points including all cautions, warnings, and implications of improper/untimely actions.

The next portion of the game or app would be the “First Person Game.” This mode primarily educates and trains individual tasks. In this mode, Soldiers perform the crew drill virtually (i.e., do all the required steps on a computer or SHHD instead of on the tactical equip). This mode should be competitive (consequences for doing well/poor), engaging, and fun. This should be done using two methods: multiple choice and essay.

In Multiple Choice Mode, the Soldier will select from a number choices as to the next step of the drill. A correct response will cause the avatar (his “man” in the game) to execute that portion of the drill. Incorrect responses will illicit increasingly negative comments/actions from his/her crew partner and or leader. As in all other modules, help functions will enable soldiers to view video of that portion of the drill, receive hints, etc. Once Soldiers have mastered this level of recall, they could progress to “Essay Method.” The degree of mental recall and proficiency required for this mode closely resembles that needed to execute a real-life drill. All that is missing in this mode is the physical interface, dexterity, and exertion required of real-life. In this mode, Soldiers receive no visual clues as to the succeeding step. Rather, they must maneuver appropriately thru the drill sequence. For example, if the next step is to deploy launcher outriggers, the soldier will maneuver his avatar to the outrigger control box (using the mouse, pointer, or tilt/ motion control feature of the smart phone)and, tap the outrigger control box (will be a hot button/area). The box will open and expand to a full view of the controls. Again, the soldier will have to manipulate the controls appropriately in the

game to replicate actual actions on a real launcher. The degree of mental recall and proficiency required for this mode of operation closely resembles that needed to execute the drill in real-life. This mode should have two sub-modes: training and evaluation.

The training mode should provide all the complexities of total cognitive recall, but enable helps, cautions, speed-ups, pause, and continue functions. It should also allow links/access to an on-line instructor (in the academic environment). However, the evaluation mode will test the ability of the Soldier to conduct all tasks in sequence, to quality and time standards (ARTEP Standard). There necessarily must be consequence to performing correctly and incorrectly. For example, if the travel lock pins are not removed prior to elevating the launching station, the elevator controls rods will break, and pins bend, as it would in real-life. This mode must be competitive and scored as in an ARTEP/Gunnery Evaluation. This score/evaluation will be a strong indicator of performance on the actual life drill (except for the physical demands associated with the drill).

Another mode of operation is Multi-player. This mode trains and educates soldiers on collective tasks enabling multiple players to collaborate on a crew drills in real time. What Crew Member One does will be seen and will impact Crew Member Two's (three, four, etc) drill. This methodology requires connectivity via the intranet, Wi-Fi, hard-line, etc. As in the single player mode, multi-player mode needs to have a training and evaluation mode. This functionality allows crew members to train collaboratively without physically being collocated. For example, during after duty study time, a Soldier could perform her portion of the drill from her barracks room, while the

other Soldier performs his portion from his room. Additionally, Soldiers could be connected via chat, white board or other method to the CQ (Charge of Quarters; NCO responsible during off duty hours). In the course of study Soldiers could query their certified instructor CQ for help.

An assessment module that measures indicators such as: time spent on each step, accuracy, safety, frequency of use, score, safety evaluations, etc would be inherent to the application. In the school environment, this function provides student help and focus instructor efforts and resources. As mentioned earlier, these functions would assist instructors asses student proficiency, need for acceleration or remediation, and identify learning trends or gaps (ie, the entire class is having difficulty with concept "X"). Feedback mechanisms could also establish links to address training methodology or game deficiencies.

In conclusion, SHHDs will change how the Army educates Soldiers in IET. SHHDs will not simply augment current training, but revolutionize how Soldiers train in order to mitigate resource requirements (time, personnel, maintenance cost, tactical equipment costs, fuel, facilities, etc) by transforming these devices virtually into any tactical piece of equipment. SHHD gaming supports individual focused blended learning bridging the Generating and Operating Force to provide distributed lifelong learning. SHHD gaming leverages technology, caterers to student learning preferences, empowers instructors, takes advantage of modern generation digital proclivities, provides hand on interactive learning, and provides unparalleled access and portability. SHHDs well address TRADOC's challenge to train and educate faster, better, on a wider range of tasks, all with fewer resources. Likely SHHD gaming will

better accomplish readiness objectives faster and less expensively. Importantly, this methodology applies to all weapon systems and equipment, particularly those that employ crew drills. Implications for this methodology apply to all branches of the Army and components of DOD with value to other government agencies and partner FMS countries.

Endnotes

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