(U.S. Army photo by Spc. Jonathan Wallace taken July 24, 2019) U.S. Army 1st Sgt. David Rogers of Headquarters and Headquarters Company, and 1st Sgt. Larry Milner of Charlie Company, 2nd Battalion, 69th Armored Regiment, 2nd Armored Brigade Combat Team, 3rd Infantry Division, create enemy combatants in a virtual battlespace as a part of their class on Combined Arms Concept and Integration at Fort Stewart, Georgia, July 24, 2019.

The Effectiveness of Virtual Simulation as a Training Tool

By Staff Sgt. Frank Lyndall III

4th Security Force Assistance Brigade

Since the Middle Ages, instructors, trainers, and teachers have utilized simulations of various types to augment learning. For example, knights utilized wooden swords when training in order to mitigate the risk of serious injury (Lindholm & Svard, 2008). The use of simulations has progressed throughout the years with each technological advance and now includes virtual reality (VR). This article will highlight the history of VR, its uses, monetary value, and implementation practices.

Virtual Reality in Education

Virtual reality is defined as "an artificial environment which is experienced through sensory stimuli (such as sights and sounds) provided by a computer and in which one's actions partially determine what happens in the environment" ("Virtual Reality," n.d.). It is most commonly associated with the head-mounted viewing display first patented in 1960 by Morton Heilig ("History of Virtual Reality," n.d.). Originally designed to view film without motion tracking, it has evolved into a tool with extensive educational possibilities.

The social platform/game Second Life, created in the early 2000s, was one of the first, and most popular, early virtual worlds (Jamison, 2017). It was immersive, allowing users to be fully interactive. Users could purchase property and perform almost any job or task they could in the real world. This ability to interact or "live" in a virtual environment became celebrated for its ability to support learning with the use of in-game artifacts of realistic design that would most likely be too expensive for the average person,

NCO Journal provides a forum and publishing opportunity for NCOs, by NCOs, for the open exchange of ideas and information in support of training, education and development.
https://www.armyupress.army.mil/Journals/NCO-Journal/

or secured in a museum in the real world. This ability to experience situations and objects normally out of reach for average people, has gained popularity, and led to institutions, like the Guggenheim Museum and The Museum of Modern Art, developing their own virtual tours in order to display their art and reach an audience that cannot physically attend (Schaltegger, 2020; Coates, 2020).

A study conducted on games, virtual worlds, and simulations by Merchant et al., (2014), found that virtualization was an effective form of instruction and found virtual games displayed higher learning gains when compared to other virtual methods. The ability to fabricate a world that mimics learning environments and immerses the user within the information presented has been found to be more beneficial than traditional solely text-based teaching methods.

Cost Benefit

Unclassified open source contracts for virtual and augmented simulation training for the U.S. Army totaled $2.7 billion in 2019, has risen to an estimated $3 billion in 2020, and is expected to grow to over $19 billion by 2027 (Harper, 2019; Mayfield, 2019). While this number seems large, it is actually cost-effective and affordable when compared to traditional training costs as VR and simulations do not have travel costs, expensive munitions, fuel, or any other overhead cost normally associated with a training exercise. There are also reduced risks for Soldiers as they virtually use weapons, operate an array of vehicles, or practice team, squad, and full unit tactics in a vast range of simulated environments with adaptable stressors (Velichko, n.d.).

The current problem across the technological advancement field is that the military currently lacks a true cost benefit model accounting for all variables. This is a common issue amongst several professional fields, not just the military. In 2015, Grace Carolan-Rees and Alistair Ray were able to closely determine the viability of replacing traditional training methods in the obstetrics and gynecological field with the ScanTrainer ultrasound VR training simulator (Carolan-Rees & Ray, 2015). With technology continuing to make progress, and other fields creating accurate VR cost benefit analysis, the military needs to establish its own standardized and reliable cost benefit analysis. This will help not only the military as a whole, but also individual units as virtual technology advances, decreases in cost, and units want to procure their own training simulations and software to quickly and efficiently prepare for specific deployments.

Implementation

Virtual simulations have been used successfully by the U.S. military for decades. From historic basic flight simulators to the cutting-edge virtual battlespace synthetic training environment that is being developed by Army

(U.S. Army photo by Markus Rauchenberger taken Feb. 13, 2020) U.S. Army Soldiers assigned to 10th Special Forces Group (Airborne) fire an M3E1 Multi-Role Anti-Armor Anti-Personnel Weapon System during a Reconfigurable Virtual Trainer demonstration at the 7th Army Training Command's Grafenwoehr training area, Germany, Feb. 13, 2020.

Futures Command, the military has never been shy about using technology to prepare its members to accomplish their missions. Even beyond creating entire virtual cities to train in, the military is using virtual reality to treat returning combat veterans suffering from Post-Traumatic Stress Disorder (PTSD). By utilizing a secure and controlled environment, medical personnel can control the amount and type of exposure to stressors that cause PTSD to surface (Parkins, 2017). This allows the patient to become desensitized over time and better recognize and manage their stress and anxiety from certain stimuli.

The Future

Technology has advanced exponentially in the last decade and VR simulations and training have shown great results in increasing Soldier information retention and preparedness, but there are several areas that can be focused on in order to best incorporate this technology into the Army's regular training cycles.

A study conducted by the Rand Corporation in 2019 on simulation-based training in the Army noted these areas for improvement (Straus et al., 2019):

1. Revise training policies and doctrines – VR will become a more accepted form of training if it is officially included in command policy and doctrine.
2. Improve and standardize measures of performance – there needs to be a standardized grading or reporting process across the force.
3. Ensure that unit leadership has access to training support packages – the training support packages should include scenarios and educationally-based performance measures.
4. Collect data – units should collect data on training evolutions to evaluate, adapt, and improve effectiveness.

5. Experiment – units should occasionally experiment or hold demonstration projects to test the effectiveness of their simulations. The data from these experiments should be used to direct future training.

Conclusion

While VR is an improved, and lower cost method of training, real-world training must also still have its place. This new advancing technology opens up an extensive amount of new possibilities, but Soldiers should not be deployed into combat without ever having fired a real weapon. However, VR is a high-performing educational tool that prepares Soldiers for the future fight. If the Army can adapt their doctrine and policies to better incorporate VR, it will be even more effective Army-wide. ■

References

Carolan-Rees, G., & Ray, A. (2015). *The ScanTrainer obstetrics and gynaecology ultrasound virtual reality training simulator: A cost model to determine the cost viability of replacing clinical training with simulation training*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4760578/

Coates, C. (2020). *Virtual Reality is a big trend in museums, but what are the best examples of museums using VR?* Museum Next. https://www.museumnext.com/article/how-museums-are-using-virtual-reality/

Harper, J. (2019). Army spending big on training, modeling, simulation. *National Defense Magazine*. https://www.nationaldefensemagazine.org/articles/2019/12/2/army-spending-big-on-training-modeling-simulation

History of Virtual Reality. (n.d.) Virtual Reality Society. https://www.vrs.org.uk/virtual-reality/history.html

Jamison, 2017. (2017). The digital ruins of a forgotten future. *The Atlantic*. https://www.theatlantic.com/magazine/archive/2017/12/second-life-leslie-jamison/544149/

Lindholm, D. & Svard, P. (2008) *Sigmund Ringeck's knightly art of the longsword*. Paladin Press.

Mayfield, M. (2019). Web exclusive: Training and simulation market expected to grow. *National Defense Magazine*. https://www.nationaldefensemagazine.org/articles/2019/7/29/new-training-and-simulation-tech-could-lower-military-training-costs

Merchant, Goetz, Cifuentes, Keeney-Kennicutt, & Davis. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education*, 70(C), 29-40.

Parkins, S. (2017). How virtual reality is helping heal Soldiers with PTSD. *NBC News*. https://www.nbcnews.com/mach/innovation/how-virtual-reality-helping-heal-soldiers-ptsd-n733816

Schaltegger, M. (2020). These iconic museums offer virtual tours perfect for when you're stuck at home. Thrillist. https://www.thrillist.com/news/nation/virtual-museum-tours

Straus, S. G., Lewis, M. W., Connor, K., Eden, R., Boyer, M. E., Marler, T., Carson, C. M., Grimm, G. E., & Smigowski, H. (2019). *Collective simulation-based training in the U.S. Army*. Rand Corporation. https://www.rand.org/content/dam/rand/pubs/research_reports/RR2200/RR2250/RAND_RR2250.pdf

Velichko, M. (n.d.). VR military training – the next step of combat evolution. https://jasoren.com/vr-military-training-the-next-step-of-combat-evolution/

Virtual reality. (n.d.). *Merriam Webster Online*. https://www.merriam-webster.com/dictionary/virtual%20reality

Staff Sgt. Frank Lyndall is a satellite communications (SATCOM) systems NCO in the U.S. Army. He is currently serving as the SATCOM operations NCO for 4th Security Force Assistance Brigade. He previously served as a satellite systems supervisor in 30th Signal Battalion and SATCOM operations NCO in 2nd Brigade, 101st Airborne Division (Air Assault). He will be graduating with a master's degree in education from Central Michigan University this August.

NCO JOURNAL

https://www.armyupress.army.mil/Journals/NCO-Journal/
https://www.facebook.com/NCOJournal
https://twitter.com/NCOJournal