

## Evaluate the Benefits of Employing Immersive Learning Techniques: Improve the Effectiveness of Sexual Assault and Prevention (SAPR) Training

Kellie A. Hill  
Air University eSchool  
Air Command and Staff College (ACSC)-On-line Master's Program (OLMP), Maxwell AFB, AL  
[Kellie.Hill@us.af.mil](mailto:Kellie.Hill@us.af.mil)

### ABSTRACT

Imagine it is 1984 and you are a 17-year-old female civil servant, a teenager in a male-dominated workforce; this was a recipe for disaster. Imagine also that this young female civil servant was sexually harassed several times during her initial career into the Air Force. Today's Zero Tolerance Policy has been effective in changing the culture of the 1980s and 1990s. The Air Force has come a long way since 1984! Nonetheless, it is our responsibility to do everything possible to ensure Zero Tolerance is not a catchphrase but reality for every single Airman.

There is an increased cost for immersive training; however, the Air Force cannot afford the price of a single Airman suffering from sexual assault or harassment. Airmen receive state-of-the-art training for hard skills, such as piloting, maintaining, and sustaining billion-dollar weapon systems. The Air Force misses the mark when training soft skills, such as leadership, communication, listening, adaptability, teamwork, and respectful behavior. Understanding the nuances of Sexual Assault and Prevention (SAPR) training is more than the explicit, illegal behavior of physical assault; this training must teach the gray areas of harassment and prevention. Those gray areas include teaching consequential behavior, respect, reading body language, and many more skills not conveyed by PowerPoint presentations. Today's digitally native workforce is most comfortable online, making soft training skills more critical than ever (Hansen, 2018).

The standard training method for SAPR is low-tech and non-immersive. This paper contends that the Air Force would improve SAPR training by employing immersive learning techniques. This paper will utilize Ruscella's and Obeid's Taxonomy for Immersive Experience Design chart (2021) to measure and compare the effectiveness between PowerPoint training and immersive experiential training methods. The result will provide evidence to support the investment in immersive technologies to improve programs across the Department of Defense

### ABOUT THE AUTHOR

**Kellie Hill** serves as the Supply Chain Sustainment Flight Chief for the KC-135 Weapon System for the United States Air Force at Tinker Air Force Base, Oklahoma. She earned a Bachelor of Liberal Studies from the University of Oklahoma and a Master of Military Operational Art and Science from Air University in April of 2023. Her civil service career began in 1984 at Tinker, where she served in Supply Chain until 1990, then continued in positions at Altus Air Force Base, Oklahoma, Randolph Air Force Base, San Antonio, Texas, and Ramstein Air Base, Germany until stepping away from civil service in 1997. During those following years, she served as an Active-Duty Air Force spouse and assisted military communities worldwide. In 2016, Kellie returned to civil service, supporting the sustainment of several weapon systems, including B-52, KC-46, B-1, E-3, and KC-135. She trained over 300 individuals as the Squadron level SAPR trainer in 2018.

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## INTRODUCTION

In early 2004, former Secretary of Defense Donald H. Rumsfeld directed senior staff members to review the Department of Defense (DoD) policy and process for the treatment and care of victims of sexual assault in the military. In January 2005, DoD implemented a policy on prevention and response to sexual assault. Later that year, working with chaplains, lawyers, and law enforcement agents, the DoD trained over 1,200 individuals to become the newly defined Sexual Assault Response Coordinators (SARCs). The official DoD Directive 6495-01, Sexual Assault Prevention and Response Policy became official in October 2005. Since then, the military services have trained "more than 1,000,000 service members and established sexual assault program offices at all major installations" (United States Department of Defense Sexual Assault Prevention and Response, 2023). Seventeen years later, the Sexual Assault Prevention and Response Office (SAPRO) serves as the single point of oversight charged to "create a climate of confidence and trust where everyone is afforded respect and dignity" (p. Ibid.).

In many organizations across the Air Force, the solution to the DoD directive has been to develop hour-long PowerPoint presentations that cover the required points and attempt to clarify the clearcut areas of sexual assault and shed some light on the gray areas of sexual harassment within our workplace. Before the pandemic, this annual requirement was held in a large conference room, or the base theater, with 50-200 individuals listening to an hour-long slide presentation, which included short 2-minute videos. In smaller groups, it would be the same but include one or two interactive exercises. Over the last two years, the interactive training has diminished even further to a Microsoft Teams presentation encompassing 100 or more Airmen at a time. Today the Air Force has a vast array of technological advancements available that could improve the effectiveness of this critical Soft Skill training. This paper will explore and measure several opportunities to utilize Immersive Learning Environments (ILE), such as virtual reality (VR), mixed reality (MR), and augmented reality (AR).

Despite the decade-plus efforts, the trend of incidents has remained relatively the same and, in some instances, increased over the years (Barry, et al., 2020; Breslin & Davis, 2019; Mileva, 2021). Statistics paint the picture that the DoD is failing to meet the intent of the directive to protect the military workforce by significantly impacting the incidents of assault and harassment through education and accountability. Across services, including the military academies, a RAND Corporation report identified an overall increase in reported incidences of both sexual harassment and assault. The survey lists several recommendations regarding improved deterrence. Still, it recognizes deterrence alone fails to get to the heart of the issue and change the culture through impactful training for every service member. The RAND study states explicitly, "[The] Office of Secretary of Defense (OSD) should...implement prevention practices that reflect the best evidence available and involve comprehensive planning and continuous evaluation (i.e., phasing out lecture-based trainings)" (Acosta, Chinman, & Shearer, 2021, p. 3). Utilizing emerging opportunities through ILE will take this policy from a directive to a culture within the Air Force that is, without exception, one of zero tolerance.

This paper will utilize Ruscella's and Obeid's Taxonomy for Immersive Experience Design (Ruscella & Obeid, 2021) to rank immersive experience elements and thus assign a numeric value to the various SAPR training methods currently employed within the United States Air Force along with different ILE methods. The use of the Taxonomy of Immersive Experience will serve to identify the most effective method of training, one that will leave the learner with an experience that will best equip our Air Force to truly become a positively changed culture of trust where every member is valued and respected, in turn, better equipped to serve the task of Mission First, People Always. The first section of this paper will define the language used in the taxonomy chart, describe the various immersive technologies and their benefits, and share some current methods used in the Air Force today. Secondly, this paper will apply the taxonomy methodology to weigh various methodologies for facilitating a positive culture change

within the Air Force. Finally, this paper will present the reader with clear choices for the most impactful way forward to meet the true intent of DoD Directive 6495-01.

## **BACKGROUND**

### **Define Immersive Learning Environments, Experiential Learning, Presence, and Immersion**

Immersive Learning Environments include training simulations done in virtual reality (VR), mixed reality (MR), and augmented reality (AR) or a combination. These immersive learning tools pull learners into an experience, not a lecture. According to a study conducted by the Biotechnology and Biological Sciences Research Council, "learning from experience actually changes the circuitry in our brains so that we can quickly categorize what we are seeing and make a decision or carry out appropriate action" (Biotechnology and Biological Sciences Research Council, 2009). Humans make decisions and react to situations based on a personal database of collected experiences. This database becomes an intrinsic part of a person's decision-making toolbox. Think of a small child; a parent says, "No, HOT!" and the child may stop because of the tone of voice of the parent. Still, the next time the child sees the pretty flames behind a fireplace screen, and the parent is not there with the voice, and the child may reach out and touch the hot fireplace screen and get burned. The experience of being burned will, for the rest of the child's life, equip them to quickly decide whether to touch a flame, regardless of where they see it. Telling the child something, even from a person of authority, is not as effective as the child experiencing it, which internalizes that experience into the child's growing databank.

Experiential learning was first defined as a method of learning by David Kolb. Kolb built his theories from studying the original works by earlier theorists Dewey, Lewin, and Piaget. Experiential learning is intrinsically woven into having experiences, not just watching experiences. "An experience is always what it is because of a transaction taking place between an individual and what, at the time, constitutes his environment, whether the latter consists of persons with whom he is talking...a book...or the materials of an experiment he is performing" (Dewey, 1938, pp. 39, 42-43; Kolb, 1984, p. 35). Experiences are building blocks in the process of learning. It is not necessarily the repeating of processes that expands learning, but the experience of new, challenging, emotional, and interactive experiences that impacts the effectiveness of learning. Think of the adage, "He doesn't have 20 years of experience, but one year repeated 20 times" (Kolb, 1984, p. 35). True knowledge cannot be attained or conveyed; learning must be experienced to be transformative (pp. Ibid, 38). For a person to gain transformative knowledge on a subject, they must be changed by learning; the knowledge itself will settle into the building blocks of the person.

The effectiveness of experiential learning can be further described by understanding two more principles, Immersion and Presence. Immersion is measurable as the range of sensory input from a virtual simulation. The more available inputs, such as haptic gloves, VR headset, interaction with another person or people, music, sounds, motion, or even smell, will deepen the level of immersion a person will experience in VR. Presence is a valuation of how deeply a person feels the simulation is happening around or to them. The illusion is intuited, not cognitive; the brain-body system reacts immediately to the virtual environment. The cognitive system will eventually process the intuited perception and reach a conclusion regarding reality and perception (Berkman & Akan, 2018).

### **Define the Importance of Soft Skills**

Teaching soft skills to our workforce is critical; the Air Force must use the latest technologies and techniques to train them. Soft skill training is proven to be essential for the long-term success of a healthy and productive team member. Here are findings from four respected research institutions: Stanford Research Institute and the Carnegie Mellon Foundation studied 500 Fortune 500 CEOs and found that only 25% of job success resulted from an employee's technical skill and an astounding "75% of long term job success resulted from soft skills mastery"; Boston University and University of Michigan's Ross School of Business collaborated on a study that found productivity among employees with soft skills training were 12% more effective than those that did not receive the training; Harvard University study found 85% of employee's success was attributed to the employee's soft skill mastery and "only 15% to technical skills"; McDonald's corporation in the United Kingdom collaborated with other research organizations and "predict over half a million people will be held back from job sectors by 2020 due to lack of soft skills" (Vasanthakumari, 2019).

ILE methods to build and grow our workforce in the soft-skill areas, such as for SAPR, are highly effective because the learner is gaining experiences, not just being fed information (Clayton & Straub, 2020). ILEs naturally use the power of the human brain to “create an emotional response that leads to employee buy-in, skills retention, and behavioral change” (Gaffney, 2022). Immersive learning is precisely the training the RAND study recommended for the OSD (Acosta, Chinman, & Shearer, 2021) to improve today’s SAPR training. Immersive learning will change and empower the learner to interpret and internalize the concepts, especially those gray area soft skills, not just explain them.

**Define the Compared Learning Environments**

Below is a short description of each of the learning environments that will be measured using the Immersive Taxonomy Chart (Ruscella & Obeid, 2021), including in order of anticipated least to most immersive: PowerPoint slide presentation, 360-degree video presentation, Human-in-the-Loop Simulations (HILSims) (both Witness and Participant) using digital puppeteering.

**PowerPoint Slide Presentation**

Flat presentations are best used to impart information, such as metrics presentations, business plans, or statistics. This two-dimensional type of presentation is useful as reference material because it can be electronically searchable, easily saved, printed as a hard copy, and shared. Traditional slide presentations are helpful as reference tools; however inadequate for training soft skills or invoking emotion.

**360-degree Video**

Immersive video experience visually places the viewer in the room or place with the ability to turn and look from a 360-degree perspective. 360-degree viewings incorporate perspective, which allows the participant to see the space and experience the situation from the perspective of different players within the scenario or various positions in the location. The 3-dimensional effect of participating in a 360-degree video experience creates a feeling of being or sharing in a situation rather than watching a non-immersive 2-dimensional presentation.

**Human-in-the-Loop Simulations (HILSims) with Digital Puppeteering**

“Human-in-the-loop simulation (HILsim), defined by the Department of Defense (DoD) in the Modeling and Simulation Glossary as a simulator “that employs one or more human operators in direct control of the simulation/simulator or in some key support function that is used to develop leadership and soft skills” (Clayton & Straub, 2020; Department of Defense, 2022). These simulations employ a virtual reality avatar controlled by a human using a computer interface which brings emotional intelligence, role-playing, and improvisation into the learning environment in a non-threatening way (Clayton & Straub, 2020). “Avatars are digital characters in VR or AR controlled by humans” (Blascovich & Bailenson, 2011).

**Defining the Taxonomy for Immersive Experience**

Level	Interactivity	Embodiment	Co-Participation	Story	Dynamics	Gamification	Immersive Tech	Meta Control	Didactic Capacity
☆☆☆☆	Passive	Detached	Single-Player	No Story	Pre-determined	Ungamified	None	No Meta-Control	Elemental
☆☆☆☆	Participatory	Watcher	One-on-One	Setting	Choice	Instruction	AR	Journey	Explicit
☆☆☆☆	Physicalized	First-Person POV	Secondary Perspective	Pre-Created	Multi-Thread	Reinforcement	360° media	Character	Implicit
☆☆☆☆	Problem Solving	Movement	Group	Choose Your Own	Free Will	External Process	VR	World Builder	Recall
☆☆☆☆	Interpersonal	Human2Human Interaction	MMO	Interactive Story	Convo-Reality	Reward System	XR	World Master	Synthesis

**Figure 1. A Taxonomy for Elements/Dimensions of an Immersive Experience (Ruscella & Obeid, 2021)**

Figure 1 is the taxonomy chart developed by Ruscella and Obeid and will be the tool used to measure the effectiveness of the varying immersive learning experiences described above for training SAPR to Airmen. The horizontal axis lists the nine elements of an immersive experience; each is described further detail in the Taxonomy Framework Pocket Guide (Ruscella & Obeid, 2021). The vertical axis measures the level of immersion from lowest to highest. To utilize

this taxonomy chart as a tool to measure a program's immersive learning effectiveness, each type of training is assessed and matched to the correct element and the level of immersion, resulting in a score (Ruscella & Obeid, 2021). It is essential to recognize this score identifies the level of immersion for each technique; it does not imply that it is the best overall solution. The executability and cost-benefit must be considered when developing the case for a particular method of SAPR training for the Air Force to implement. Fiscal and mission constraints do not allow unlimited funds or time; therefore, cost benefit analysis must be considered with regards to both the time and dollars required for each training method.

## APPLY TAXONOMY FOR IMMERSIVE EXPERIENCE TO MODES OF LEARNING

This section will apply the taxonomy measurements to each method of training described above. Below each method of training is a bulleted assessment based on the Taxonomy chart, as follows: PowerPoint Slide, 360-Degree Video, and Human-in-the-Loop Simulations (HILSims) using Digital Puppeteering, both Participant and Witness. The result will be used to measure the effectiveness of each method in imparting the knowledge and enhancing the soft skills necessary for SAPR training (Ruscella & Obeid, 2021). Each learning scenario will utilize a video scene set in an office with three individuals. Individual-one is sitting at a desk working at a computer; individual-two walks up and stands very close, pressing against the person sitting with the side of their body, then placing a hand on the other person's shoulders and back; individual-three walks upon the scenario.

### PowerPoint Slide Presentation

Currently, the primary method of SAPR training is the traditional PowerPoint presentation, with the available addition of a short YouTube-style video portraying the office scene described above. The in-person PowerPoint presentation is offered annually in small groups of 30-40 or in a sizeable theater-type setting with 100 or more individuals. The training can also be provided to many individuals in a virtual environment using an application such as Microsoft Teams or Zoom; attendance is only limited by the network or application capacity. The embedded video adds an element of emotional impact. Still, the level of influence depends on the quality and content of the video and whether the video is presented in a large or small group. In a large auditorium, the effect of a short video portraying a scenario has less personal impact than in a small group where group dialog could follow. The PowerPoint presentation provides no one-on-one interaction.

- **Interactivity; Passive; 0 Points:** The slide presentation is given and received in lecture style.
- **Embodiment; Detached; 0 Points:** The student does not experience the training, just receives it.
- **Co-Participation; Single Player; 0 Points:** The student does not have real-person contact.
- **Story; Pre-Created; 0 Points:** The student has no influence over the stories shared in the presentation or the video scenarios shared during the presentation.
- **Dynamics; Pre-Determined; 0 Points:** The student does not have the ability to influence the story.
- **Gamification; Ungamified; 0 Points:** This is not interactive with rules of engagement or participation.
- **Immersive Tech; None; 0 Points:** No immersive technology is presented.
- **Meta Control; No Meta Control; 0 Points:** The user has no control over the experience.
- **Didactic Capacity; Explicit; 1 Point:** The learning is direct and instructional.

**Total Points: 1**

PowerPoint Slide Presentation - 1 Pt Total									
Level	Interactivity	Embodiment	Co-Participation	Story	Dynamics	Gamification	Immersive Tec	Meta Control	Didactic Capacity
0 Pts	Passive	Detached	Single-Player	No Story	Pre-determined	Ungamified	None	No Meta-Control	Elemental
1 Pt	Participatory	Watcher	One-on-One	Setting	Choice	Instruction	AR	Journey	Explicit
2 Pts	Physicalized	First-Person POV	Secondary Perspective	Pre-Created	Multi-thread	Reinforcement	360 Media	Character	Implicit
3 Pts	Problem Solving	Movement	Group	Choose Your Own	Free Will	External Process	VR	World Builder	Recall
4 Pts	Interpersonal	Human2Human Interaction	MMO	Interactive Story	Convo-Reality	Reward System	XR	World Master	Synthesis

Figure 2. Taxonomy; PowerPoint Presentation

### 360-Degree Video Presentation, No Wearable Equipment

The 360-degree video method of training would utilize an immersive video experience that allows the student to witness various points of view as they watch the scenario play out from the perspective of several players. A 360-degree video gives a viewer a feeling of being surrounded by a scene. In the 360-degree version of the scenario described above, the 360-degree perspective would allow the presenter to share different versions of the video, such as from any of the three players or an overhead view. This ability to change perspective imparts a more profound sense of emotional learning.

- **Interactivity; Participative; 0 Points:** The student cannot change the outcome or interrupt the scene.
- **Embodiment; Watcher; 1 Point:** The student is part of the experience but has no influence over it.
- **Co-Participation; Single Player; 0 Points:** The student is alone with no real personal contact.
- **Story; Setting; 1 Point:** The student can infer a time and place from the 360-degree video.
- **Dynamics; Pre-determined; 0 Points:** The user has no influence on the outcome of the experience.
- **Gamification; Ungamified; 0 Points:** The student may not change perspective, move, or look around the setting without wearable equipment.
- **Immersive Tech; None; 0 Points:** No immersive technology is presented.
- **Meta Control; No Meta Control; 0 Points:** The user has no control over the experience.
- **Didactic Capacity; Explicit; 1 Point:** The learning is direct and instructional.

**Total Points: 3**

360-Degree Video Presentation, No Wearable Equipment - 3 Pts Total									
Level	Interactivity	Embodiment	Co-Participation	Story	Dynamics	Gamification	Immersive Tec	Meta Control	Didactic Capacity
0 Pts	Passive	Detached	Single-Player	No Story	Pre-determined	Ungamified	None	No Meta-Control	Elemental
1 Pt	Participatory	Watcher	One-on-One	Setting	Choice	Instruction	AR	Journey	Explicit
2 Pts	Physicalized	First-Person POV	Secondary Perspective	Pre-Created	Multi-thread	Reinforcement	360 Media	Character	Implicit
3 Pts	Problem Solving	Movement	Group	Choose Your Own	Free Will	External Process	VR	World Builder	Recall
4 Pts	Interpersonal	Human2Human Interaction	MMO	Interactive Story	Convo-Reality	Reward System	XR	World Master	Synthesis

Figure 3. Taxonomy; 360-Degree Video

### Human-in-the-Loop Simulations (HILSims) Using Digital Puppeteering

Utilizing Human-in-the-Loop Simulations (HILSims) with Digital Puppeteering gives the student or students via VR headsets the ability to participate in the scene using individual avatars. The students are assigned a role in a pre-determined set. They are also given the rules of engagement, questions, and scenarios in advance. The student will then take those parameters and enter the scenario. The student will embody an avatar and engage with another avatar controlled through a computer interface by a digital puppeteer. The puppeteer can interact and prompt questions and interactions with the student via their avatar. One or two students would wear a VR headset in the three-person office scene and enter the virtual location as an avatar. The digital puppeteer would participate in the scene by operating the antagonist avatar. The students could exchange roles between the worker sitting and the co-worker walking upon the scene to allow for differing perspectives and following different rules of engagement.

HILSims can be projected as a video to several viewers simultaneously, as a recording, or in real-time. This flexibility magnifies the reach of the training to multiple users at one time and requires a minimal number of VR headsets. This environment is more interactive than a scripted YouTube or 360-degree video because it involves students interacting in real time with a puppeteer. However, the student-witness would gain a different immersive experience than the student-participant. For the student-witness, the level would be like that in the 360-degree experience with an additional five points added for synthesis and perspective.

- **Interactivity; Participative; 0 Points:** The student cannot change the outcome or interrupt the scene.
- **Embodiment; Watcher; 1 Point:** The student is part of the experience but has no influence over it.
- **Co-Participation; Secondary Perspective; 2 Points:** The student is interacting and observing other participants.

- **Story; Setting; 1 Point:** The student can infer a time and place.
- **Dynamics; Pre-determined; 0 Points:** The user has no influence on the outcome of the experience.
- **Gamification; Ungamified; 0 Points:** The student may not change perspective, move, or look around the setting without wearable equipment.
- **Immersive Tech; None; 0 Points:** No immersive technology is presented.
- **Meta Control; No Meta Control; 0 Points:** The witness has no control over the experience.
- **Didactic Capacity; Synthesis; 4 Point:** The learning is experiential.

Human-in-the-Loop (HILSims) Using Digital Puppeteering-Witness - 8 Pts Total									
Level	Interactivity	Embodiment	Co-Participation	Story	Dynamics	Gamification	Immersive Tec	Meta Control	Didactic Capacity
0 Pts	Passive	Detached	Single-Player	No Story	Pre-determined	Ungamified	None	No Meta-Control	Elemental
1 Pt	Participatory	Watcher	One-on-One	Setting	Choice	Instruction	AR	Journey	Explicit
2 Pts	Physicalized	First-Person POV	Secondary Perspective	Pre-Created	Multi-thread	Reinforcement	360 Media	Character	Implicit
3 Pts	Problem Solving	Movement	Group	Choose Your Own	Free Will	External Process	VR	World Builder	Recall
4 Pts	Interpersonal	Human2Human Interaction	MMO	Interactive Story	Convo-Reality	Reward System	XR	World Master	Synthesis

Figure 4. Taxonomy; HILSims-Witness

HILSims using VR headset from the participant perspective dramatically increases the ILE impact (see below). The addition of a professional puppeteer also adds a deeper level of interaction with the student.

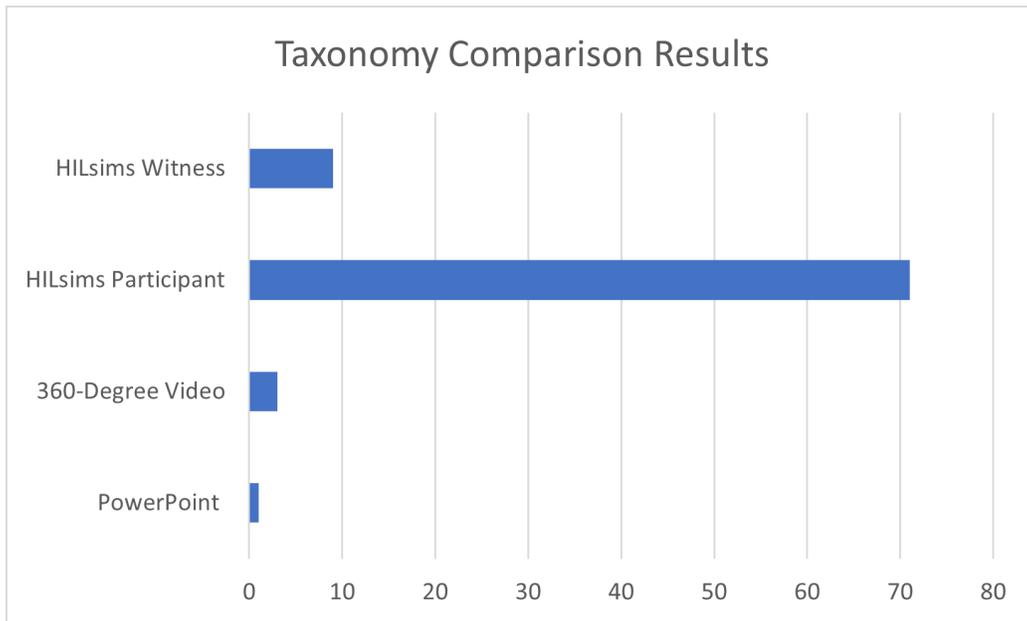
- **Interactivity; Participatory (1), Physicalized (2), Problem Solving (3), and Interpersonal (4); 10 Points:** - The student is participating by answering or asking questions. They are physically represented by the embodiment of their avatar and physically engaged by speaking and interacting with the digital puppeteer’s avatar. The student must problem-solve by working through scenarios and making decisions based on the interaction with the digital puppeteer’s avatar. Finally, this method develops interpersonal skills by requiring practiced communication with another avatar.
- **Embodiment; First-Person POV (2), Movement (3), Human-to-Human Interaction (4); 9 Points:** The student is participating from a first-person point of view and, depending on the level of hardware will be able to move around or even pick up objects. Finally, this scenario allows the student to be fully immersed in a human-to-human scenario using avatars, both controlled by a human (student and puppeteer).
- **Co-Participation; One-on-One (1), Secondary Perspective (2), Group (3); 6 Points:** The student is engaged with another person via the avatars, all the participants are experiencing a physicalized experience. More than one person can participate in the scenario.
- **Story; Setting (1), Pre-Created (2), Choose Your Own (3), Interactive Story (4); 10 Points:** In an interactive HILsim the story is set up, but the interaction is in real-time, so the storyline and outcome could change based on the student’s responses to the puppeteer and vice versa. It has the potential to be fully interactive.
- **Dynamics; Choice (1), Multi-threat (2), Free Will (3), Conversational Reality (4); 10 Points:** The student will be engaged by the puppeteer and, in turn, will choose their response; each response will drive the next by the live interaction with the puppeteer. The student can exercise free will in each reaction in a conversational virtual reality interchange with the puppeteer.
- **Gamification; Instruction (1), Reinforcement (2), External Process (3), Reward System (4); 10 Points:** The student has a specific guideline to follow. The puppeteer will engage in behavior encouraging participation and infer success or failure. The rules of engagement must be followed for the experience to be effective. If the student does not participate within the prescribed boundaries or engage, the outcome will not be satisfactory.
- **Immersive Tech; Virtual Reality (3); 3 Points:** The experience is in an artificial computer-generated environment that surrounds the student and engages their audio, visual, and, sometimes, haptic senses.
- **Meta Control; Character (2); 2 Points:** Students can personalize their avatars.
- **Didactic Capacity; Implicit (2), Synthesis (4); 6 Points:** The student’s learning is derived from the total experience through discovery using multiple ideas and real-life experience combined to lead the student to make decisions that drive the outcome of various scenarios. The result is a bank of lasting experiences that can influence the student’s abilities to make decisions and recognize scenarios in the real world.

**Total Points: 71**

Human-in-the-Loop (HILsims) Using Digital Puppeteering-Participant - 71 Pts Total									
Level	Interactivity	Embodiment	Co-Participation	Story	Dynamics	Gamification	Immersive Tec	Meta Control	Didactic Capacity
0 Pts	Passive	Detached	Single-Player	No Story	Pre-determined	Ungamified	None	No Meta-Control	Elemental
1 Pt	Participatory	Watcher	One-on-One	Setting	Choice	Instruction	AR	Journey	Explicit
2 Pts	Physicalized	First-Person POV	Secondary Perspective	Pre-Created	Multi-thread	Reinforcement	360 Media	Character	Implicit
3 Pts	Problem Solving	Movement	Group	Choose Your Own	Free Will	External Process	VR	World Builder	Recall
4 Pts	Interpersonal	Human2Human Interaction	MMO	Interactive Story	Convo-Reality	Reward System	XR	World Master	Synthesis

Figure 5. Taxonomy: HILSims-Participant

**TAXONOMY COMPARISON RESULTS FOR SAPR TRAINING**



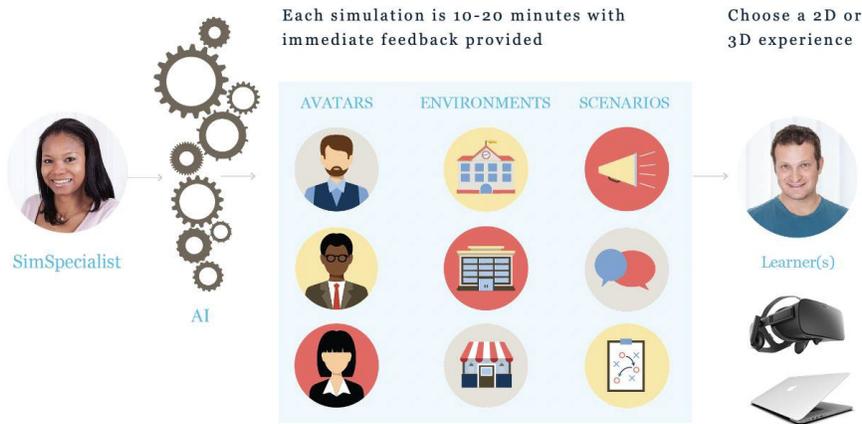
**Figure 6. Taxonomy Comparison Results for SAPR Training**

**RESULT:** Based on the analysis of the training methods, the HILSims-Participant is by far the most effective immersive learning experience. However, it is also the costliest in both dollars and time investment. The HILSims-Witness is the second most effective immersive learning experience. The HILSims-Witness method reduces the time and financial burden of large groups individually utilizing the virtual reality headsets. Therefore, from a cost benefit perspective the combination of HILSims-Witness with only two or three HILSims-Participants is the overall best choice for the Air Force.

**EXECUTING HILSims IN AIR FORCE SAPR TRAINING TODAY**

Today's Air Force uses human-in-the-loop simulators and other virtual reality training methods to teach soft and hard skills to many of our Airmen. Air University has researched and worked to deploy prototypes using a mixed reality avatar simulation using a human-in-the-loop simulation for use at Air Command and Staff College (ACSC) to expand the training for students preparing for the demanding position of Squadron Commander. This training was termed a Virtual Leadership Simulator (VLS), a combination of VR with “human and artificial intelligence used to control the simulation” (Clayton & Straub, 2020) as depicted in Figure 2 below.

### Virtual Leadership Simulations using the Mursion Simulation Software System



**Figure 7. Visual Representation of the Virtual Leadership Simulator (VLS)**

The Air Education and Training Command (AETC) at Joint Base San Antonio, San Antonio, Texas, provides an interactive VR experience in current leadership training for front-line supervisors, see a classroom example in Figure 4 below. "[Interactive virtual reality] sessions offer dynamic decision-making moments and empower the learning of cognitive skills, such as emotional intelligence, empathetic listening, and critical communication in a supportive environment. Through the experience, front-line supervisors build skills engaging in difficult [Diversity, Equity, Inclusion, and Accessibility] DEIA conversations. These types of experiences will help fully develop the Airmen who are our competitive advantage in strategic competition." said Maggie Laws, AETC's Chief Diversity and Inclusion Officer (Hawkins, 2023). Similar programs have been implemented across the Air Force. In 2022 Air University's Eaker Center located at Maxwell Air Force Base, Alabama, conducted "three facilitator training courses ... training 52 facilitators across the Air Force. In FY23, the team will host eight courses, training 160 facilitators at 20 students per course" (p. Ibid). The Air Force uses VR technology to meet their SAPR training requirement at Joint Base Charleston (JB-Charleston) in North Carolina. The JB-Charleston team partnered with a tech company specializing in developing VR training programs to develop interactive training to enhance the activity for SAPR first responders, and Volunteer Victim Advocates, and Squadron Leadership teams around the Air Force.



**Figure 8. Photo from LIVE Leadership Training at AETC, JB-San Antonio, Feb 2023**

## CONCLUSION

This paper has sought to demonstrate that the more experiential a learning experience can be, the more students will be immersed in that experience. In this study, four types of training were applied to the taxonomy chart. The highest score went to the most immersive HILSims with puppetry, and the next most effective went to the observers of that training. Virtual reality combined with HILSims can create the perception of actual presence in challenging life experiences. Therefore, the learning will be more impactful and have the power to change behaviors for the better. HILSims provides real-person interaction via professional, virtual puppetry, creating a true sense of participation in real-life scenarios. Life experience trains the mind in deep and lasting ways. Actual behavioral change directly correlates to the level of immersion in the training (Wentworth, 2021). The taxonomy assessment conducted in this paper, clearly demonstrates that true experiential learning through immersive training is profoundly more effective than traditional training methods.

The time and cost comparison between HILSims with puppetry, and the HILSims with puppetry combined with group observation results in the most practical choice to be HILSims with puppetry in a group participant/observer setting. The investment in the virtual headsets for the participant/observer scenario would be minimal. The puppeteers could be Air Force members who received train-the-trainer training from a professional company; the puppeteer could easily be virtual. Groups of 30-50 could receive a shared immersive experience in a single afternoon that could turn the trajectory of workplace harassment and violence in a positive direction.

The Air Force must provide each Wing level leader with the resources to ensure they will be empowered and funded to train the soft skills needed to equip our Airmen to be their best. Partnerships with innovative companies and our Air Force partners, like AETC, can be leveraged to provide the most effective soft-skill immersive training possible. The Air Force does not hesitate to invest heavily in hard-skill training. It is time to invest in the whole person and our most valuable asset, our Airman, by expanding the outlay into soft skills. By equipping our Airmen with the tools to recognize how a the actions of a few can negatively or positively impact those around them, the Air Force will empower every Airman with a voice to stand up for a safe and respectful environment. The entire Air Force will become a more robust military fighting force of the future.

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