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# Best Practices in Using Technology in HAZMAT Training

Report from the Spring 2017 Workshop

Sponsored in conjunction with



National Institute of  
Environmental Health Sciences  
*Worker Training Program*

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## Executive Summary



WTP Director Joseph “Chip” Hughes emphasized the importance of increased collaboration for deployment of e-learning technologies, as well as the evaluation of these technologies for their effectiveness among different target audiences.

(Photo courtesy of Jim Remington)

Given the thriving age of computers and technology, the traditional learning environment has shifted significantly over the past several decades. For example, in many settings, trainers and learners have experienced transitions from physical classroom attendance to distance e-learning, onsite communications to emails, hands-on participation to virtual reality (VR), and paper-based tests to electronic exams.

On March 29-30, 2017, the Rutgers School of Public Health, in conjunction with the National Institute of Environmental Health Sciences (NIEHS) Worker Training Program (WTP), held a workshop in San Juan, Puerto Rico to discuss best practices in using e-learning technologies to train workers that face risk of exposure to hazardous materials (HAZMAT). The event provided a forum for WTP awardees and innovative technology experts to share traditional and emerging experiences on use of e-learning technologies, as well as limitations and best practices to deploy these technologies for HAZMAT training.

Notably, this event marked the first time WTP awardees and NIEHS Small Business Innovation Research (SBIR) awardees gathered during a formal workshop to discuss the topic of e-learning technologies for HAZMAT training. A brief synopsis of the workshop is provided in an April 2017

NIEHS Environmental Factor [article](#), and presentation slides are available on the [workshop website](#).

The following lists key messages from the workshop:

- E-learning technologies have evolved over time, as well as the needs of learners.
- Awardees, as well as their trainers and target audiences, have different experiences and perspectives on e-learning technologies and resources.
- Game-based technologies and immersive technologies are a hot topic, and provide various opportunities for awardees to consider across all programs.
- Online resources and learning platforms facilitate interactive learning environments and dialogue between trainers and trainees.
- Evaluation is critical for effective deployment and implementation of e-learning technologies. Evaluation of these technologies should include both qualitative and quantitative outcomes.
- WTP will incorporate needs and best practices for e-learning technologies in the Minimum Criteria by focusing on affordability; e-literacy and user-friendliness; ease of use by trainers; and enhancement of discussion and group or empowerment learning.

## Keynote Address: A Personal Story on the Evolution of Health and Safety Training

Keynote speaker *Jill James*, chief safety officer of *Vivid Learning Systems*, is a passionate advocate for workforce well-being and safety through prevention. To illustrate the evolution and future of health and safety training, James provided a summary of her professional history in this area (Figure 1). She described the types of training offered to people, the types of technologies used, and lessons learned within each of her professional positions.

As an undergraduate, James and a group of her classmates taught a class about safe sex and prevention of sexually transmitted diseases. The technologies used for teaching the class included a television, VCR, and model of a uterus. They evaluated knowledge transfer through a written test.

Two years later as an intern with the Department of Transportation in Minnesota, James trained snow plow drivers on seat belt safety using videos. This was her first time offering professional safety training for adults. In this case, tests and surveys weren't administered to the drivers and knowledge transfer could not be evaluated.

Between 1994 and 2006, James worked as an industrial safety investigator for the Occupational Safety and Health Administration (OSHA) in the northwestern and central region of Minnesota. During this time, she led walk-arounds with workers and employers, and distributed factsheets and booklets that contained pictures of hazards that she was investigating. James leveraged these site walk-arounds as small training sessions and learning opportunities, where she pointed out hazards to workers and held conversations with them. Workers

### 1990 - 1992

- Taught a class on prevention of STDs during undergraduate years (1990)
- Worked as an intern with the Department of Transportation (DOT) in Minnesota, and offered training to snow plow drivers (1992)

### 1994 - 2006

- Worked as an OSHA investigator in the northwestern and central regions of Minnesota

### 2007 - 2010

- Worked at a medical clinic organization
- Attended a conference and met James Moss from Vivid Learning Systems (2007)

### 2010 - 2012

- Worked at a community college and provided customized training for employers in the community

### 2012 - 2015

- Worked as a safety and health professional, and provided training for workers employed by a company that raised turkeys

**Figure 1: James has approximately 27 years of professional experience with health and safety training.**

demonstrated knowledge transfer by identifying hazards and providing feedback on citation training packages.

A few years later while attending a conference, *James Moss* from the Vivid Learning Systems company introduced her to online health and safety training. The online content provided by Vivid Learning Systems fit all the criteria needed for effective health and safety training:

**Knowledge transfer is a key metric evaluated in health and safety training or educational programs. This metric helps confirm what training content is, or is not, retained.**

- Compliance,
- Engagement for learners,
- Consistent messaging,
- Interactive tests of knowledge,
- Confirmation of transferred knowledge, and
- Solid documentation.

Between 2010 and 2012, James worked at a community college where she provided customized training for employers in the community. She later noticed that the employers only wanted the training to check off their list of requirements. Unhappy with the position at the community college, in 2012, she accepted a position to lead health

and safety training for workers employed by a company that raised turkeys. She noticed that the workers were lacking many things in health and safety, and reached out to Vivid Learning Systems to determine effective ways to train the workers. James and Moss worked together and were successful in developing online courses to train and educate workers from diverse backgrounds and languages.

In 2015, James accepted a position with Vivid Learning Systems, and has since been using lessons learned from her previous experiences to share her story and to partner with visionaries who understand the importance of delivering training into the hands of people that need it most.

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## The Evolution of E-learning Technologies in WTP

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### Past Experiences with E-learning Technologies

WTP Director Joseph “Chip” Hughes provided a historical overview on use of e-learning technologies in WTP, and how it has evolved over time.

In 1997, WTP began conversations to incorporate an e-learning technology, or advanced training technology, initiative. Through this initiative, WTP took a [structural approach](#) to consider the use and implementation of e-learning technologies across all programs. This initiative involved contributions from all awardees in the form of technical workshops and focus groups, which resulted in the development of a formal e-learning technology [guidance document](#) for WTP in 1999. This guidance sought to:

- Provide uniform guidance for awardees to consider for integrating e-learning technologies into worker training.
- Preserve core values and comply with training policies enforced by OSHA.

- Establish a basis for cost-effective e-learning technology applications.
- Identify a new e-learning technology support program for WTP, as well as a mentoring process.

In 2000, components for e-learning technologies within WTP included e-collaboration, -certification, -teaching, and -learning. In 2001, WTP examined the technological divide for workers in diverse target populations, as well as protocols to build technical literacy and blended learning techniques. These blended learning techniques include the delivery of training content through a variety of combined methods, such as face-to-face classroom instruction and digital instruction through online, mobile, or virtual activities.

“As a program, we were rocked by the technology revolution in the 1990s and early 2000s,” said Hughes. “However, some of the

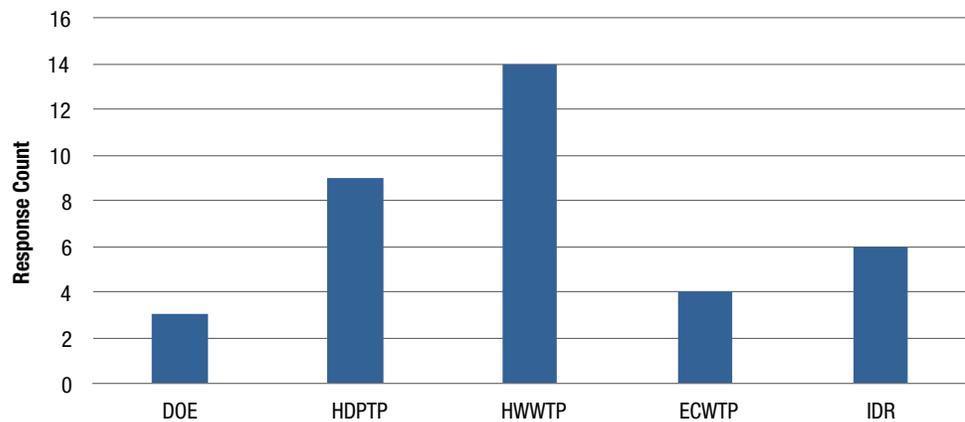
same questions and challenges we faced back then in terms of e-learning technologies are still relevant today. How can the core values of worker training, as outlined in the WTP [Minimum Health and Safety Training Criteria](#) (Minimum Criteria), be sustained as

WTP moves toward greater deployment and use of e-learning technologies? How does use of e-learning technologies compare in terms of compliance for certain OSHA standards? How easily can e-learning technologies be adapted for blended learning techniques?"

## Current Experiences with E-learning Technologies: Awardee Self-Assessment Survey

Kenda Freeman, NIEHS contractor and National Clearinghouse representative, presented a summary of results from a 2016 self-assessment survey of awardees' use, deployment, and evaluation of e-learning technologies within their respective organizations. The assessment included 60 questions, and about 20 responses were received from awardees overall. Responses

included representation from all programs, the Department of Energy (DOE), HAZMAT Disaster Preparedness Training Program (HDPTP), Hazardous Waste Worker Training Program (HWWTP), Environmental Careers Worker Training Program (ECWTP), and the new Infectious Disease Response (IDR) Training Program (Figure 2).



**Figure 2: Responses to the self-assessment survey included representation from all programs, but fewer responses were received from DOE and ECWTP awardees (N=17).**

## Classroom and Web-based Technologies

Out of 17 respondents, 100 percent of awardees indicated use of at least one technology in the classroom for both awareness- and operations-level training (Figure 3). Most awardees use traditional technologies, such as LCD/LED projectors, laser pointers, display monitors, wireless clickers, and in-class WiFi. However, fewer awardees use more advanced classroom technologies, such as interactive whiteboards.

Out of 16 respondents, 89 percent of awardees indicated use of at least one web-based technology for both awareness- and operations-level training (Figure 4). Most awardees use phone or tablet applications with training content as reference tools. Fewer awardees use gaming, scenario-based simulations, and self- or custom-built e-learning modules.

## Indirect Technology Resources and Virtual Simulations

Out of 8 respondents, 53 percent of awardees indicated use of at least one indirect technology or resource for both awareness- and operations-level training (Figure 5). Most awardees use standalone registration systems, survey or polling tools, and quiz or assessment tools. Some use web cams and badging, or electronic token systems.

On the other hand, awardees' use of virtual simulations technologies is very limited. Out of 19 respondents, only 32 percent indicated use of VR or simulation technologies for training. Use of these technologies among awardees involves primarily specialty training devices, simulated equipment, or simulation 3D goggles.

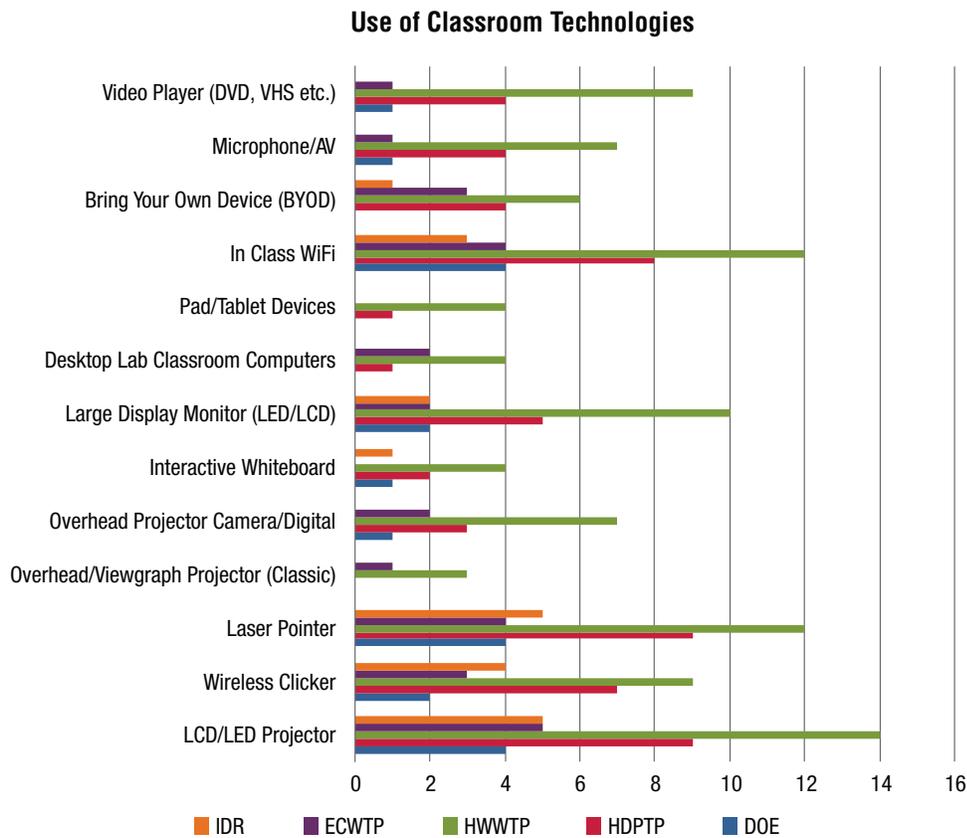
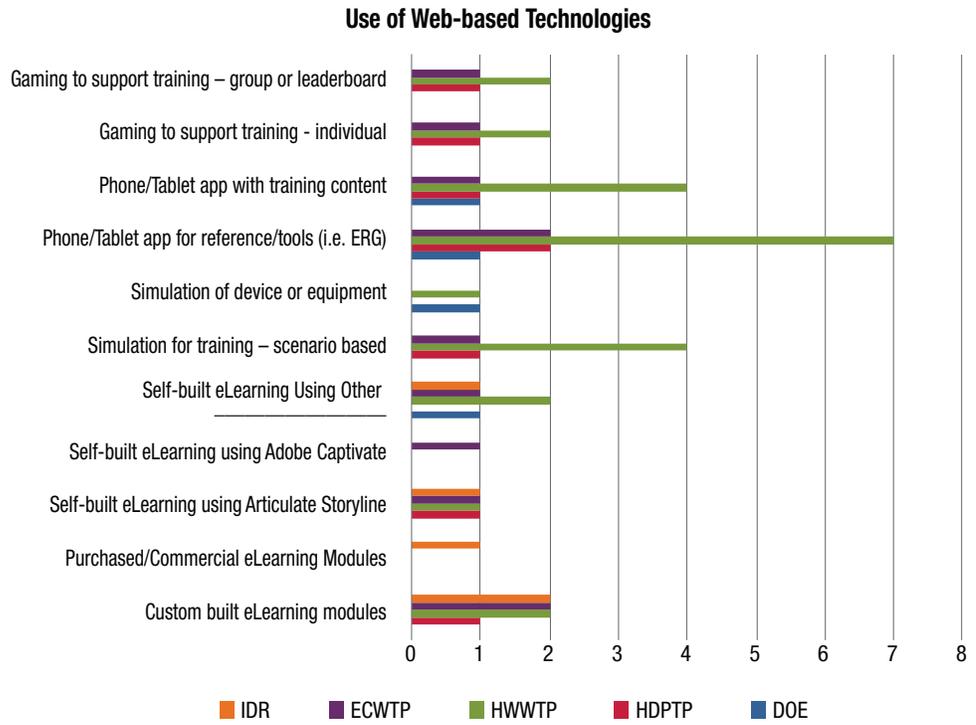
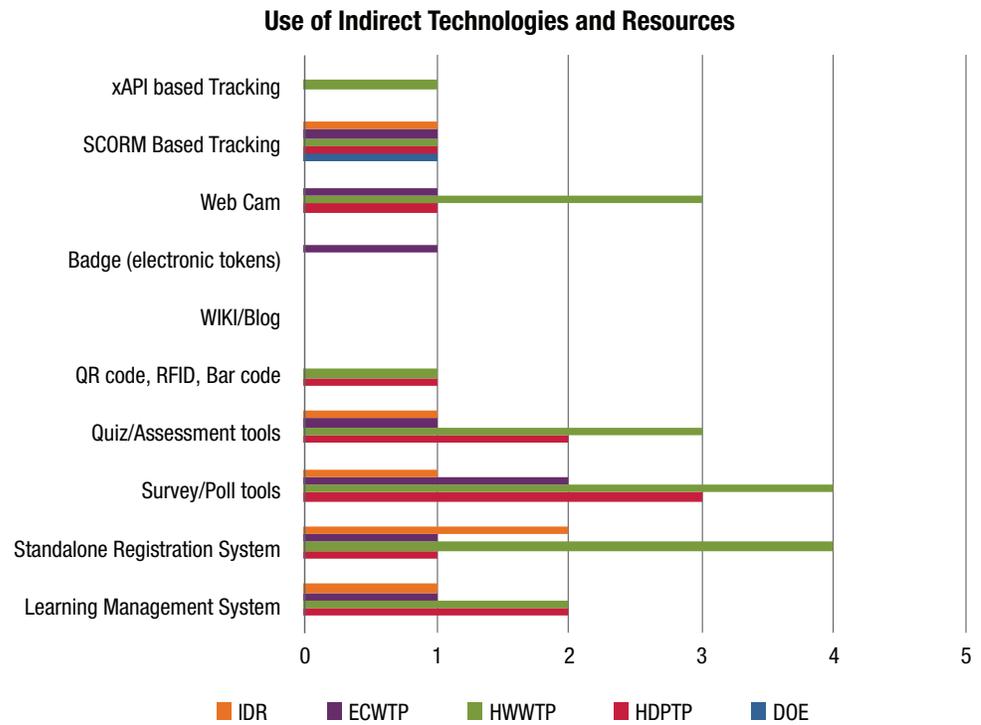


Figure 3: Bar graph illustrates use of general classroom technologies among awardees (N=17).



**Figure 4: Bar graph illustrates use of web (online) based technologies among awardees (N=16).**



**Figure 5: Bar graph illustrates use of indirect technologies and resources among awardees (N=8).**

## Limitations and Best Practices

Results from the 2016 self-assessment showed that awardees experience common limitations on implementation and deployment of technologies for training (Figure 6). For example, insufficient funds and resources inhibit most awardees' capacity to purchase and deploy technologies for training. Transportation has also been an issue for some, as they have experienced difficulties in transporting fragile, expensive equipment to different training locations.

Accessibility is a pressing issue, especially in rural or remote training areas that lack consistent access to WiFi. Site fire walls and employers' policies regarding the download or use of training software on work computers present additional limiting factors. Adaptation of newer technologies for more traditional training methods and devices can also be a challenge. For example, one awardee noted difficulties adapting a desktop computer simulation for a hazardous waste site assessment exercise to tablets for courses that are delivered offsite.

Other limitations are unique to the awardee organization, trainers, instructors, and target audiences reached for training. For example, some awardees have been using traditional face-to-face training methods for many years, and lack the expertise to integrate other systems, such as distance learning technologies.

Some instructors and trainers are resistant to change or wary that online training will replace them. Furthermore, some are not comfortable with the use of newer e-learning technologies, which inhibits an effective teaching and learning experience in the classroom.

Different factors among target audiences also present limitations for training with e-learning technologies. For example, the target audience may have limited education or understanding of a specific technology. Age can also present a barrier, as many older trainees are resistant to newer technologies.



**Figure 6: Thematic illustration of limitations that awardees experience to deploy or implement use of e-learning technologies for training.**

As a means of overcoming these limitations, awardees exercise best practices for use of e-learning technologies in their organizations. The following includes an abbreviated list of best practices awardees specified in the 2016 self-assessment survey:

- Ensure students have downloaded all the necessary software on their computers before the course begins.
- Include a lesson plan for trainers. This helps trainers better understand how to use the technology during training. The more trainers understand and feel comfortable with the technology, the better the student trainee experience will be.
- Implement mobile-first strategies (e.g., phone or tablet applications) that employ scenario-based content with as much beta testing as possible.

scenario-based content with as much beta testing as possible.

- Introduce training technology along with paper options.
- Provide an alternate classroom-based activity in preparation for glitches that occur or for locations where technology is not able to be used.
- Look at the specifications of equipment before buying. Research all options to get the lowest price point possible without sacrificing function.
- Verify internet access and WiFi signal availability in the training area prior to the start of training, and make sure an adequate number of electronic devices are available.

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## Emerging E-learning Technologies and Resources

Awardees and technology experts discussed their experiences and lessons learned based on emerging e-learning technologies and resources used for HAZMAT training. This

included presentations about in-classroom technologies, mobile and online applications, gaming software, VR simulations, and e-learning resources or networks.

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### Classroom Technologies

Pat Goble and Rob Winger from the [International Chemical Workers Union Council \(ICWUC\)](#), gave a brief overview on the use of a visual presenter, called Elmo, for training workers at the [HAMMER training facility](#). Elmo can project live images of objects when connected to a projector. Trainers

use Elmo to teach from tablets, which is more effective compared to traditional PowerPoint presentations in the classroom. For example, they have used Elmo to train workers on the use of an application that monitors heat stress.

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### Online and Web-based Applications

James shared more information about the language-free learning tools offered by Vivid Learning Systems. The company [website](#) aims to help individuals determine what training they need upfront through an online [training for compliance quiz](#). This

quiz is based on OSHA 1910 standards and is intended to match the individual's workforce with the appropriate courses. It generates PDF reports of results that list the course subjects needed, a reference to the regulation that is covered, and the frequency

of updates needed for the training. Other tools include an [active shooter preparedness video](#), which goes beyond the traditional “run, hide, fight” message to explain the science behind our instincts to freeze during this type of situation.

The Vivid Learning Systems [safety toolbox](#) includes a new safety engagement survey with two tracks, one for employees and another for managers. The survey includes questions about safety culture which aim to identify gaps between management and employees. Safety videos include short vignettes about a single hazard, and are intended to assist with skill building for individuals who are not safety experts.

Mark Catlin, an industrial hygienist with the Service Employees International Union (SEIU), shared a YouTube [video library](#) he developed, which hosts a variety of old and current health and safety videos.

Pete Raynor, Ph.D., shared more about the Midwest Emerging Technologies Public Health and Safety Training (METPHAST) Program. Raynor is the director of the METPHAST Program, which develops and disseminates Web-based modules to educate learners about health and safety issues associated with emerging technologies. The program is based on a multi-institutional collaboration between the University of

Minnesota School of Public Health, the University of Iowa College of Public Health, and Dakota County Technical College.

Existing METPHAST Program [modules](#) are focused on worker health and safety, and are closed captioned in English. Each module includes a narrated screencast with knowledge checks. The program also includes instructions and videos for trainers to use in deployment or application of the modules for training different audiences. Raynor’s team is currently working on developing a website that has customizable instructional content, which will enable trainers to create their own lessons.

Carol Rice and others within the Midwest Consortium are leveraging online resources, such as those from the METPHAST Program, for training exercises. For example, the Midwest Consortium has integrated one of the METPHAST Web-based modules into an air pollution training exercise for communities. The exercise includes a facilitated discussion with electronic resources rather than traditional lecture. The Midwest Consortium is developing additional training exercises using other resources such as [ToxTown](#), [My Right to Know](#), and the mobile application for the National Institute of Occupational Safety and Health (NIOSH) [Pocket Guide to Chemical Hazards](#).

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## Gamification and Game-based Learning

Sean Phillips, innovation and learning manager from [Opportunity, Advancement, Innovation \(OAI\), Inc.](#), described how adding game-like elements to training, or gamification, is used to help motivate ECWTP trainees to take serious interest in learning about health and safety issues. Gamification provides instant feedback, rewards, and boosts productivity. Gautham Venugopalan, senior analyst at [Gryphon Scientific](#),

described game-based learning. “This type of learning is different from gamification, which uses points and badges,” Venugopalan said. “Compared to conventional techniques, game-based learning encompasses aspects of experiential learning and intrinsic motivation. Building a game-based learning product involves a process of needs assessment, curriculum development, prototyping, testing, and deployment.”

Venugopalan presented an example case study where Gryphon Scientific worked with stakeholders to build a game-based learning product to train disaster research responders for emergency operations. Stakeholders for this project included program leaders from the [\*National Institutes of Health Disaster Research Response Program\*](#), disaster responders, and researchers. During the needs assessment step, Gryphon Scientific worked with all stakeholders to answer questions and identify training needs, and they assured that the game-based learning technique would provide responders with opportunities for refresher training before disaster deployment. Federal, state, and local emergency management practitioners contributed subject matter expertise to develop the training curriculum towards a deployment scenario-based story board and product reflecting real-world issues faced by experienced responders.

Prototyping was performed in an OpenSim environment, and beta testing was completed by disaster research novices and experts to ensure the quality and teaching effectiveness of the product. The prototype was revised based on training feedback, and pre-training, post-training, and 3-month assessments were used to improve usability. The game provides online resources, spaced repetition, and just-in-time training. Continued engagement with the game offers reinforcement of health and safety principles for disaster responders.

Gary Gustafson, director of environmental hazard training at the [\*Center for Construction Research and Training\*](#) (CPWR), stated that microgames are often used during refresher activities as part of their organization's blended training approach. CPWR works with a company called [\*Simcoach Games\*](#) to incorporate microgames into training. Simcoach Games develops games for

workforce development and safety. Cost of development for one microgame can range anywhere from \$15,000 - \$40,000. Simcoach works with different partners to develop microgames, and to provide end users with a game that can be downloaded for free in a mobile app store.

There are similarities between a good learning program and a good game. These include goals, participation, feedback, practice, and consequences. Microgames are intended for use before and after a class. All safety related games on the app store include a disclaimer that specifies they do not provide substitutes for hands-on training.

Ken Smith, president of Simcoach Games, shared example case studies of games that Simcoach has developed. One game was created for cashiers at a regional grocery store. Evaluation of this game demonstrated cashiers' retention of key ergonomic risk factors, demonstrated by a reduction in lost time from injuries. He also shared a game that was developed for a Philadelphia construction union to address infection control and risk assessment. The game uses a "see-it, own-it" technique in which a user scans the scene, and then identifies hazards that require action. Each time the user gets a different scene, he or she is requested to identify hazards and then carry out actions to eliminate them. Upon eliminating different hazards, the user can earn points and badges. Simcoach is currently working on incorporating safety hazards within different applications.

Because Simcoach staff are not experts on worker health and safety, they work with different experts in this field to develop microgame content. When asked about best practices for design of microgames, Smith stated that mobile is the leading format for microgames because this ensures that they can be made available at no cost

**"Games are not meant to replace training. They reinforce key behaviors after a training."**

**- Ken Smith,  
Simcoach Games**

for underserved populations, and those with lower internet rates and less access to computers. It is easier to format them for an iOS or Android operating system, since browsers present greater challenges with plugins.

Simcoach microgames are all made available in English, but half of the existing games have been tooled for Spanish translations. This is part of a back-end design element. For example, the “see-it, own-it” games use language that is coded separately, which enables new language updates to be made quickly and emphasizes visual identification as part of helping with language barriers.

Some of the games have sound that reads the text.

Evaluation is dependent on the microgame and client. Microgames are usually followed with an efficacy study, where retention levels, engagement, and reduction of injury statistics are measured for users and trainees. Although not every game tracks that level of detail, all of them allow tracking of users, time used, actions, and badges earned, which can be integrated into an online platform. Simcoach is hoping to track success with microgames and job acquisition, and how well, if at all, the games attracted different users to a certain field of work.

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## Virtual Reality, Simulations, and Immersive E-learning Technologies

Russell Rivard, master instructor and director of the Milwaukee Regional Hazardous Material Response Team, described a product called HazSim. HazSim is a handheld monitor that simulates a chemical detection meter. Training with a real meter presents a variety of limitations, and real chemical sources are needed to make the meter training effective. With HazSim, simulated meter readings for a variety of exposures are generated exclusively by an instructor, and are controlled as a trainee moves within a certain space.

HazSim is capable of simulating 18 different exposure meters, including those for oxygen, carbon dioxide, and hydrogen sulfide. A small operating system enables the instructor to control the simulated meter readings from afar, so a Bluetooth signal is needed for the technology to function properly. An instructor can also set an alarm at a desired meter reading, and can send a bank of questions when a trainee is downrange.

The HazSim technology costs roughly \$10,000. A cheaper alternative is Bolex. Limitations for Bolex are that it only works where sensors are and can only provide readings for a small range of gases. Another alternative is using a smartphone as a pseudometer, which is extremely cost-effective.

Jennifer Lastra, CEO and managing director at [360 Immersive](#), described immersive and VR technologies, and how they can be effective for training. Immersive technologies can include computer-generated simulations using gaming engines, unity software, and realistic imagery, or live 360-degree experiences. Compared to Web-based learning, immersive learning is more realistic and provides more opportunities for participants to become engaged in training.

Lastra stated that there are several advantages to using VR and immersive technologies, including:

- They are customizable for the actual events and experiences trainees will face.

**“Most people are comfortable with traditional learning methods; however, teachers and trainers should begin thinking about technologies beyond Web-based applications, and consider virtual reality.”**  
– Jennifer Lastra, 360 Immersive

- They can be self-paced.
- They provide cost and time savings for training organizations and employers.
- They enable stakeholders to interact more often, specifically during the development of training content and curricula.
- They can be used for corrective actions – a scenario can be replayed with multiple points of view.
- They can be adapted for team learning and it allows learners to rehearse a scary scenario in a safe space and a safe way – there is no fear of failure.
- They can include branding.

360 Immersive is a company that focuses on creating technology solutions that are affordable and scalable. 360 Immersive's first use of VR technologies began with training quarterbacks for the Boise State football team. They noticed the effectiveness of VR for training quarterbacks, and realized that the technology could have an even larger impact to train workers. They have also explored use of VR to train law enforcement in rural areas and health care facility workers.

360 Immersive's staff serve as subject matter experts from a production standpoint, as they specialize in creating software and content to meet the needs of clients and different organizations. The company trains people how to capture best practices and incorporate blended learning techniques into training, and how to produce their own imagery and content using a software platform. User-created content is then made available in a downloadable application. The software platform provides opportunities for the client to collaborate with others on training content development. Cost for developing the software varies, and is dependent on whether the client wants to develop their own training content or if they want 360 Immersive to come to the training site and create training demos.

Each client has their own application for protected use located on an Amazon web server (AWS), and the AWS subscription is managed by the company. Production specialists and application developers work with clients to customize the training curriculum, and to create stories in an immersive environment. Short video vignettes (2-5 minutes long) can also be created and used as a precursor for workers who will be placed in real-life hazardous situations or as supplemental training.

Lastra concluded by noting that there is a need for more research into trainee and participant retention rates when VR is implemented into blended learning approaches.

Janet Womachka and Matt Kozak from [The New England Consortium Civil Service Employees Association](#) (TNEC-CSEA) shared their experiences with use of VR simulations technologies. VR and computer-based simulations with 360-degree view provide the capability to place trainees in a hazardous area, while trainers provide guidance on how to assess and control hazards.

A year ago, Womachka was introduced to a VR headset where she experienced a simulated NASCAR garage. During the NASCAR experience, Janet noticed some hazards in the garage that had not been properly labeled. This gave her an idea – what if the VR headset could be adapted for training workers? She realized this type of tool would be useful for training on the assessment and control of hazardous materials within different scenarios, including garages, confined spaces, and during disaster clean-up efforts.

These great ideas also brought up questions – how would the VR technology be adapted and implemented within an incident command system (ICS)? Is it affordable? Womachka, Kozak, and other colleagues

were successful in developing an affordable, useful VR technology using a 360-degree camera (\$300), magnetometer and gyroscope, smartphone (Nexfit Robin brand, \$150), and a Viewmaster VR viewer (\$10-100). The technology functions simply – a picture or short video is displayed on the smartphone, which is then inserted into the VR viewer. The technology can be adapted for group exercises where photos or videos can be displayed on a projector; however, this type of activity is not as immersive.

So far, TNEC-CSEA has used the VR viewer to train workers at the end of a clean-up safety, train-the-trainer (TTT) activity. The training activity was designed to help workers create a comprehensive plan before being deployed for clean-up activities after a natural or man-made disaster. It was also designed to prepare workers for assessment of hazards they may encounter during residential or industrial sanitation.

“A hands-on proficiency activity is a requirement for all training sessions, regardless of whether it is required by OSHA or not,” Womachka said. “It would be difficult for our peer trainers to recreate a post-disaster scenario for training, as it is not possible to transport large amounts of trash or debris to the various training locations we utilize. So we had to find an alternative to create a realistic scenario.”

TNEC-CSEA achieved this by taking photos of a Federal Emergency Management Agency disaster training site and another site after clean-up of an abandoned home. They then incorporated these photos into the VR viewer for trainees to use. With the viewer, trainees could see 360-degrees, giving them a more accurate and comprehensive view of the conditions than a normal picture could have provided. The training activity was very successful, and was found favorable among trainees. Trainees showed proficiency in

assessing and controlling hazards, and 90 percent of the trainers stated that they were comfortable using the VR viewer.

Positive feedback from trainers after the TTT activity included:

- “The virtual reality is an awesome training tool.”
- “I love the virtual reality exercise. Very effective. I think it should become a key component in the TTT program.”
- “I think that we could start using virtual reality in most of the trainings.”
- “Please continue with the 3D reality. Really tells the story of the hazards.”

Other trainers reported shortcomings of the VR viewer after the activity:

- “My eyes can’t take too much of this.”
- “Virtual reality will be hard to pull off due to the [lack of] resources and ability of workers.”
- “We are not allowed to bring these items into any correctional facility.”

Moving forward, TNEC-CSEA plans to continue use of the VR viewer to train skilled support personnel that are often deployed for disaster response and clean-up, as well as first responders and workers that are involved in replacement and repair of damaged infrastructures.

TNEC-CSEA is working on obtaining photos and video footage to develop other training activities. For example, a simulated training activity on confined spaces using the VR viewer will help teach workers about assessment and classification of permit-required spaces, or those that require alternate entry procedures. The VR viewer will be utilized for heavy equipment training, and to help workers visualize blind spots and proper techniques for inspection. It will also be utilized to train first responders at the awareness level and on hazardous

material spills. In this case, the VR viewer will be used to test responders' capability to secure a scene, and their capacity to use the Emergency Response Guidebook to identify hazardous substances from a safe distance when notifying authorities.

TNEC-CSEA also anticipates collaborating with local partners to offer the VR viewer for other training opportunities. "Some local and state government representatives in New

York have started using drone technologies to assess dangerous areas and disaster situations," Womachka said. "We hope to work with these stakeholders to utilize the drones to capture real-time footage of places where workers are deployed. By using drones with 360-degree cameras combined with the VR technology for training, we can ensure that workers are fully prepared for the hazardous conditions they will face."

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## Other E-learning Technologies and Resources

Gregory Sempowski, Ph.D., lead principal investigator for the [Duke University IDR Training Program](#), provided an overview on use of the [Inquisiq](#) Learning Management System (LMS). Inquisiq is used to develop, schedule, track, and document training sessions at the Duke IDR Training Program. It is also used to register trainees, and offers pre- and post-tests and evaluations after training.

Chris Trahan Cain, executive director of CPWR, shared information about their Trainers and Researchers United Network (TRU-Net). The TRU-Net initiative falls under CPWR's research to practice project funded by NIOSH. TRU-Net is an effort to formalize the link between CPWR's consortium of health and safety researchers and its extensive training network, and to give researchers, trainers, and trainees access to each other's experience and expertise. By creating this formal link, CPWR hopes to improve the quality and relevance of health and safety research and advance the use of effective research-based solutions in the field.

The goals of TRU-Net include:

- Expanding the role of trainers and trainees in shaping and contributing to the research process and outcomes.

- Encouraging trainers to help identify existing and emerging health and safety concerns that could benefit from research (this may include reporting urgent unmet health and safety needs that they observe, either through feedback from trainees or job-site observations).
- Raising awareness and supporting the widespread use of health and safety research findings, solutions, and best practices.

TRU-Net offers informal and formal connections between trainers and researchers. The informal component is an online forum, where trainers and researchers can ask and respond to questions, find out about new research initiatives, and share ideas. This is a closed forum for union trainers, government researchers, and members of the CPWR research consortium. During the early development phase, Cain and colleagues surveyed 79 trainers who signed up to use the forum. They learned that the trainers wanted to be able to find information of use relevant to their work on the site, but not feel pressured to post information. The trainers also indicated that they would most likely respond to a question if it directly impacted those that they train. The forum was revised to address the trainers' concerns, to increase use, and

expand reach, then relaunched to promote participation.

The formal component of TRU-Net provides a network for trainers and researchers to collaborate on new research projects, which enables collection of information in a formal, systematic way. This may include trainers working with researchers to review surveys, interpret results, and evaluate new materials, tools, and work practices. It may also include the use of formal surveys to inquire about exposures, hazard identification, training needs, and other factors.

Cain shared examples of how the informal and formal components of TRU-Net are being used at CPWR. For example, in the online forum, trainers post about specific topics, such as exposures (e.g., nanomaterials) or work site experiences. Cain and colleagues are currently using the formal component of TRU-Net to complete a pilot project focused on noise exposure. This pilot project will help them reach a consensus on and develop a protocol for researchers to follow in the future. Noise was selected because it is a hazard facing workers across diverse trades and hearing loss is one of the leading occupational health risks. This project is being used to gather information from trainers on awareness of the hazard, use of controls, trainings currently offered, and associated challenges. As part of the project, CPWR distributed two surveys about noise exposure to trainers and unions – a trainer survey and a trainer support workers survey. Contributions from this project will help support a proposed NIOSH study on noise and the Buy Quiet effort. It will also provide information for an OSHA Request for Information on noise.

Henry Ryng, founder of [inXsol](#), an NIEHS SBIR awardee, discussed different e-learning technologies and interfaces that have great potential as effective worker health and

safety training tools. Prior to the workshop, Ryng reached out to technology experts, such as John Brunacini, Art Werkenthin, and Ben Betts, and held interviews to determine their perspectives on best practices for e-learning technologies. Each of these experts would be great partners for WTP awardees to consider collaborating with on use of e-learning technologies for training.

[Blue Card](#) is a local hazard zone and ICS credentialing system that includes an online program and scenario-based, blended learning techniques. Once trainees have taken the online course, they can then move into full scale simulations. The certification consists of three days of simulation-led training, with 12 continuing education credits per year. Blue Card tools reinforce the rules and regulations that all individuals with a certification must follow. “An LMS is a necessary component of a certification system,” Ryng stated. “Using the LMS, we can interact with trainers and support the certification process.” The Blue Card system demonstrates that environmental sensors can be paired with LMS credentials to screen for or alert individuals who are trained to work in certain conditions. Ryng worked with colleague John Brunacini from Blue Card, to develop a dashboard that allows trainees to pull their record in real-time to determine where they are in the certification or re-certification process. Ryng and Brunacini will continue working together to improve the Blue Card credentialing tools.

Art Werkenthin, president of [RISC, Inc.](#) and colleagues use radiofrequency identification and QR codes on certain equipment for geofencing, and can combine these into training records to demonstrate on-the-job performance. For example, their xAPI learning record standard provides an innovative method to validate on-the-job performance against training prescriptions.

The CMI5 profile over the xAPI standard enables LMS to construct blocks of training along with competencies which can have test-out criteria informed by performance. For example, Werkenthin and colleagues have used this technology to track where and when trucks apply their breaks within a mine. Trainers can use feedback from this to identify improper break use, which would signal an increased need for training.

Ben Betts, chief executive officer of [HT2 Labs](#), is working with colleagues on a social learning platform called [Curatr](#). Curatr enables learners to join private social learning communities, and provides

clients with high engagement and huge cost savings. Curatr demonstrates that an effective learning experience can come from the curation of available resources on the internet, or massive open online courses (MOOCs). A MOOC can read through web content in a coherent thread of learning. Social features like discussion and leader boards provide ways for learners to interact with peers and moderators. Gamification in the form of badging and micro credentialing also contribute to the learner experience. The next phase I SBIR project at inXsol will seek to create a similar social learning platform with interesting geolocation components.

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## Evaluating the Effectiveness and Appropriateness of E-learning Technologies for Training

Salvatore Cali, associate principal investigator at OAI, Inc. presented his experiences with interactive, blended, and stand-alone learning techniques. He also offered observations on the suitability of these techniques, and described different evaluations that have been used to determine the techniques' effectiveness for training.

Cali has a background in film production, and he has witnessed the utility of videos for training in different health and safety professions. Learning evaluations based on video training are limited, and typically consist of pre- and post- multiple-choice questions. Cali has also worked with Lock-Out, Tag-Out technologies, which include a lockout and loop feature if one question is answered incorrectly at the end during review.

Use of e-learning technologies provides ease of accessibility for trainees who have limited time or live in distant locations. E-learning technologies also provide innovative

techniques that promote engagement and emotion for trainees. While there are many advantages of implementing e-learning technologies, there are also specific limitations. For example, incompatibilities for e-learning technologies to work across multiple platforms and systems is a huge concern, as well as the labor and cost required for continual maintenance of these systems.

Cali suggested that there are timeless rules to abide by with use of e-learning technologies to overcome these limitations. Organizations should focus on well-defined goals and concepts, and capture elements using high production values (e.g., high resolution photos and videos). It is also important to manage assets and to maintain knowledge about changes in technological compatibility and formats.

"Many instructors are concerned that e-learning technologies will replace them, but a human presence will always be needed

**"Videos are great for training, but it is important to keep the human element, otherwise you will unintentionally lose your audience."  
– Salvatore Cali,  
OAI, Inc.**

for effective instruction,” stated Phillips, from OAI, Inc. Instructors must be willing to keep up with the pace of learners. Students are learning differently compared to years ago, and the attention span of millennials is much shorter compared to other generations. Therefore, students need to be able to quickly access information, and then move onto other things.

Phillips described how OAI uses [\*Talent Learning Management System \(Talent LMS\)\*](#) to train workers. Talent LMS is a software program that provides trainees with access to training curriculum, scheduling, learning content, emails, surveys, quizzes, and timelines in a central location. “Motivation is the key to training,” Phillips stated. “If you are motivated to learn, I can teach you anything.” The Talent LMS tracks three measures of trainee motivation: frequency, duration, and intensity. Talent LMS provides trainees with infographics to help them track their progress on courses, certifications, and badges. Other infographics include aspects of gamification, where one trainees’ progress is shown in comparison to others.

OAI has experienced lots of success with the Talent LMS in a very short period of time. Within the first year of using the Talent LMS, OAI has observed an increase in the following outcomes:

- Trainee test scores;
- Trainee motivation to complete course content;
- Trainee capacity to review course content at their own pace (i.e., content mastery);
- Trainee ability to articulate content and apply it across different scenarios;
- Facilitator, or trainer, capacity to identify and resolve issues surrounding trainee learning; and
- Trainee and facilitator communication.

Trainees and facilitators have embraced use of the Talent LMS and reported positive feedback about it as a training resource. For example, trainees have stated they enjoy the ability to engage in learning when they want, which is helpful for their busy schedules. Others have mentioned that they enjoy the ability to repeat learning activities until they understand the content. Trainees also enjoy the gamification, or competitive, aspects used in the Talent LMS. Facilitators have reported that Talent LMS allows them to include more information within the same time frame as traditional learning methods, and that students are more motivated to learn. It also allows facilitators and trainees to exchange information with each other in real-time.

OAI facilitators have various experiences with using LMS for training; therefore, before any facilitator incorporates LMS into their learning program, they are required to take a TTT blended learning course on use of an LMS. The course is designed to have facilitators act as trainees so they can experience first-hand what it is like to learn via LMS.

OAI anticipates adding other components to the Talent LMS in the future. Phillips recently completed a pilot test of a full micro-lesson course on critical thinking. The course includes daily face-to-face instruction coupled with online micro activities for trainees. Next year, OAI will implement m-learning, or mobile learning, into the Talent LMS. They are also seeking to incorporate both a hard and a soft skills course into the Talent LMS to form a blended program curriculum, and will work with employers to add more e-learning modules that promote scenario-based learning for trainees.

Womachka and Kozak stated that TNEC-CSEA has experienced success with an open-source e-learning platform called [\*Moodle\*](#). TNEC-CSEA uses this platform as

**“Technology will not replace teachers, but teachers who use technology will replace those that do not.”**  
– Author unknown

a clearinghouse for their training materials, videos, games, quizzes, and calendars for scheduling.

There are many advantages to using Moodle for training. It is free of cost, provides unlimited access to training materials, offers a variety of learning tools, and provides ways to track trainees' progress on different activities. Moodle also facilitates networking between trainers and trainees. However, there are some disadvantages with use of this platform for training. For example, Moodle does not fit into NIEHS traditional reporting methods. Additionally, internet or WiFi access is required and trainees need basic computer skills to operate it.

Evaluation of e-learning tools such as Moodle should include measurable outcomes, such as increased training numbers, greater site specificity, increased level of preparedness, and decreased injury rates. TNEC-CSEA recently initiated an evaluation project to explore staff, peer trainers, employers, and trainees' perspectives on Moodle as an e-learning tool. They evaluated the following:

- Effects on trainers' abilities to train in the workplace;
- Responses to e-learning;
- Post-training outcomes (e.g., increased level of preparedness, decreased injury rates);
- Enhancement of direct (classroom) training;
- Effects on union connection and if connection or support advances desired educational outcomes;
- Effects on union building; and
- Effects on policy and programs.

The project includes a development, implementation, and continual evaluation phase. Google survey was used to gather feedback during the development and implementation phases, where staff, peer

trainers, employers, and trainees offered feedback on whether Moodle is useful and practical and if it enhances the training experience. Initial observations from the evaluation project have revealed several reasons for trainers, trainees, and employers' resistance to use Moodle. The most resistance comes from those that do not use computers on a regular basis at work or have never had any computer training.

Womachka also mentioned that TNEC-CSEA plans to evaluate the effectiveness of their VR viewer technology for Hazardous Waste Operations and Emergency Response (HAZWOPER) training sessions. Workers and their employers will evaluate training sessions and use of the VR viewer after each session "The VR is an evaluation tool itself, and when it is combined with a hazard recognition activity, it shows the instructor if a trainee has grasped the concepts of the course," she said. Workers and their employers will evaluate the VR viewer at each training session. TNEC-CSEA will request information from workers and employers to evaluate the VR viewer for:

- Feasibility: Is it possible to use the VR technology at your worksite? Do you have the technical skills and equipment to perform the activity?
- Affordability: Does your employer have the funds to buy the necessary equipment? Are they willing to purchase the equipment?
- Ease of use: Is the VR viewer and system too complicated?
- Interest: Do you find the VR activity useful, fun, and purposeful?

## Conclusions and Next Steps

The breadth of e-learning technologies will continue to expand to meet the dynamic needs of society. Learners and instructors bring important perspectives to consider for training and education. Learners thrive on the need for easily accessible, understandable, and interesting or engaging content to capture their otherwise diverted attention. Instructors are then faced with keeping up with the evolving needs of these learners in a classroom or online learning space. Furthermore, some instructors face feelings of being removed or replaced by e-learning technologies.

WTP not only recognizes the importance of considering the learner and instructor perspectives on e-learning technologies, but has demonstrated successes in deployment of these technologies for effective HAZMAT training for workers. Several awardees have adapted in-classroom learning modules for mobile applications. Some have shown the opportunities that VR and immersive technologies offer for workers in different occupations. E-learning resources and systems, such as LMS and MOOCs, will continue to facilitate distance-education and interactive learning experiences. These systems also provide opportunities for instructors to remain engaged, and to maintain contact with learners.

Moving forward, WTP will better assess and document the core principles needed for effective deployment of e-learning technologies for HAZMAT training. This will be an area of focus during the next WTP workshop in fall 2017, which will include discussion of updates to the Minimum Criteria. To prepare for these conversations, workshop attendees offered feedback on guidelines to consider related to e-learning technologies and discussed the following as next steps:

### **Affordable to Deploy and Develop**

- Reach out to partners and increase collaboration on development and deployment of e-learning technologies.
- Identify existing tools that can be easily adapted and customized for training.
- Implement a five-year buying or development plan for awardees who face budget issues.

### **E-literacy and User-Friendliness**

- Consider using familiar online platforms or tools to direct trainees to e-learning resources.
- Provide trainees with verbal, written, or picture-based instructions that are easy to understand. These types of instructions would facilitate the process of registration and completion of course modules.

### **Supports Group and Empowerment Learning**

- Incorporate opportunities for interactive, peer-to-peer learning.
- Implement e-learning technologies that incorporate a hybrid of teaching styles (i.e., lecture, hands-on activities, virtual experiences) to promote trainee engagement.

### **Ease of Use by Trainers**

- Provide instructors with an accessible manual or guide to help them determine what to do if a technology fails, and to help them find useful alternatives (e.g., glossary, list of frequently asked questions).
- Provide instructors with a checklist of criteria for TTT activities, refreshers, and follow-up training to ensure that they are comfortable using the technology.

## Needs and Challenges for Training Technologies

Workshop attendees shared their common needs and challenges for training technologies during a roundtable icebreaker activity. Each roundtable submitted feedback using a free

online whiteboard tool called *Padlet*, and the following tables provide the primary themes, comments, and questions that arose from attendees' responses.

Needs for Training Technologies	
What are the new approaches and best practices for using training technologies?	<ul style="list-style-type: none"> <li>• Electronic approaches to disseminate information.</li> <li>• Learn best practices from other awardees and organizations.</li> <li>• Learn new and useful approaches for technologies.</li> </ul>
What are some effective means of integration and delivery?	<ul style="list-style-type: none"> <li>• Learn how to better use technology to deliver training.</li> </ul>
How to evaluate technologies?	<ul style="list-style-type: none"> <li>• Is technology being evaluated separately from entire training program?</li> <li>• How is efficacy being measured and evaluated?</li> <li>• How to measure qualitative impacts?</li> </ul>
How to make technologies appropriate for trainers and target audiences (language, literacy, age, etc.)?	<ul style="list-style-type: none"> <li>• What are other organizations using for multiple languages in general and using technology?</li> <li>• How do we engage the new work force without ignoring the older workforce?</li> <li>• Learn to develop mobile applications that are accessible to workers with diverse backgrounds and learning capabilities.</li> <li>• How to integrate emerging technologies given variation in age and technical capabilities for instructors and trainees.</li> </ul>

Challenges and Limitations for Training Technologies	
Logistics and cost	<ul style="list-style-type: none"> <li>• How to keep up with ever-changing technologies?</li> <li>• How can this be done in a cost-effective way?</li> <li>• How to lower cost without sacrificing quality of training?</li> <li>• Gaining suitable space and resources to support training with technologies.</li> <li>• IT expertise and support for technologies.</li> </ul>
Accessibility	<ul style="list-style-type: none"> <li>• WiFi access, bandwidth, and security.</li> </ul>
Adaptation	<ul style="list-style-type: none"> <li>• How do we blend old technologies with new techniques?</li> </ul>
Instructors and trainers	<ul style="list-style-type: none"> <li>• Trainer acceptance of technologies.</li> </ul>
Target audience	<ul style="list-style-type: none"> <li>• Older trainees (&gt;45 years) have a hard time using technology.</li> </ul>

## Workshop Agenda

**RUTGERS**  
School of Public Health

**UMET** UNIVERSIDAD METROPOLITANA  
SISTEMA UNIVERSITARIO ANA G. MÉNDEZ

Sponsored in conjunction with

**NIH** National Institute of Environmental Health Sciences  
Worker Training Program

# Best Practices in Using Technology in HAZMAT Training

March 29–30, 2017 | The Condado Plaza Hilton, San Juan, Puerto Rico

All sessions are in the Lagoon Tower, lobby level, unless specified.

# Agenda

## March 29, 2017

8:00–9:00 a.m. **Registration and Breakfast** ..... Royal Ballroom Foyer

9:00–9:15 a.m. **Welcome** ..... Royal Ballroom

- Mitchel Rosen, Ph.D., Rutgers University
- Carlos Padin, Ph.D., Universidad Metropolitana (UMET)
- Joseph “Chip” Hughes, Jr., NIEHS Worker Training Program (WTP)
- Linda Birnbaum, Ph.D., NIEHS

9:15–9:45 a.m. **Introductions and Icebreaker Activity**

**ICEBREAKER ACTIVITY:** Attendees will discuss the limitations that they have encountered using technologies for worker safety and health training within their organizations. Attendees should consider the following questions:

- What would you like to get out of this workshop? What do you want to learn?
- What are some of the major challenges your organization faces in using technologies for worker safety and health training?
- What are some potential solutions for overcoming these limitations?
- Attendees will use an interactive polling tool to submit topics discussed at their round tables.

9:45–10:15 a.m. **Evolution of Technology Use in WTP: Our History and Looking Ahead**

■ **History of Technology among WTP Awardees**

- Chip Hughes, NIEHS WTP

■ **Current Technology among WTP Awardees**

- Kenda Freeman and Deborah Weinstock, National Clearinghouse/MDB, Inc.

10:15–10:30 a.m. **Break** ..... Royal Ballroom Foyer

10:30 a.m.–noon **Use of E-learning Technologies and Resources in WTP**

**BREAKOUT SESSION:** There will be three breakout rooms for this session. **Attendees will have an opportunity to attend two breakouts of their choosing during this 90-minute session.**

Breakout hosts will be charged with addressing several questions during their collaborative presentation(s). Breakout participants will be charged with asking questions and interacting with the breakout hosts to find out more information about the tools that are presented.

**Mobile Apps/Online** ..... Mezzanine, Condado Room

**MODERATOR:** Carol Rice, Ph.D., Midwest Consortium

- Gary Gustafson, CPWR – The Center for Construction Research and Training (CPWR), and Ken Smith, Simcoach Games

Microgames: an overview of their process and philosophy for developing and using the technology, followed by a demonstration. Microgames are two- to three-minute video games for learning and practicing real workplace skills.

- Peter Raynor, Ph.D., University of Minnesota/Midwest Consortium

The METPHAST program, supported by NIEHS, will be described and integration into a Midwest Consortium air pollution exercise will be illustrated. Other exercises developed by the Midwest Consortium using online resources will be listed.

**Virtual Reality/Simulations** ..... Mezzanine, Laguna I

**MODERATOR:** Jim Remington, NIEHS WTP

- Matt Kozak and Janet Womachka, The New England Consortium-Civil Service Employees Association (TNEC-CSEA)

Virtual reality and computer-based simulations with 360-degree views allows them to put any participant in a hazardous area while they provide training and guidance as to how to assess and control hazards.

- Jennifer Lastra, 360immersive

The company offers a do-it-yourself model where they share their best production techniques with designated people in your organization.

- Russell Rivard, Milwaukee Fire Department

HazSim is a handheld monitor that can be converted into various meters and controlled from afar by the instructor so students can properly respond to immediately dangerous to life or health (IDLH) atmospheres without actually being in one.

**E-learning Resources and Technologies** ..... Mezzanine, Laguna I

**MODERATOR:** Chip Hughes, NIEHS WTP

- Mark Catlin, Service Employees International Union

Use of a YouTube video library for safety and health training.

- Pat Goble and Rob Wininger, International Chemical Workers Union Council (ICWUC)

Use of tablets for training, and how to do HAZWOPER training through apps instead of the traditional PowerPoint presentations.

- Sean Phillips, OAI, Inc.

Use of gamification for Environmental Career Worker Training Program (ECWTP) training, and social media for recruitment and follow-up.

- Gregory Sempowski, Ph.D., Duke University

Use of the Inquisiq Learning Management System (LMS) with Storyline 2 to develop, schedule, track, and document training sessions; register trainees; pre-quiz, post-course test; and post-course evaluation.

Noon–1:15 p.m. **Lunch** ..... Royal Ballroom Foyer

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1:15–2:15 p.m. **Evaluating the Effectiveness and Appropriateness of Training Technologies** ..... *Royal Ballroom*

**MODERATOR:** Donald Elisburg, *National Clearinghouse/MDB, Inc.*

- Salvatore Cali and Sean Phillips, *OAI, Inc.*  
Observation, routine evaluations from students and instructors, third-party evaluation, peer-to-peer interest; LMS can track usage. Evidence of effectiveness: increased engagement observed; for LMS platform, higher scores on exams and better articulation of content by trainees.
- Matt Kozak and Janet Womachka, *TNEC-CSEA*  
CSEA uses a multi-level system for evaluation. Staff evaluates the technology's use, then the peer trainers, then the direct users evaluate their experience, use, and value brought to the training. CSEA is also doing an evaluation project regarding some of this technology.

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2:15–3:15 p.m. **Current and Emerging E-learning Tools and Technologies**

**MODERATOR:** Kenneth Oldfield, *Alabama Fire College*

- Jennifer Lastra, *360immersive*
- Henry Ryng, *inXsol*
- Gautham Venugopalan, *Ph.D., Gryphon Scientific*

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3:15–3:30 p.m. **Overview of Interactive Learning Sessions**

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3:30–3:45 p.m. **Break** ..... *Royal Ballroom Foyer*

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3:45–5:00 p.m. **Interactive Learning Sessions**

■ **Explore Training Technologies**

- **Using Technology to Train about the Emergency Response Guidebook** ..... *Mezzanine, Laguna I*
  - Pat Goble and Rob Winingar, *ICWUC*
- **Latest Technology Used in Work Zone Safety Training** ..... *Mezzanine, Condado Room*
  - Emmett Russell, *The American Road and Transportation Builders Association*
- **Microgames** ..... *Mezzanine, Laguna II*
  - Ken Smith, *Simcoach*

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■ **Product Sharing** ..... *Mezzanine, Miramar I*

SBIR grantees and other companies will share the products they have created that may be useful for health and safety training.

- Cesar Bandera, *Ph.D., CellPodium*
- Matt Hammer, *Vivid Learning Systems*
- Jennifer Lastra, *360immersive*
- Shariar Motakef, *Ph.D., CapeSym, Inc.*
- Henry Ryng, *inXsol*
- Gautham Venugopalan, *Gryphon Scientific*

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5:00 p.m. **Adjourn for the Day**

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6:30 p.m. **Group Dinner** ..... *Waikiki, Regatta 996, 1022, Ashford Avenue*

## March 30, 2017

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8:00–9:00 a.m.	<b>Registration and Breakfast</b> .....	<i>Royal Ballroom Foyer</i>
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9:00–10:00 a.m.	<b>Keynote Address</b> .....	<i>Royal Ballroom</i>
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■ **The Evolution and Future of Health and Safety Training**

- Jill James, *Vivid Learning Systems*

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10:00–11:00 a.m.	<b>Best Practices for Technology Use In or Out of the Classroom</b>	
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Questions to consider for session:

- What are some technology-based methods to enhance what you are teaching in/out of the classroom?
- How can existing technologies be adopted to enhance curricula?
- What is and isn't appropriate use for certain technologies (in/out of classroom)?

**MODERATOR:** Sharon Beard, *NIEHS WTP*

- Jill James, *Vivid Learning Systems*  
Language-free learning.
- Chris Trahan Cain, *CPWR: TRU-Net – The Trainers & Researchers United Network (TRU-Net)*  
TRU-Net is an effort to formalize the link between CPWR's consortium of safety and health researchers and its extensive training network.

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11:00–11:15 a.m.	<b>Break</b> .....	<i>Royal Ballroom Foyer</i>
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11:15–11:45 a.m.	<b>E-learning and Minimum Criteria: Kick-off Planning for the Fall Workshop on Minimum Criteria</b> .....	<i>Royal Ballroom</i>
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**FACILITATOR:** Craig Slatin, *Sc.D., TNEC*

Using a polling tool, or flipchart, attendees will provide at least one minimum criteria for e-learning (i.e., critical criteria that are needed to make e-learning optimally useful for trainees) that falls within one of the following categories:

- E-literacy/user-friendliness
- Supports group learning and empowerment learning
- Ease of use by trainers
- Affordable to develop and deploy
- Enhances the discussion, lecture, and hands-on learning

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11:45 a.m.–noon	<b>Wrap-up</b>	
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Noon–1:00 p.m.	<b>Lunch</b> .....	<i>Mezzanine, Miramar I</i>
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## Speaker Biographies

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### **Chris Trahan Cain, CPWR**

Chris Trahan Cain, industrial hygienist, is the executive director at CPWR and safety and health director for North America's Building Trades Unions.

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### **Salvatore Cali, OAI, Inc.**

Salvatore Cali is an associate principal investigator at OAI, Inc. He is an industrial hygiene instructor and researcher at the University of Illinois at Chicago School of Public Health. He has 26 years of experience in exposure assessment and teaching. Cali has participated in several distance and computer-based technology training projects involving video, visual graphics, audio, and simple interactive techniques that were used for reinforcement of training and evaluation of training effectiveness.

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### **Mark Catlin, SEIU**

Mark Catlin is an industrial hygienist currently working for the SEIU in Washington, D.C. Since 1981, Catlin has worked on a wide range of occupational and environmental health issues for labor unions, National Council for Occupational Safety and Health groups, and the University of Washington occupational medicine clinic. In the 1990s, he began collecting and incorporating historical films into his health and safety training. In 2006, Catlin created a YouTube Channel, [\*Historic Workplace and Environmental Health and Safety Films\*](#), as a resource for trainers and educators. The channel has had almost 8 million hits and currently contains more than 1,100 films and clips from the rich history of occupational and environmental health, primarily from 1912 to 2000. In 2010, Catlin developed

a Facebook group to promote occupational and environmental health and use of the YouTube channel.

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### **Pat Goble, ICWUC**

Pat Goble has worked at the Hanford DOE site for 31 years as a light equipment mechanic. Pat has been a worker trainer for 20 years with ICWUC involved in the HAZWOPER and respirator training programs and has been the ICWUC site coordinator for the Hanford site for 7 years.

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### **Jill James, Vivid Learning Systems**

Jill James is the chief safety officer at Vivid Learning Systems. With 12 years of experience as a senior OSHA safety investigator with the state of Minnesota, and a decade of private sector safety management experience, James brings an unrivaled perspective on risk, regulation, and liability. She is a passionate advocate for workforce well-being and safety through prevention. Having personally worked through each one of OSHA's regulations related to training and compliance, she has a talent for unwinding state and federal regulations. James holds a master's degree in industrial safety.

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### **Matt Kozak, TNEC-CSEA**

Matthew Kozak is a certified associate industrial hygienist from the Civil Service Employees Association, AFSCME Local 1000. Kozak is the director of occupational safety and health, and principal investigator for CSEA's sub-award. He has been with CSEA for 20 years.

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## **Jenifer Lastra, 360 Immersive**

Jennifer Lastra, CEO and managing director of 360 Immersive, LLC, is a certified project management professional and veteran of the U.S. Navy. Prior to her work at 360 Immersive, Lastra spent most of her career working for several large defense contractors that supply military equipment and services to help ensure our nation's security. Lastra found a niche for her skills and co-founded 360 Immersive at a time when VR was on the cusp of a massive period of growth. The company helps organizations capture mission critical imagery using an affordable application-based solution that archives, protects, and distributes immersive content on demand. As the CEO and managing director, Lastra brings a sincere passion for immersive technology, and an enthusiasm to help businesses realize the potential of VR as the game-changing training and performance-enhancing tool of the future. Lastra holds a bachelor's and master's of business administration degree from Averett University.

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## **Sean Phillips, OAI, Inc.**

Sean Phillips is the innovation and learning manager at OAI in Chicago. He is a dynamic professional that holds 15 years of experience in instructional design and facilitation. Phillips' passion is to empower learners from underserved populations and help them realize their potential in the workplace.

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## **Peter "Pete" C. Raynor, University of Minnesota School of Public Health**

Peter C. Raynor, Ph.D., is an associate professor in the Division of Environmental Health Sciences at the University of Minnesota School of Public Health. Raynor's research and teaching interests revolve around the assessment and control of environmental exposures, especially those occurring in workplace environments. Raynor directs the University of Minnesota Industrial Hygiene Program and the METPHAST. Raynor holds a bachelor's degree in chemical engineering from Cornell University, as well as a master's and doctorate degree in environmental sciences and engineering from the University of North Carolina at Chapel Hill.

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## **Henry Ryng, inXsol**

Henry Ryng has been in the technology-based training field throughout his career. Ryng has supported and led engineering efforts to develop flight simulators, desktop, mobile or Web-based training simulations, interactive e-learning, performance support tools, and LMS. Henry founded inXsol, pronounced "in ex sole", as an Arizona small business and is celebrating a milestone of 20 years in business.

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**Gregory “Greg” D. Sempowski, Duke University**

Gregory D. Sempowski, Ph.D., is a professor of medicine and pathology at Duke University, and is the director of the Duke Regional Biocontainment Laboratory. Sempowski is an accomplished cellular and molecular immunologist with expertise in immune senescence, immune reconstitution, animal models and experimental vaccination and infectious disease challenge. He is the principal investigator of the Duke Infectious Disease Response Training Program, which is focused on Ebola and other infectious disease awareness education and safety training for worker populations across the U.S.

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**Gautham Venugopalan, Gryphon Scientific**

Gautham Venugopalan is a senior analyst at Gryphon Scientific. He is the technical lead for an NIEHS Phase I SBIR project entitled “Develop and Test a Tool for Training Research Responders in Emergency Operations.”

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**Rob Wininger, ICWUC**

Rob Wininger has worked on the Hanford site for 30 years as a health physics technician, and 22 of those years have been spent as a worker trainer for the ICWUC grant and the HAMMER facility. In those 22 years as an instructor, he has helped write and instruct hazardous waste refresher courses, 24/40 hour initials for ICWUC, and respiratory and beryllium classes for HAMMER.

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**Janet Womachka, TNEC-CSEA**

Janet Womachka is from The Civil Service Employees Association, AFSCME Local 1000. Womachka is the occupational safety and health trainer and peer trainer program coordinator. She has been with the CSEA for 13 years.



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