

# ONLINE VS. CONVENTIONAL

## Safety Training Approaches

By H.E. "Trey" Greene and Cheryl L. (Cheri) Marcham

**AS ACCESS TO HIGH-SPEED INTERNET HAS BECOME UBIQUITOUS** and the possibilities presented by rapid advancement in the development of interactive, game-based courseware increase, even the most traditionally minded safety managers are considering including online safety training, or e-learning, in their OSH programs. As part of that consideration, safety managers may question whether taking safety training online is a valid alternative to their instructor-led efforts or if it is simply a cheaper, check-the-box option with less than favorable results.

To begin the analysis of whether online safety training is a valid alternative to in-person training, a typical literature search reveals many comparative analyses on the merits or weaknesses of e-learning versus conventional learning approaches. In fact, a meta-analysis of multiple studies comparing classroom lessons with electronic distance learning lessons reported that no major differences exist in learning between the two styles of presentation (Bernard, Abrami, Lou, et al., 2004). However, most of the literature comparing online e-learning to conventional instructor-led classroom training focuses on academic education settings, although some isolated comparisons of online training versus in-person training have been reported in specialized corporate situations (Esch, 2003; Jordan, 2016; Schmeeckle, 2000), online CPR training (Braun, 2002; Rogers,

2013; Teague & Riley, 2006), and industrial safety and health training for a relatively small, multinational company (Rozar, Ibrahim & Razik, 2011).

Currently, however, the preponderance of evidence from which to draw a comparison between online and instructor-led training is based on academic classroom settings (e.g., algebra, philosophy, history classes), but the authors see safety training as quite different from a high school history class or similar application. Exploring and understanding these differences, as well as understanding the benefits and limitations of online learning, can facilitate discernment on whether and when to incorporate online safety training.

### **Safety Training: Different From Other Instruction Types**

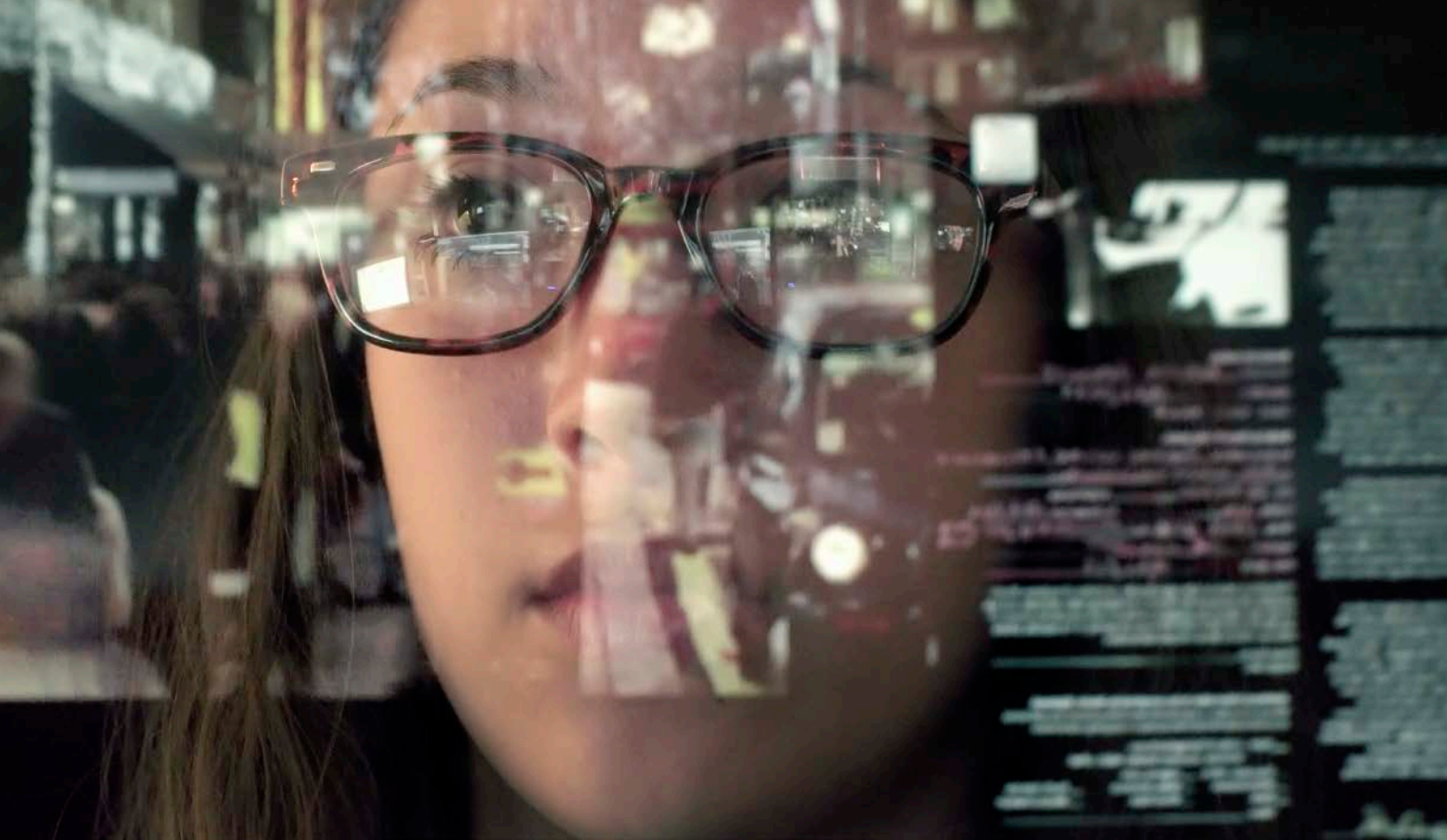
Employee safety training is a fundamental component of any corporate compliance program. If the regulation, policy or standard does not explicitly require employee safety training, almost invariably, the corrective or preventive action resulting from root-cause analyses of incident investigations, ISO 14001 audits or job safety analyses results in recognition that part of the solution is some nature of employee training. But safety training is different from other types of instruction in terms of the instructor's role, learner motivation, verification of competency and measuring effectiveness.

### **Differences in the Role of the Provider**

In contrast with higher education, for example, the provider role is altogether different in safety training. A college professor sets out his/her curriculum and lesson plans, delivers lectures, assigns reading, and administers mid-term and final exams. If the student pays attention in class, completes the assignments and studies, s/he should earn a passing grade. If graded on a scale, the student is in competition with other students. The greater the aptitude and effort, the better the grade. The professor has a limited implied responsibility for how well the student fares in the course. An A grade indicates that the student achieved a high level of competency with

### **KEY TAKEAWAYS**

- While ample published research establishes that online education courses can be effective, the intended purpose and expected outcomes of safety training are different than for academic educational courses.
- With safety training, it is not enough to simply provide the employee with training; the employer must also show that employees can demonstrate competency by transferring the knowledge and skills acquired in training and performing the job safely.
- In many cases, online safety courses can be more efficient, consistent and cost effective. However, OSH professionals should selectively apply e-learning and understand when face-to-face training provides a better option.



the material; a D grade indicates that the student displayed limited competency. Further, if a student earns a D grade or fails a course, the professor has no follow-on responsibility to continue providing instruction until the student is competent in the material. If a student fails while others do well, it is generally perceived as the student's fault.

In contrast, an instructor hired by an employer to deliver a hazard communication course to a group of employees has an entirely different job. The instructor has been hired to train employees on their rights and responsibilities under the standard, the hazards to which they are potentially exposed and how they can mitigate those hazards so that they can work safely. In this type of instruction, the instructor bears more relative responsibility in ensuring that the learner learns. With little exception, simply failing an employee because s/he did not pay attention during lectures is not an option. In the authors' experience providing safety and environmental training to a range of audiences, it is not uncommon to have delivered a safety course in which not all the students have achieved competency in the subject matter by the end of the scheduled course. Invariably, we find ourselves spending time with those who did not pass a test to discuss concepts they had clearly not grasped during the course and confirm that they ultimately do before we sign off on their certificates and leave the facility.

What are the alternatives? Suggest that the employer terminate the employee? Send the employee off to work knowing that s/he has not achieved competency? Of course not. Everyone must pass, and the employee knows this. The fact that the employee "cannot fail" perpetuates a passive, less-engaged attitude, putting even more of the burden on the instructor.

### Differences in Learner Motivation

This article does not argue that a student is more excited to go to an English literature lecture than is an employee going to a HazCom course, but there are subtle differences in the way these individuals perceive the event. College students have chosen their school and selected the classes they need to

achieve their educational goals. Presumably, there lies some passion for the subject matter, and while they may not be entirely convinced that this class is critical to their education, they may see it as a means to an end. In contrast, employees typically dislike safety training. Most OSH training assigned to employees (e.g., safe lifting, stormwater compliance, workplace violence) is perceived as a bureaucratic requirement that they are required to sit through.

Lim, Lee and Nam (2007) report that motivation, or "the degree to which the learner is willing to make efforts to improve his or her performance of training and work" (Robinson, 1985), directly affects online learning performance. Mathieu, Tannenbaum and Salas (1992) report that trainees react more positively and score higher on post-test results if participation in workplace training is self-selected rather than assigned. While some companies allow employees to selectively complete supplemental, non-regulatory-based training, most safety training courses are assigned, mandatory courses. This motivation and attitude, where the employee comes to the training event potentially "checked out" and with little motivation, adds burden to the trainer. To be effective, special attention must be paid to course design, development and delivery to convince the learner that the training is valuable and relevant.

### Differences in Verifying Employee Competence

With safety training, it is not enough to simply provide training to the employee; the employer must also show that employees can demonstrate competency by transferring the knowledge and skills acquired in training and performing the job safely (OSHA, 2018). A typical history exam might indicate that a student remembered that the Magna Carta was signed in 1215 or that John Wilkes Booth was an actor. Correctly answering these questions confirms that the student listened to the lectures, took notes and studied the textbooks. It rarely confirms that the student achieved the wisdom and world perspective that knowing the history should provide.

In contrast, an effective OSH training program must establish direct associations between identified hazards and impacts, with both the employee competencies required to mitigate them and the training designed to deliver those competencies. Companies should identify these hazards and impacts through comprehensive job hazard or environmental impact analysis, establish their relative significance and determine what competencies are required to mitigate these risks (ANSI/ASSP, 2017). Once the competencies are defined, they should be linked with what training is delivered to meet them. This approach should be an ongoing process on a continual improvement cycle (ANSI/ASSP, 2017).

### Differences in Measuring Outcomes

In general, the connection between an educational degree and the desired outcomes of that accomplishment are murky at best. In fact, many recent news stories report that college degrees may not have a positive return on investment in lifetime earnings. In contrast, an effective safety training program maintains a direct link between safety metrics and the training being delivered. Workers' compensation claims, OSHA-reportable injuries, near-hit and incident investigation data are analyzed for root causes, the solutions to which typically affect a company's training program. Safety training is different and, therefore, any research comparing generic online education to conventional approaches is not relevant when evaluating the comparative strengths and weakness of online safety training with conventional safety training approaches.

### Comparing Online Safety Training to Conventional Approaches

Now that the authors have argued that existing studies may not be relevant to whether online safety training is as effective as conventional approaches, let's compare the two. Conventionally delivered or instructor-led safety training can take many forms. At its best, it involves a knowledgeable, passionate instructor with direct experience in the subject matter delivering accurate, vetted, standardized, relevant learning content to a small group of motivated learners in an environment conducive to learning, and involves testing the learners on the course's terminal learning objectives. These events can be multiday courses or 10-minute tailgate briefings. Such courses can be delivered in a classroom or at the work site. They can include visual displays, individual and group problem-solving and hands-on exercises to assist the instructor in meeting the training objectives. At its worst, conventional training involves dry presentations read by the instructor or long, boring videos with content that has little relevance to workers' actual on-the-job hazards.

E-learning can also take on different forms. Some of the e-learning provided in higher education is considered synchronous e-learning. Classes are held at specific times where an instructor may deliver lectures via a web-conferencing platform. Some classes may be asynchronous, in which students are provided with uploaded videos or reading assignments, but students have access to an instructor for questions and participate in online forum discussions. Students can download their assignments and upload homework and tests to the platform to be either automatically graded or graded manually by the instructor, with results posted on the platform. Asynchronous educational classes can be self-paced or can have assignment due dates like synchronous learning.

Most online safety training is delivered asynchronously and is self-paced. Training can range from highly interactive with text, voice narration and animation, to a simple PowerPoint slide deck with a multiple-choice or true/false quiz at the end. Well-developed and thoughtful online training designed to encourage processing and application of the information presented, as well as intentional interaction with the delivery system, can effectively promote learning (Clark, 2010).

For example, training that incorporates multiple interactivity components, such as a new graphical element, highlighted graphical element or some other visual illustration of a concept being conveyed throughout the training helps to hold the learner's interest. In addition, periodic highly engaging and interactive assessments such as drag and drop, image sorting and other complex exercises designed to provoke and test the learner's critical thinking throughout the course, rather than just at the end, can help to ensure that content is conveyed. Complex scenarios can be used to engage the learner in decision-making with branching results in which the learner is presented with varying levels of outcomes based on his/her decisions.

Given the technology available today, it makes sense to explore online safety training as a tool to meet both compliance and employee competency objectives. The trick is to determine which mode of training is the best choice for each safety training requirement and employ the optimal modality.

Conversely, online training that relies on merely reading a PowerPoint and answering all the questions correctly on a quiz provided immediately after training cannot be relied on to ensure that the employee will be able to apply those required skills later (Clark, 2010). Content covered is not always content learned (Clark, 2010); so, for this discussion, let's presume that the online safety courses to be employed are relevant, engaging and well-constructed.

Clearly, one benefit of employing e-learning is that it can be less expensive in comparison to instructor-led training, principally by eliminating direct costs related to travel time, facilities and in-house or contract human instructors, especially for geographically dispersed organizations (Becker, Fleming & Keijsers, 2011). In fact, avoiding these costs is likely the single most compelling reason that companies have adopted the technology.

An additional benefit is that e-learning is available 24 hours a day, every day, making this method advantageous for immediately training newly hired employees, rather than waiting for the next scheduled in-person course. For example, the authors worked with an insurance company that insured small grocery stores to switch from conventional safety training performed by a consultant to online training. In 1 year, the company reported a 55% reduction in workers' compensation claims from clients. The reason for this astounding impact was not that the



online safety training itself was necessarily more effective than the conventional approach, rather than most grocery employees were not actually receiving the conventional safety training. The grocery industry is known for its attrition. Another factor was that most stores run multiple shifts, so the consultant was only training one shift, once per year and was only able to reach some of the stores. Moving the training online allowed the insurer to require nearly complete compliance with training requirements. The employees took the training as part of the onboarding process and could take it anytime, from anywhere. They all received the training and achieved the competencies, resulting in a reduction in injuries and illnesses.

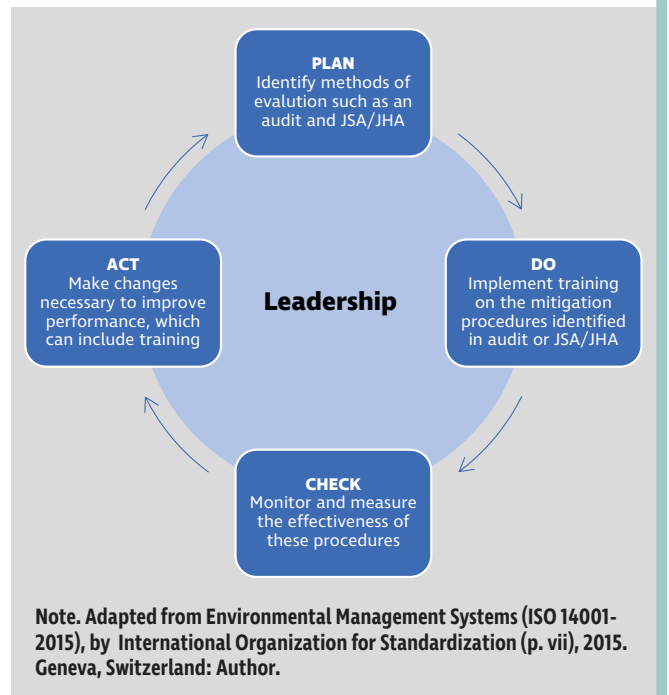
Online training can also be significantly more efficient in terms of employee time. The authors were tasked with converting a traditional 32-hour course delivered conventionally for many years to an online course. Although the online course contained all of the lectures, exercises and test questions of the conventional version, learners were completing the online version in 9 to 13 hours. How could the online version take only 9 hours to complete, while the conventional version requires 32? The authors combed through the online version for anything that might be missing yet found that it was identical to the classroom version. So, what was swallowing up so much time in the classroom?

One time-consuming issue was several breaks during the day to allow learners to use the restroom. This halted training for 20 minutes at least four times during the day. Another time-consuming factor was stopping for questions. Instructors typically love questions because they indicate that the class is engaged and interested in the subject. Questions may also indicate where the information was not successfully relayed, and elaboration might be needed for learners who missed a salient point.

However, after really paying attention to what was going on in class, the authors were surprised by how few actual questions were being asked. In fact, we observed that most potential questions were not actually questions at all, but rather learners demonstrating their own mastery of the subject to classmates (e.g., "Excuse me, isn't it true that vapor pressure and atmospheric pressure are linked?"). In actuality, after keeping a log, the authors discovered that as many as four out of five asked and answered events were not relevant to the defined learning objectives and did nothing to advance the learning process.

Another time-consuming component of conventional training are the stories told. People who choose training as a career typically like to talk. Trainers know and enjoy the subjects they elect to teach and like to talk about their experiences as they relate, albeit loosely, to the subject. Stories can be memorable and, when used carefully, relevant stories can promote the instructional goal and improve learning by engaging the audience's attention (Clark, 2010). However, in many cases, the use of stories for the sake of stories does not always advance the learning progression and rarely directly supports the target objectives. Telling stories tends to eat up time and, while some learners may enjoy these musings, invariably some learners do not appreciate the distraction and want to get back to the lecture. In fact, there is evidence that anecdotal stories unrelated to the learning objective, while interesting, may interfere with the student's ability to retain the important information intended to be conveyed in the training (Clark, 2010). In other words, the student will remember the stories but not the information needed to safely perform a job or task.

**FIGURE 1**  
**RELATIONSHIP BETWEEN PDCA MODEL & USE OF TRAINING**



Another factor with conventional learning is that because a broad range of aptitudes and experiences exists, and because trainers must get all learners through the material at the same time, the course must be designed to allow enough time to train those with the least experience or understanding of the material. Some may have previous experience with the subject, while others may be unfamiliar with the material altogether. The self-paced nature of online training means that no learner is waiting for others to catch up. While some will take longer to complete an online course than others, the cumulative time spent on training is inherently less than that of its conventional counterpart.

These breaks, questions and tangents exist to a varying degree in most conventionally delivered safety training. Along with the disparity in aptitudes, this can, as noted, significantly increase the time a learner must be involved in training with little additional benefit. The additional time can come at a cost. When deploying both a conventional and an analogous online version, in the authors' experience, the online training is at least 50% more efficient. This efficiency can save companies significant costs. Suppose an organization employs 500 workers with an average hourly rate (including benefits, FICA, etc.) of \$35. Also, suppose the organization requires that each employee complete a 1-hour instructor-led safety course each month. Calculating 6,000 hours at \$35 means the company spends \$210,000 in labor costs for safety training alone. Additionally, the company loses an hour of productivity for each employee once a month, which is another 6,000 hours and \$210,000 in costs, totaling \$420,000. If the company chose to take the program online, where employee time spent on the training is cut in half, it would equate to \$210,000 in avoided costs.

## BLENDING LEARNING



**For some training scenarios, a blended approach using a combination of web-based and face-to-face training may be an efficient means of providing training. In a blended learning situation, an e-learning component can provide a general overview of a topic, including fundamental concepts, regulatory information, and employer and employee responsibilities. Once the basics are conveyed, the employer can provide hands-on application of that information as to how it applies to the specific work site using the employer's specific equipment.**

**For example, forklift operations, asbestos repair and maintenance, confined space entry, and lockout/tagout training are all examples in which the fundamental and regulatory information could be conveyed to the worker in an online format, but a hands-on component, such as demonstrating how to operate the forklift or repair damaged insulation, performing a simulated confined space entry, or applying a lock and following the lockout procedure, completes the training. This in-person component is often necessary for the learner to be considered adequately trained not only according to OSHA standards, but also by many employer policies.**

One of the benefits of an online safety training program is consistency. Everyone in the organization receives the same training all the time. In contrast, the authors were once hired by the U.S. Air Force Air Combat Command to provide six different 2-hour lecture-based courses at its annual symposium. The courses were in advanced subjects such as environmental toxicology and chemical agent detection. They were delivered as many as four times a day over a 5-day period to groups of about 30 at a time. Because of the workload, five highly qualified instructors were assigned to the project, each competent in all six course subjects. While the instructors all worked for the same firm, it was rare to all be in one place at the same time. So, while there, a comparison was made between how three instructors presented the same information for a toxicology course.

The slide decks and instructor notes were developed by instructional designers in the home office. The presentations went through a quality-control process and were vetted before they became available to the instructors. All three instructors were given the same presentation. Yet at some point between boarding the plane and standing at the podium, the instructors had substantively changed their presentations and the narrative. The simple fact is that using multiple instructors results in mul-

iple courses. No matter how hard one works to get everyone aligned, invariably the instructors would at least tweak their presentations. This is likely because different instructors have had different experiences and have developed their own opinions on the relative importance of various learning objectives and the best way to convey them. Also, the authors have observed that trainers generally tend to focus on what they know best and have the most experience with, and gloss over subject matter they are less comfortable with.

Consistency in training content delivery is important because any effective OSH management system has continual improvement as a fundamental component. The plan-do-check-act model requires continuous identification and evaluation of occupational hazards and environmental impacts (plan), as well as implementing effective procedures to mitigate them (do) (ISO, 2015). Planning can include methods of evaluation such as auditing or job safety/hazard analyses (JSA/JHAs) and doing often involves training on mitigation procedures identified in the JSA/JHA. Following implementation, the organization must also monitor and measure the effectiveness of these procedures (check) and make necessary changes to improve performance (act) (ISO, 2015). Companies often expend considerable effort through JSA/JHAs or incident investigation to identify opportunities for improvement, and often address improvement through employee training (Figure 1, p. 29). If the training is not deployed consistently across the organization, it makes any qualified or quantified data in terms of evaluating the outcome meaningless.

### Which Is Better?

So, which is better: face-to-face, in-person, instructor-led training or online training?

Of course, the answer is that it depends on the circumstances. The authors believe that in some cases conventional, instructor-led training is superior to its e-learning counterpart. In fact, certain training courses should never be delivered online. For example, while some of the basic components of powered industrial truck training can be managed through online training, teaching someone how to drive a forklift should be performed in-person, with hands-on training for the operator, manipulating the same equipment the employee is expected to use safely every day. Other examples of where hands-on training should occur include learning how to properly don and work in protective clothing and respiratory protection. Often, working within this gear can be hot and confining. Some people experience extreme anxiety and having a real-world experience is an important part of the training that must be experienced in person prior to entering the actual exposure environment. Demonstrating competency with direct-reading instruments or other sampling devices is another area where in-person training is most effective. In general, when performance-based or hands-on skills must be taught and assessed, in-person training is likely a better solution than an online alternative.

Scenario-based training such as for emergency response or for participation in an incident command system is critical to being able to respond quickly in an emergency setting. Scenarios that require employees to respond intuitively, instinctively or instantly require training platforms that transfer knowledge and skills into long-term memory so it can be recalled when needed (Clark, 2010). In many cases, in-person immersive learning environments are the best choice when effective and automatic response is needed (Clark, 2010).

For some applications, a blended approach (see “Blended Learning” sidebar) using a combination of web-based and face-to-face training may be the most efficient by providing fundamental information through online training, supplemented by hands-on application of course material. Mirroring the forklift training example, other safety training such as confined space entry, asbestos operations and maintenance, and lockout/tagout training are additional examples in which the fundamental and regulatory information could be conveyed to the worker in an online format, but a hands-on component, such as actually performing a simulated confined space entry, repairing damaged asbestos-containing material, or applying a lock and properly following the lockout procedure, completes the training and “allows the employee to fully participate in the training process and to practice their skill or knowledge” (OSHA, 2015, p. 156).

## Conclusion

Whether online safety training should be used instead of in-person training is not an either/or question. The use of online safety training can clearly provide significant efficiencies with time, money and consistent course information in an on-demand environment. Online courses that incorporate decision-making and problem-solving skills are particularly useful when there is a need to document that the employee can identify hazards and apply appropriate safe work practices. Demonstrating competency in performance skills such as how to operate equipment, however, may not be best assessed in an online environment.

Given the technology available today, it makes sense to explore online safety training as a tool to meet both compliance and employee competency objectives. The trick is to determine which mode of training is the best choice for each safety training requirement and employ the optimal modality. Because of the widespread diversity of knowledge, skills, abilities and comprehension levels required to be conveyed in the vast range of safety training programs, OSH professionals should carefully evaluate and identify the specific hazards for which training is needed and determine what competencies are required to mitigate these risks. When these competencies are defined, OSH professionals can then evaluate the appropriate form of training that can be used to meet these competencies. **PSJ**

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**H.E. “Trey” Greene has more than 30 years' experience overseeing the design, development and deployment of targeted, need-specific environmental, health and safety training for public- and private-sector organizations. In the 80s, as a consulting engineer, he performed health and safety planning, training and certification services for field workers at many uncontrolled hazardous waste sites in the U.S. In the 90s, as a faculty director of the Institute for Environmental Management at University of Oklahoma, he was instrumental to the design and delivery of EHS training continuums in various fields. As managing partner for GBK Partnership, Greene oversaw the deployment of more than 500 federal EHS training contracts, ranging from \$10,000 to \$3 million, delivered in 18 countries and eight languages. In 2007, Greene and his wife Jill founded SafetySkills.com, a provider of e-learning solutions for EHS training to thousands of employers worldwide.**

**Cheryl L. (Cheri) Marcham, Ph.D., CSP, CIH, CHMM, FAIHA, is an assistant professor and program chair for the M.S. in Occupational Safety Management in the College of Aeronautics Worldwide Online Campus for Embry-Riddle Aeronautical University. Prior to this, she was the environmental health and safety officer for a major university for more than 26 years. Marcham holds a B.S. in Biology from Arizona State University, and an M.S. and Ph.D. from University of Oklahoma Health Sciences Center Department of Occupational and Environmental Health. She has served on the board of directors of AIHA and BCSP, and has served on the ASSP Educational Standards Committee. Marcham is a professional member of the Oklahoma City Chapter.**