FORTNIGHTLY'S

SPARK

Letter #65
May 2009

THE ON-LINE GATEWAY FOR READERS OF PUBLIC UTILITIES FORTNIGHTLY MAGAZINE.

The loss of the Baby Boomers in the utility and energy work space as mass retirements are expected from the aging work force, poses major problems. Here, Lonnie Harmon and Bill Sherman examine how the next generation of utility worker can be trained. They unlock the secrets as to how best train the younger worker in the age of Facebook, Twitter and others.

Next, Dr. Nigel Walker discusses the use of outsourcing, as new research reveals that the utilities industry is one of the heaviest adopters of outsourcing since the recession began.

L.A. Burkhart
Editor

UTILITY EMPLOYMENT

How to Train the Next Generation?

Energy Industries Re-examine Training Methods for Influx of New Workers

BY LONNIE HARMON AND BILL SHERMAN

The energy industry has been hiring new workers—even before stimulus package funding for power storage and transmission was discussed. This rapid influx of new employees creates an urgent need to strengthen employee training programs. With a projected 400,000+ jobs being created in the energy industry from the stimulus plan, even the U.S. Department of Energy is looking at training programs that incorporate instructional design to effectively, and rapidly, ramp-up large populations of new energy-industry workers.

As early as 2007, the industry had been forewarned of workforce shortages and had begun preparations for the recruiting and training of new employees. In its 2007 Workforce Survey Report, the Center for Energy Workforce Development recognized »

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that the prospect of retiring Baby Boomers could leave the energy industry coping with losing nearly half of its skilled workforce at a time when economic and population growth in the United States started fueling increased demand for energy. The Center's report predicted major investments—in power plants, storage, transmission and distribution systems—would be required. Once these infrastructure investments occur, a new workforce must be hired and trained to run these systems.

Likewise, the Nuclear Energy Institute (NEI) came to the same conclusion—as aging, skilled workers retired, the energy industry would face a labor shortage and have little time to train new workers. The NEI estimated that by 2012, more than half of non-nuclear power plant operators would need to be replaced, while over half of generation technicians would become eligible for retirement. In addition to these shortages, the NEI predicted that nearly 40 percent of line worker jobs would be vacated, along with over 40 percent in the engineering fields of the energy industry.

The NEI study only focused on workforce turnover. It did not even take into account the many new workers that would be hired for new electric transmission and distribution lines, natural gas pipelines and power stations already scheduled for construction within the next few years.

Another key factor not considered in NEI's study was the hiring, training and retention of additional workers to safeguard America's energy plants and transmission and distribution systems from natural disaster or terrorist attack. The Department of Homeland Security (confronted with the risks of possible terrorist activity, as well as crippling interruptions in service by hurricanes, wildfires and other natural disasters) identified major pipelines that were energy lifelines to specific regions of the nation. The Department recommended training programs for these critical energy conduits: specifically to provide the protection, preservation and ongoing production of those pipelines in the event of a natural catastrophe or terrorist attack.

In any case, workforce shortages plague the energy industry at all levels. Currently, new employees comprise an estimated 25 percent of the workforce in the gas and petroleum pipeline industries, creating an immediate need for safety, compliance, and skills-training programs.

Retiring Boomers are ready to exit the industry at a time when infrastructure investments require more employees. The skilled labor pool is shrinking at the very time when the need for skilled labor is increasing. The industry faces an exodus of trained, knowledgeable workers that will be accompanied by a concurrent knowledge loss. When people retire, they take decades of knowledge and experience with them. Successful training programs must be built around the (Cont. on p. 6)

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FORTNIGHTLY'S SPARK

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Utility Employment

(Cont. from p. 2)

key skills and knowledge that Boomers have acquired over their entire careers. Once these seasoned employees walk out the door, it becomes much more difficult to record their knowledge and create formal training programs. Therefore, the energy industry must be ready to train the next generation of workers. Otherwise, there will be many undocumented knowledge and skill gaps.

Workplace Training Methods

Workplace training programs have changed greatly during our lifetimes. Formal classroom training has been supplemented by e-learning, simulations, and webinars. There are changes in how training has been delivered, and more important, in how training has been designed. Workplace training programs have changed dramatically in order to adapt to the learning styles of America's new workforce.

Until now, two basic modes of instructional design have been utilized for training programs over the past few decades. These are the "first-generation" objectivism model and the "second-generation" cognitive constructivism model.

First-generation instructional design (objectivism) places a learner in a passive role. Learners are treated as sponges waiting to "soak up" knowledge. Within a first-generation course, learners are tasked only with absorbing information identified through prior analysis. In first-generation training, the instructor teaches, guides, lectures, and provides information as a subject matter expert, while the learner memorizes and practices.

Second-generation instructional design (cognitive constructivism) encourages action and interaction between instructor-learner and learner-learner. Within this model, the instructor creates a learning environment and facilitates interaction designed to motivate learners to research, explore, experience and apply newly acquired knowledge. This model also can pair learners with other learners to work together toward problem resolution within teams, project groups, breakout groups, as well as by means of online whiteboard sessions, discussions and chat rooms.

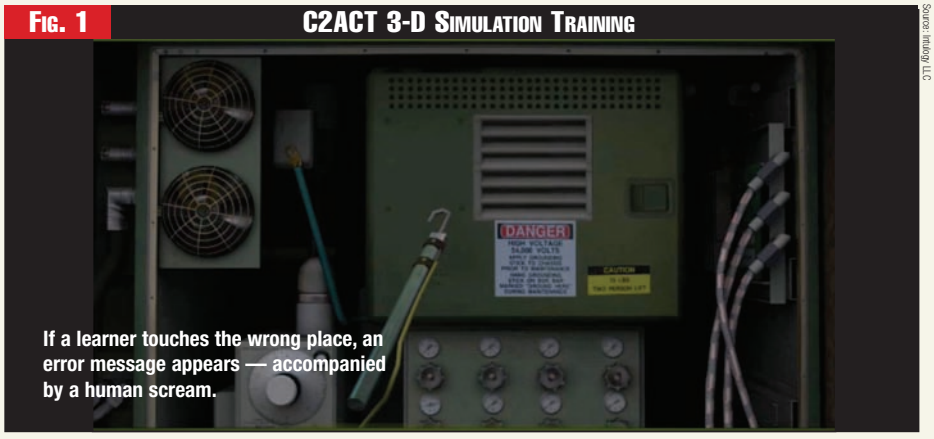
A good example of a training program that incorporates both models is a safety course. First generation instruction would consist of an instructor presenting and reviewing the safety rules and regulations with the class, having learners memorize each of them, and testing on that capacity to memorize. No matter how high-tech or low-tech the presentation medium (classroom lecture, an e-learning program, PowerPoint presentation, DVD video of the consequences of lapses in safety procedures and precautions) it's still first generation instructional design.

Second generation instructional design could consist of actual field experiences in the work environment (*e.g.*, fire drills, emergency drills, *etc.*) that create an environment where learners can explore and apply their knowledge.

Another delivery option for second-generation methodology would be simulation training, where learners can make decisions as to how they will apply their knowledge in various situations. Certainly, 3D simulations can reduce the overall cost of a program and make them available to a wider group of learners. Simulation poses little risk to the physical work environment, expensive machinery, or to a learner's wellbeing, while still allowing learners to handle equipment virtually and put knowledge and skills into practice in a safe environment.

"There's a quote by famous Chinese philosopher Confucius," says Raj Raheja, CEO of a 3D simulation and animation firm, Heartwood Studios. "Confucius said, 'I hear and I forget. I see and I remember. I do and I understand.'" That quote was a cornerstone in the design of Heartwood Studios' »

Fig. 1 C2ACT 3-D Simulation Training



If a learner touches the wrong place, an error message appears — accompanied by a human scream.

Source: Infology LLC

virtual training program aptly named C2Act™ (See-to-Act). Instead of just watching instructional videos, the learner actually performs functions on the virtually replicated machinery or system (*see figure 1*). Failure-based learning is encouraged; for example — while developing a training module for Raytheon's radar system, if an engineer opened the panels without grounding the system first, an actual human scream would be activated (along with an error message) to prevent electrocution in real life. "Lessons like those cannot be taught in the real world without a trip to the hospital — or worse," says Raheja.

Yet another medium for second generation instruction is the use of intelligent tutoring systems whereby an instructor appears as an avatar, engaging in dialogue with each learner individually. As learners respond to the avatar's questions, the tutor provides feedback, clues, prompts, and correction, while assessing strengths and weaknesses and adapting accordingly. Once again, no matter what medium is utilized, such instruction remains second-generation instructional design in its methodology.

Digital Third Generation

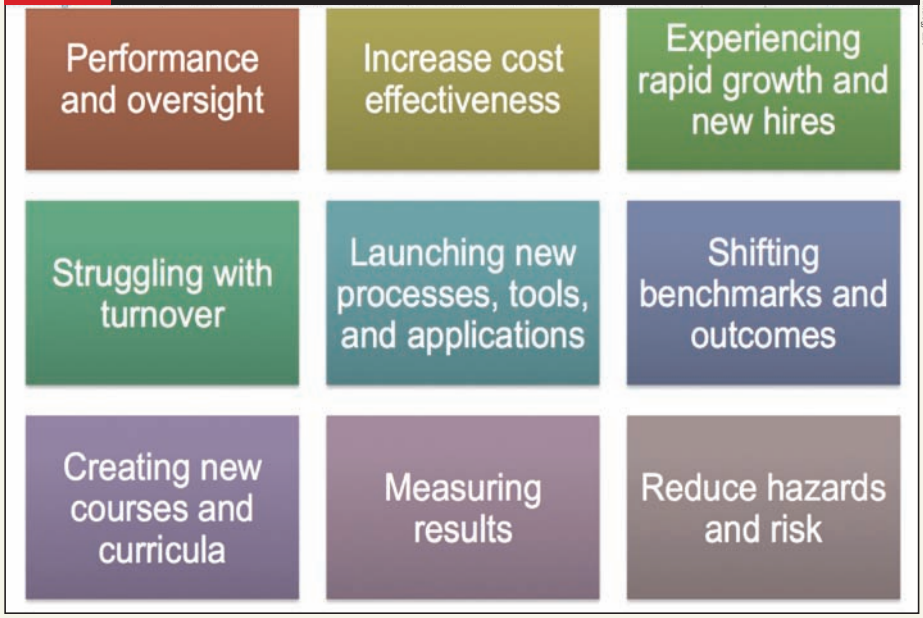
There is now a question, however, as to how effective both first and second generation instructional design methodologies will be with the next generation of workers – the NetGeners and Millennials. They were raised in the digital age of Nintendo's Wii, Xbox 360, Facebook and Twitter. As these digital natives enter the workforce, the energy industry will have to adopt "third-generation" instructional design methodologies in order to fully engage today's new learners and effectively train them.

Third-generation instructional design is not so much about bells-and-whistles high-tech media (*e.g.*, eLearning, interactive videos, simulation, intelligent tutors, *etc.*) as about focus on methodology in relation to the psychology of the learner and the how/what/where and why the best learning occurs. In order to be truly effective, training for the next generation will need to go far beyond the "wow" factors of flash animation, gaming environments, and catchy 3D effects. Without solid instructional design based upon the demographics of its learning audience, even a super-cool 3D simulation training program will be little more than a very expensive workplace video game.

Third generation programs incorporate social constructivism, social interaction comprised of rich communications among instructors, other learners, mentors, colleagues and subject matter experts to facilitate the learning process. This type of access to a spectrum of individuals with varying perspectives on a subject provides an expansive, multi-faceted and comprehensive body of knowledge to the learner. Social constructivism will enable learners to work together on projects while providing support and encouragement for each other via e-mail, postings, or instant messages. Such a medium also will help them prepare for examinations by creating their own online study groups on Twitter, Facebook, MySpace, LinkedIn or other social networking sites.

Third-generation instructional design places more emphasis on the initial needs assessment than ever before. A rigorous needs analysis will align the training program's design with the learner's needs and the entire workplace ecosystem. Training can drive behavior change, but it can't happen in a vacuum; training »

Fig. 2 Reasons for Utility Training



Source: Intuology LLC

programs must align with the workplace culture and objectives.

In other words, an agency or organization must first identify the problem, conduct an analysis of the cause(s) of the problem, and determine that training could in fact resolve the issue. From there, a training program can be designed, which includes outlining training objectives, developing course content that takes into account the importance of motivated, engaged learners, followed by the delivering of training — and capped by post-evaluation of the program to measure learning retention and overall effectiveness in modifying the behavior of employees.

The role and importance of the instructor actually increases in third-generation programs, even more so if the course is online or web-based. Instructors move beyond designing and organizing course content, beyond the role of teacher, lecturer or instructor. Instructors must create environments where interaction is encouraged and must provide feedback, counseling, support, challenges and advice to learners. They must share knowledge, as well as introduce knowledge from books, articles, and other outside sources. And in web-based courses, it is the instructor that must create the sense of community and trust that is crucial to lively online discourse. It falls to the instructor to design the set of activities, timeline, protocol, format for course materials, and evaluation criteria that provide the framework for a successful learning environment. Indeed, a talented and gifted instructor can make a mediocre training program a good learning experience, while a bad instructor can reduce even the best course to mediocrity.

Psychological Factors

So exactly what psychological factors will third-generation instructional design take into account? How do today's learners differ from those just a decade or two ago?

For one thing, the old pass-fail model of testing may not apply to Millennial learners. Anders Gronstedt, PhD., of Gronstedt Group, notes that learning among Millennials more closely resembles Nintendo than logic: Since losing at an interactive game is the fastest way to master it, Millennials are accustomed to learning from mistakes. They obtain instant feedback on performance, and adjust their performance to succeed in attaining "the next level" in the video game. This is how they learn correct actions and processes. In addition to immediate feedback on performance, Millennials have been raised on the Internet with information and interaction just a click away; therefore, they have little tolerance for delay.

It is easy to see why this style of learning by trial and error is simply not practical for training in a nuclear or power plant.

While Millennials are relatively comfortable with taking risks and learning on the job, it is easy to see why this style of learning by trial and error is simply not practical for training in a nuclear or power plant, on the transmission lines, or along an oil or gas pipeline. In the field or in the plant, learning from one's mistakes can be dangerous, if not deadly—costly not only in materials and machinery, but most important, in human life.

Therefore, the challenge remains to adapt critical knowledge into an instructional design that recognizes the unique learning style of today's new learners. It isn't about technology; it's about how the technology is used. Scheduled online e-learning sessions are popular, but may be too passive for these learners. PC-based simulations, animations, and interactive exercises, coupled with instant scoring on performance, could be more effective. Third-generation design principles don't replace first-generation and second-generation design, instead they must complement each other. Even with online social networking and online discussion forums, a successful program still may include good-old-fashioned classroom instruction that encourages learners to participate and interact. Programs will produce the highest post-evaluation responses and grades when they blend instructional design models properly—matching the design with content, learners, and the workplace ecosystem.

Even more may change in the future, when virtual classrooms take "face-to-face" interaction even further, for example allowing learners to create avatars within the training program or workshop. Indeed, such a simulated classroom environment, where learners can see the instructor's avatar, as well as the avatars of the other learners sitting with them in the classroom, might offer some advantages. In 2008, research at Stanford's Virtual Human Interaction Lab revealed that learning was enhanced when students received moderate amounts of eye contact from the instructor. In a virtual environment, an instructor's avatar could be programmed to give every learner that increased level of eye contact, which of course no human instructor could achieve. Other studies have »

indicated similar positive effects on learning outcomes through the use of facial mimicry. Imagine the effect of the instructor's avatar mimicking facial expressions or body language the learner is displaying, which may generate increased attention and interest. In other words, an instructor's avatar could be customized to each individual learner's style — something not even the best instructor can hope to accomplish in the traditional classroom environment.

How to get There

Third generation instructional design is not a replacement for, but rather a compliment to, first and second generation instructional design. It is simply taking instructional design to the next level for the next generation of learners in order to achieve the most beneficial, cost effective, and expeditious training of the new workforce.

What steps can utilities, power plants and others in the energy industry take now to best address the training needs of its new recruits? Here are some areas to consider and questions to ask:

1.) Knowledge Transfer – Is knowledge from current subject matter experts (SMEs) being transferred into training materials? Is training content regularly reviewed with SMEs? Are there hidden steps or assumptions that experts take for granted but that haven't been documented? Would retiring SMEs consider returning on a part-time basis as mentors? Does your agency or organization require an objective pair of eyes, or a consultant?

2.) Update, revise, redesign –What content simply needs updating, and what has to be revised due to conversions in processes or systems? Also, since Generation X and the Millennials have different preferred learning styles; will current courses need to be redesigned to achieve maximum learning and behavior change in a new audience? Do you have an expert in instructional design, or will you need a consultant in that area?

3.) In-house vs. Outsourcing options – It doesn't have to be a "versus" decision. Large-scale trainings regularly require augmentation of in-house staff with additional outsource trainers or support personnel, especially for training rollouts tied to regulatory compliance, safety trainings, or systems conversions and updates. Preparing for change can produce peak training demand beyond the in-house team's bandwidth. Furthermore, if the course requires technological expertise in animation or 3D simulation, one may opt to outsource the design of the courseware to providers that can build such interactive programs.

4.) Understand the Learners – Should a training program be held in a classroom, lab, simulator, webinar, or online e-learning environment? Should it even incorporate interaction or simulations? It's important to note that the incoming workforce of late GenXers and Millennials don't count computers as technology. They grew up with computers; so, computers are as much a way of life as microwave ovens. This generation spends more time on video games than they do watching TV. Millennials have moved beyond watching, reading and listening to doing, simulating, interacting and engaging. Handing these new employees "The Manual" or even scheduling them for an e-learning course may not be the most effective delivery method. Even if delivery is in a classroom, the teaching methodology you implement is going to have to be social, interactive and engaging.

As Boomers retire, the energy industries will have to:

- Compete for the best and brightest among GenXers and Millennials;
- Manage to keep their interest through the initial training; and
- Continue to engage their interest, promise and potential in order to fully tap their productivity.

A shortage of experienced workers is an issue that can be mitigated by an infusion of well-trained workers. Integrating the most up-to-date knowledge into training programs that have assessed and addressed the learning styles of tomorrow's workers with the appropriate and applicable instructional design is a step in the right direction. ■

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