Safety Survival Skills

The Development of Computer Based Safety Training at the Centers for Disease Control and Prevention

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Abstract

Todays biomedical laboratories are quite different from those of ten years ago and vastly different from those of twenty years ago. New chemicals, new microbes, new technologies, and new attitudes have all contributed to produce a workplace where safe practices and procedures must be followed to assure the safety of all. However, providing relevant, interesting and effective safety training to workers is a tremendous challenge. This session provides a look at the development and application of Safety Survival Skills, a basic safety orientation course, which was developed at the Centers for Disease Control and Prevention (CDC) to ensure that all workers (laboratorians and non-laboratorians) receive basic safety information relevant to their job functions at CDC.

Introduction

How many of us have ever received comprehensive job-specific safety training? More importantly, how many of us are ever required to review and update this essential training? All too often, we are ushered into the new worksite without mention of resident safety procedures, because it is assumed that we come equipped with information about the specific hazards we are likely to encounter. This can be a big mistake, because failure to train and/or adequately train continue to be among the most frequent grounds for citation by the Occupational Safety and Health Administration (OSHA). Employers, and more importantly, supervisors can never assume that their workers share their beliefs about safety unless the supervisor takes an active role in seeing that the worker is properly trained.

Few of us have firsthand accident experience, but when we walk into any laboratory we are likely to note even the most basic safety guidelines being ignored. Specifically, doors are left open, protective gloves and eyewear are not being used, and lab coats are unbuttoned, if worn at all! Why is it that people ignore basic safety guidelines designed to protect them?

One factor is that most workers feel (as evidenced by grumbling and poor attendance at safety classes) safety is such a simple and intuitive thing that everyone will know what to do if an accident occurs. Also, there is denial (or ignorance?), as evidenced by the often repeated its not going to happen to me remarks voiced to safety trainers. The longer workers perform the same tasks, the more routine the tasks become, and perceived mastery of the obvious breeds disregard for the possibility of hazard. Experienced and familiar workers tend to become complacent, overlook the risks, take shortcuts, and assume that they are performing in a safe manner when the exact opposite

might be true.

The behavior of the supervisor plays a big role in establishing the overall safety climate. If the supervisor never wears personal protective equipment when working in the lab and never enforces these practices with others, then why should we expect others working in the lab to do any differently? As you might imagine, age and gender also play a role. Those most likely to adhere to safety procedures and practice defensive safety habits are more likely to be female and seasoned employees, while those least likely to adhere to safety procedures and likely to take excessive risks are young and male (Gershon, 1995).

We should all step back from our daily routine, look beyond our personal biases, and consider the consequences of *what if it happened to me?* or, *Do my co-workers and I have the necessary training under these circumstances?* Training has become a complex issue with many factors (e.g. regulatory changes, accident statistics, personal agendas, work schedules, costs, perceived needs, and time constraints) impacting its implementation and the overall safety culture of the organization.

Background

At the Centers for Disease Control and Prevention (CDC), a decision was made several years ago to change the organizations safety culture. Several near misses, combined with increasing numbers of students, visiting scientists, and contractors, led to a policy, the CDC/ATSDR Workforce Safety Training Policy, that now requires all new workers at CDC to attend a basic safety orientation *before* beginning work. This policy has been endorsed by the CDC Director, conveyed to all Centers, Institutes, and Offices (CIOs) by the Office of Health and Safety (OHS), and contains several important features. To view the policy and a memo of endorsement from the CDC Director, go to http://www.cdc.gov/od/ohs/ and select Safety Survival Skills.

1. All CIOs must participate;
2. All new employees are required to either attend an introductory safety class entitled Safety Survival Skills, Part I, General Responsibilities, or read the Part I safety manual, or take Safety Survival Skills on the CDC intranet within thirty days of starting work at CDC;
3. All new employees must receive site-specific safety instruction before beginning work;
4. All supervisors must ensure that their employees understand the training policy and CDC safety practices;
5. All employees must complete a Safety Checklist (specific for lab and non-lab areas) with their supervisors, and
6. All supervisors and workers, working in a hazardous work environment (laboratory, wood shop etc.) must have a critical safety element in their work plan for annual evaluation.

The key to the current level of acceptance for this program has been the corporate buy-in from top-level CDC management which values the Office of Health and Safety as a group of dedicated and effective professionals. However, this has not always been the case. As recently as the early seventies, the Centers for Disease Control had a Safety Office comprised of three people covering everything from radiation safety to lab safety. At that time, office safety was of minor importance, ergonomics wasnt even thought of, and training was offered infrequently. In spite of the magnitude of its responsibilities and the tasks to be accomplished, this early group remained largely invisible to the majority of CDC employees until a 1978 wake-up call which led to the first change in CDC safety culture. Specifically, two employee deaths from Rocky Mountain Spotted Fever resulted in the decision to overhaul the Safety Office, form the Office of Biosafety, reorganize, and commence the comprehensive process of increasing the Office of Biosafetys expertise. During the next twenty years, the Office of Biosafety evolved into the current Office of Health and Safety with distinct branches

focused on laboratory safety, radiation safety, industrial hygiene, environmental protection, physical safety, employee health, and safety training. Today, the on-going commitment of top management has provided a staff of more than forty to serve approximately nine thousand government employees and another eight thousand contractors, students, visiting scientists and others distributed throughout the U.S. and around the world.

Development of Safety Survival Skills

Safety Survival Skills (S3) began its evolution with the hiring of a full-time safety trainer and training assistant in the late 80s. Individually taught classes on topics ranging from general employee responsibilities to bloodborne pathogens, each one hour in length, were slowly combined into three highly interactive classroom modules ranging from three hours (laboratory safety) to two hours (general responsibilities and supervisory responsibilities). Each course makes use of high quality visuals and is designed around personal experience, stories, and group discussions of actual incidents, mostly at CDC.

Comprehensive training manuals have accompanied the evolving nature of the didactic classroom sessions, and presently serve as stand-alone modules themselves. Each contains a comprehensive exam and is written in a procedural and reference guide format, to answer questions such as, *What do I do in this situation*? and *Who can I call to get the answer*? Each also includes brief descriptions of actual CDC incidents to show workers that accidents really happen to people just like them. The manuals have been extensively reviewed and are continually updated with the help of the OHS staff and Occupational Health and Safety Committee members. To see copies of the manuals, go to http://www.cdc.gov/od/ohs/ and select Safety Survival Skills.

The contents of each manual are:

■ Part I, General responsibilities
- Regulatory Mandates and Responsibilities
- Overview of the Office of Health and Safety
- CDC Safety Guidelines
- Appendices (e.g. OSH Act, Safety Training Policy, OHS Directory, Injury Reporting)

■ Part II, Laboratory Safety
- Laboratory Hazards
- Basic Biosafety
- Basic Chemical Safety
  - Appendices (e.g. Waste Disposal Chart, hazardous waste forms, packaging/ shipping, Clinic services)

■ Part III, Supervisory Responsibilities
  - Responsibilities (e.g. general safety, hazard communication, office safety, safety training)
- Appendices (e.g. Safety Training Policy, Ergonomics Policy, Corridor Policy, Incident Report Form, Employee Assistance Program)

Reaction to Safety Survival Skills classroom sessions and manuals has been overwhelmingly positive. Students often state an appreciation for the forthright sharing of actual incidents to emphasize the importance of safety. Additionally, students often express surprise following roundtable discussions that others actually had ideas different from theirs about the safe way to perform work. In its present form, these courses and manuals do a good job of providing workers with practical information which they can use immediately on the job, and in preparing them to take more in-depth classes (e.g. bloodborne pathogens and radiation safety).

Movement of Safety Survival Skills Into the Computer Age

Prior to the development of the Safety Survival Skills courses, a good year saw approximately 1,000 workers trained. With the development of S3 and the implementation of the Workforce Safety Training Policy, the numbers have doubled on average to roughly 2,500. Although this sounds good, in reality, the OHS Safety Training Activity (Training Manager and Assistant) were falling farther behind the curve. The CDC community grew from approximately 5,000 workers in the early 80s to more than 17,000 today. In addition, many of these new hires were foreign Nationals and contractors with little or no safety training, and spread out over twelve locations within the U.S. and many more around the world. As the numbers grew, we found ourselves continually in the classroom and constantly on the phone being told that the courses were too long or people did not have the time needed to attend. Classroom training was rapidly becoming a bleak prospect. It was simply prohibitively expensive to travel trainers to these many sites or to travel trainees back to Atlanta. In addition, there was a logistical nightmare brewing when trying to match training schedules for those in need with the physical availability of trainers and training facilities.

To address these developing issues, it was decided to convert Safety Survival Skills into a computer-based training (CBT) course containing modules for laboratorians, non-laboratorians, and supervisors. These would then be offered via the CDC intranet to all connected sites and would provide CDC mandated training to all CDC worksites at any time that CDC workers chose to take it. This enterprise was entered into somewhat naively (we had no prior experience) with the mantra of doing it better, faster, and in the long run, cheaper. Unfortunately, the result was to create several major issues in design and implementation which continue even today.

The conversion/development of the classroom based S3 into a computer based course began in 1997 and followed a general contract plan of action which included the following steps:

1. Write a multimedia contract - submit thru CDC contract process
- Develop course outlines of subject material
- Pull together reference material for contractor
- Identify subject matter experts (SMEs)
- Identify CDC IT requirements - 486, Windows, IE access, and sound
- Decide on budget (75K)
2. Meet with the contractor
- Explain the vision, need, and purpose
- Provide content and all resource material
- Discuss IT requirements and CDC integration
3. Course development
- Meet weekly with writer/editor
- Develop content with an idea of repeating material three times
- Review content for completeness, accuracy and interpretation
- Beta test course content and test screens for:
- Ease of use
- Relevancy
- Interactivity
- Fun factor
4. Course Pre-Implementation
    - CDC web integration - bring CDC IT experts into discussions and educate about product
- Negotiate IT over-site for problem fixes
- Talk to CDC LAN administrators about:

- Software requirements
- Course features
- Course access
- Talk to CIO administrative officers about:
- Safety training requirements
- Course contents and features
- Completion tracking

5. Course Implementation
- CDC-wide announcements
- Safety Training Policy requirements
- Course availability and access
- Respond to feedback and problems
- Modify course based on feedback to improve performance

Unfortunately, the actual development and implementation did not go as smoothly as the above process might indicate. The most frustrating aspect were issues which arose that were totally beyond our control. Here are our Top Ten problems which had serious impact on the success of this project:

1. Course designer quit. Halfway thru the project, the original course designer/writer/editor quit the contract company for a better job and was not replaced by the contractor. The affect of this was that this persons duties were now being performed by someone who had no formal training as a writer/editor, public health educator, or in computer based training development. And of course, this new person brought a different philosophy of what should be done and was backed up by the company project manager. Not only was the general momentum of course development lost, but text and image files were lost as well which added increased time to the development.

2. Bells and whistles were not delivered. After the contractor was selected, the contractor and writer/editor were invited in to present ideas on course development and to show ways of making the training more exciting. The statement of work for the project stated that the course was to be highly interactive with lots of visuals, video clips, sound etc. The contractor demonstrated just that, including the use of a voice expert to provide narration in multiple dialects to enliven the script. We indicated that we liked what we saw and heard, and to proceed with development. What the contractor came back with during the first module review was basic narration without dialects and primarily a page-turner type course. Yes there were photos (which we provided) and some drag and drop type exercises, but not the glitz which had us excited at the outset. When pressed as to why there was no multiple dialect narration, their response was that this was only for demo and not intended for production. And of course, we could add it for an additional cost if we really wanted it!

3. Multiple plug-ins were required. The course was designed to utilize multiple plug-ins to play short video clips, and to allow drag-and-drop and fill-in-the-blank exercises. Unfortunately, there was and still is no standard for computer configuration and multimedia capabilities for computers at CDC. A large proportion of users could not download the plug-ins and when they tried, were sent out to hyperspace, giving up in frustration. And to make matters worse, this same contractor had already developed another course for CDC which suffered from the same problems, but neglected to mention this during our initial meetings.

4. Open registration was allowed. Initially the log-in would allow anyone to log-in with their user ID and email password. The problem was that there was no security check to determine if this really was the CDC worker or someone taking the course for someone else. This made tracking a nightmare, because log-ins were accepted no matter what you typed and created multiple records for some individuals. The registration process has since been altered to cross check each course user against

the CDC active directory of paid workers. This creates a unique file for each person which is then used to generate person specific records and certificates of completion.

5. No simultaneous Netscape/Internet Explorer (IE) compatibility. The course was designed for access under IE, the unofficial CDC web browser, but there was also widespread use of Netscape across CDC. In one case, even though the person had an IE icon on their desktop, their IT folks had set the default browser to Netscape even when they selected the IT button!

6. Multiple intranet configurations existed. CDC consists of 12 Centers with multiple offices, divisions, branches etc. with one central Information Resources Management Office. Each Center has its own virtually autonomous IT department which led to a variety of intranet configurations as well as computer configurations - some had speakers and some did not, some had the latest equipment, and some were working on 286 and 386 computers.

7. Production/design server the same. Because the production and design server were physically the same box, when changes were made and needed to be implemented, the entire system had to be brought down.

8. Cost + contract. The contract mechanism was a cost plus contract which meant that the contractor was within their rights to charge for increases in work and time beyond what was stipulated in the contract. This meant that the government had to pay for the contractors time in editing the script for typos, misspellings, and general inaccuracies which we discovered during script review and beta testing. All of this led to major cost overruns which ballooned the final cost by an additional 100K. The better solution would have been a fixed price contract in which additional time, corrections, etc. are simply the contractors responsibility.

9. No follow-up support. The contractor provided minimal software support after implementation of the courseware and even had to be asked to create an instruction manual for the courseware. In addition, the software was written in an arcane language which was on its way out of common usage by the time the course hit the CDC web environment. We have subsequently had to dedicate a CDC contractor to service the myriad of computer language issues as the CDC workforce uses the software.

10. Contractor was bought out three times. Fortunately, the contractor project manager remained the same, but multiple people revolved thru the project each time this happened leading to more delays, loss of continuity, and of course, cost overruns.

Thus ended what we like to call Phase I of the implementation with the acceptance of the course by CDC in 1999. Reaction to this first iteration of the computer course was overwhelmingly positive although there was never a day without an access or function question related to S3. As more people have taken the courses, we have been better able to refine the workings of S3 and give most people a more pleasant experience. This better experience has been reflected in the numbers of workers taking the courses on-line and will result in an end-of-year total (FY 2002) that is fast approaching 6,000 workers trained - a three fold increase over previous years.

What Does Safety Survival Skills Look Like?

To have a look at several examples of S3 as it presently exists, go to http://www.cdc.gov/od/ohs/, select Safety Survival Skills and then look at the S3 Screens. Sorry, but we are unable to provide access to CDCs internal intranet for security reasons, but this will give you a good idea of what a typical CDC worker sees when they access the course.

Screen 1. Opening screen and security log-in
Screen 2. Welcoming Screen and Self-identifier Screen where a new user identifies themselves as to laboratorian, non-laboratorian, supervisor etc.
Screen 3. LSS Site Map which shows the worker what they are required to take based on the user information they supplied before.
Screen 4. S3 Main Menu showing the three courses, General Responsibilities, Labora- tory Safety, and Supervisory Responsibilities
Screen 5. S3 screens: supervisory responsibilities topics, OHS web page, typical inter- active page
Screen 6. Laboratory safety module menu
Screen 7. Typical screens from lab standard practices module
Screen 8. Typical screens from biosafety module
Screen 9. Typical screens from chemical safety module
Screen 10. More screens from chemistry module
Screen 11. Typical screens from radiation safety module

As the student goes thru the courseware, they are presented with screens which they read (there is no narration), screens which ask them for a variety of answers, screens which ask them to think about their answer before they see an answer, and screens which provide an actual scenario to which they must respond. In addition, there are tests at the end of each module and a final exam for each course. When the final exam is passed, the worker is then allowed to print a certificate of completion which must then be presented to security to receive a permanent picture ID and access card (again, required under the CDC Workforce Safety Training Policy).

A CBT Solution for the New Millennium

Unfortunately, as well as things seemed to be going with this first iteration, we continued to see cracks open from one problem after another as all of CDC migrated to newer generation computers, next generation browsers, new servers, and new workers (mostly contractors) who for security reasons did not have access to the CDC intranet. A new solution was needed.

The new solution, or Phase II, was already present at CDC in the form of video and CD-ROM safety training from Coastal Training Technologies of Virginia Beach, VA. As the frustration level for the web version of S3 grew, discussions began with Coastal about the conversion of S3 into their CD-ROM format with full-motion video. We were already utilizing Coastal videos and their general safety CD-ROMs for training, and felt that the power of their courseware would allow us to provide a quality product to our workers. The benefit of the Coastal product was its fully customizable format, the use of real-life scenarios in the courseware which could be made site specific in custom courses, and the cost which was reasonable given the more dynamic nature of the courses. The downside was the proprietary administrator which made it all work.
The decision was made to institute the Coastal CBT solution across the board and we again began the contractual process (fixed cost) with Coastal. We brought together the Coastal architects and CDC IT people to work out the technical details, and began supplying Coastal with the necessary reference material for the conversion of S3. We also contracted for the entire off-the-shelf Coastal safety and health catalogue (30 courses) and for three additional courses: conversion of our didactic radiation safety course into CBT, development of a biosafety CBT, and the development of a course on the formaldehyde standard. These courses will all reside on the CDC intranet and utilize Coastals current state of their art incorporating short video clips into the courseware.

The entire process has gone more smoothly than before, but it has not been without fault. Most of our current issues center around integration of the courseware into the ever evolving CDC computer

network. Since the process began in 1997, all CDC locations around the U.S. (there are 12) have become better connected to headquarters in Atlanta, and we are nearing total penetration of individual computer workstations with Windows 2002. We have just completed an upgrade to our third SQL server and are at present ironing out database setup and functionality issues across the entire CDC intranet.

We anticipate our safety training platform to be fully functional by October, 2002 and available to all CDC workers in the continental U.S. Training numbers for the coming FY (2003) should again show a marked increase in users. Security will be achieved thru the use of individual user IDs and unique number identifiers, making the courseware available only to individuals with access to the CDC intranet.

To see what Safety Survival Skills is evolving into, go to http://demo34.claritynet.com/. Use *cdc1* for the log-in and *cdc1* for the password. Select CDC Radiation Safety to view our most recently developed course, but feel free to view any of the other projects which Coastal has under development.

Top Ten Tips for Developing Computer Based Training

As mentioned before, we blindly proceeded into the development and implementation of computer based training at the Centers for Disease Control and Prevention expecting that all things would integrate as planned. This, as you now know, was not the case, but we have gleaned the following ideas which may be helpful to others when pursuing a similar endeavor.

1. ***Offer variety*** - provide multiple ways of taking the training (computer, classroom, or booklet based), and allow testing out of the training. In whatever form the training takes, different types of feedback should be provided or offered.
2. ***Offer incentives*** - provide a reason/benefit to taking the training.
3. ***Provide follow-up/contact numbers*** - absolutely essential for many OSHA training courses.
4. ***Make it compatible*** - establish minimum IT standards and bring your IT department into the project at the outset of the project.
5. ***Make it easy to use*** - course design should provide an intuitive and self-explanatory method of interaction. Perform as many Beta tests as needed BEFORE the official release.
6. ***Provide real-life examples*** - design around real-life experience and scenarios, ideally ones that have happened to you, the student, or the worksite - someone or place that the student can identify with.
7. ***Personalize it*** - insert your own photos of your workers and facilities to show the student you are not talking about hypotheticals.
8. ***Make it fun*** - if it is not fun, they will leave it very soon.
9. ***Make it timely*** - keep the course updated with new information, photos, current events etc.
10. ***Make it relevant*** - forget the history lesson! Give them what they need when they need it and provide references for background information and further reading.

And finally,

- Write everything down during the planning and development phases, no matter how trivial.
- Design your course for the lowest common denominator. Too many bells and whistles may overpower the message and diminish the focus.
- Test your course development early and often.

- Do not rush - get it right BEFORE release.
- Have a web-master to deal with issues related with course web integration.
- Be available to answer questions and respond to problems.

And most importantly, do it all with a smile!

Enjoy!

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