

# **Tell Me A Story...**

## **Using Stories to Improve Occupational Safety Training**

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Human beings are natural storytellers and story listeners. We learn very early that stories entertain us, but also give us the “rules” about what is expected of us and how to make meaning of our experiences. Stories are integral to our lives, and have great power to change or influence how we think or how we react. They are an innate part of how we learn, and have obvious benefits to trainers or educators who are trying to impact what and how we learn. This paper and presentation discuss the social and cultural power of stories, and how they have been used to develop training for skilled blue-collar workers. Included will be examples as well as suggestions for trainers on where to find stories, what type of stories to pay attention to, and how to use them to improve occupational safety training.

### **Background**

Most of this story takes place within the backdrop of the U.S. mining industry. In the late 1990s, mine safety trainers participating in NIOSH stakeholder meetings in the West divulged that lack of modern, relevant or interesting training materials was a major concern for them. The law, specifically 30 CFR that pertains to the mining industry, requires health and safety training for all miners. This includes “New Miner Training,” specifying at least 40 hours of training for new underground miners and 24 hours for new surface miners, and “Annual Refresher Training” for every miner which is mandated to be 8 hours every year. Mining is one of the few industries that has a federally required training component this stringent, yet the trainers themselves felt that even though they were complying by assuring that their miners spent the necessary time in training, they were not sure it was making a difference. They were, in their opinion, meeting the letter of the law, but not necessarily meeting the intent. In fact, several of the trainers shared that the miners themselves dreaded their “8-hour training,” referring to it as “Safety Jail” and considering it little more than an opportunity for a free donut and a nap. They begrudgingly spent the required 8 hours of “seat time,” but making them pay attention was another matter. Trainers believed that there was a need for more and better training materials that would get and keep the

attention of the workers, and that would be remembered by them after the sessions were over. They asked us if NIOSH could help, by creating “effective” training materials for the industry.

The project that was developed as a result of these meetings was ambitious. Its objective was to “Develop and Evaluate Effective Safety Training for Miners.” One major obstacle was that no one could define what “effective” looked like or how to measure it. We did, however, have the support of safety professionals who offered ideas, technical advice, and access to work sites, and who weren’t afraid to offer critical assessment if they thought we were off-track. The mandate for training in the industry was another asset in that trainers were required to train every miner every year, and would be grateful, if not eager for any new materials we developed. Therefore, it was less likely we would have to pressure people to try them; instead, we had a ready-made and eager audience. We gathered an informal group of safety trainers and directors together at the start of the project to help us create a prioritized list of topics that needed new or better training materials, and to act as technical advisors. This group was crucial to the success of the project. Members not only made suggestions, they acted as subject matter experts, and became in a sense, co-creators of the materials that were developed. Membership in the group was fluid, as the topics under development changed, but the safety experts consistently made sure that what we created met their needs and the needs of their workers. We had a small budget and did not want to waste our resources creating products that would not be used.

Before we started to create materials, we spent time studying theories of adult learning, training models, and regulations that controlled, to some degree, what was included in training. We also looked at materials that were being used. We had been asked to make training more interesting and effective; we needed to find a different way to present the information in order to do that. There were two dominant characteristics of the mining industry that we focused on, which became the underlying framework for our new videos. These were the strong culture of mining and the love miners had for stories.

## **The Role of Culture**

Every organization has its own culture. Culture isn’t something an organization has, it is something the organization is (Lewis and Thornhill). It has been defined as a “social roadmap” for its members, providing essential information on how to survive and be successful within its boundaries. Patton states that culture is “that collection of behavior patterns and beliefs that constitutes:

- Standards for deciding what is
- Standards for deciding how one feels about it
- Standards for deciding what to do about it
- Standards for deciding how to go about doing it. (81)

Culture is inherently social. It develops over time through the shared experiences of its members who then teach new members its rules, perpetuating the culture. It can be a difficult thing to define, but is readily apparent to those inside, and often, to those outside. Simply put, it is “the way we do things around here.”

Occupations also have cultures, especially those occupations that have a shared sense of danger or that they are different from other work cultures. Occupational cultures have been defined as “a group of people who consider themselves to be engaged in the same sort of work; whose identity is drawn from the work; who share with one another a set of values, norms and perspectives” (Van Maanen and Barley, 287). These cultures are also seen as relationships “that apply to but extend beyond work-related matters . . . whose social relationships meld work and leisure” (287). Occupational cultures that are particularly strong because of shared dangers faced by members will be very resistant to any changes suggested or even mandated by outsiders. Examples include the military, loggers, fire-fighters, police, commercial fishermen, and of course, miners. If these same changes are brought forward by insiders, however, they are much more likely to be viewed positively and eventually adopted. According to Van Maanen and Barley:

Danger . . . invites work involvement and a sense of fraternity. . . . Recognition that one's work entails danger heightens the contrast between one's own work and the work of others, and encourages comparison of self with those who share one's work situation. Attitudes, behaviors, and self-images for coping physically and psychologically with threat become part of an occupational role appreciated best, it is thought, only by one's fellow workers. (301)

The lesson here is that credible insiders have much more power to change behaviors inside a culture than outsiders do.

Occupational cultures can often be identified by their “tribal language.” This is language that is understood by members and can therefore be used as a kind of shorthand, while maintaining the added benefit of being somewhat incomprehensible to outsiders. It serves as a communication tool, but also helps define who is in and who is out, who is good and who is bad. It may be jargon specific to the industry, geographic idioms, or phrases that come from languages other than English. Whatever the origin, it is the common language that has the power to convey meaning. Using language in training programs that is not common to the culture is not going to be effective. While it may be understood, it will clearly brand the communicator as an outsider, and will create one more barrier between the speaker and the members. As we looked at existing training materials, it became obvious that many of the training products available were presented in highly technical or regulatory language that was not common in the industry, which may have played a role in why it was not considered effective. They were full of information, but as Bruner points out “Information is indifferent with respect to meaning” (4). If the trainees could not use the information provided to construct meaning for their own work experience, then it can not possibly be effective.

Organizations are often made up of many sub-cultures, all of which have their own way of doing things and their own internal language. In a large mining operation, for example, the mechanics may not consider that they have much in common with the geologists. Environmental engineers probably have a whole different set of concerns compared to truck drivers. Shovel operators may not believe that company managers understand what they do or what their problems may be. A safety trainer needs to be aware of the differences between organizational culture and occupational culture in order to be truly effective, and to realize that as far as safety training goes, “one size does not fit all!” Hansen, a training expert, believes that new information, such as training, will always be filtered through the beliefs, experiences, and norms provided by

the learners' occupational culture. There is a belief that "members have the exclusive right to perform a given set of related tasks" (60), and this can make them quite resistant to outside influences. She goes on to say that "information communicated in a manner greatly different from what is culturally common requires a longer learning period and often leads to a lack of comprehension or misunderstanding" (61). Learners are much quicker to pay attention to, and pick up the meaning of new information if the teacher looks and walks and talks like they do.

Two characteristics of strong occupational cultures like mining, logging or fishing are the shared belief workers have in their own competence, and their reliance on the ability and willingness of others to do their tasks without putting co-workers in danger. What this means is that experienced workers believe nobody knows the job better than they do, and they can become very resentful of someone else, particularly an outsider, coming in to tell them how to do it better. There is also a strong sense of independence among these workers, what experts would call an internal locus of control. Because they have a cultural resistance to outsiders trying to control them, they will generally do something because they choose to do it, not necessarily because someone else tells them to. Trying to permanently change behaviors in this type of culture without obtaining the buy-in of the workers is impossible. People will change their behavior to comply with mandated rules when they must (when an external locus of control is present such as having the supervisor or inspector watching) but when nobody is monitoring their actions, they will generally revert to how they have always done things, and how the occupational (not organizational!) culture expects things to be done. To openly and willingly go against a traditional norm, workers must be convinced that the new behavior is a better choice, and that it is their choice. If this is done successfully, the new behavior becomes part of the cultural norms, and a safety trainer or director doesn't need to monitor it.

## **The Value of Storytelling**

The question, then, is how do you convince people, especially people with experience in an industry, and perhaps a long history of doing things unsafely, to do things differently? The first and most obvious step is to get their attention. The safety trainer needs to find that internal switch that responds to the question, "Why should I care about this information?" and answers, "Because it makes sense for me to care. It may save my life some day." Stories have the ability to do this.

Stories have been used to entertain ever since humans gathered together in groups. They have other functions, however, such as to help us make sense of what is happening in our lives. "Storytelling is a natural way of recounting experience, a practical solution to a fundamental problem in life, creating reasonable order out of experience" (Moen). Simmons believes that stories are "the oldest tool of influence in human history" (xvii) and that they effectively "connect people to what's important and to help them make sense of their world" (29). Slater further explains the power stories have to influence behavior:

It is difficult to consider another communication genre that can communicate beliefs, model behavior, teach skills, provide behavioral cues, and simulate consequences of behaviors over time in as compelling a fashion. (16)

For a trainer, one of the most valuable characteristics of stories is their ability to teach vicariously. We do not need to be part of the story to learn from it. Because stories engage both the thinking and feeling sides of our brain, we can place ourselves in the story, and think about

what we might have done in the same circumstances, and at the same time feel the anxiety caused by the problem. Storytellers can elicit the fear, confusion, or heightened awareness common to disaster stories without ever placing the learners in danger. This situation greatly increases the likelihood the listeners will remember both the story and the lessons it taught. Livo and Rietz claim:

‘Story’ is a way of knowing and remembering information—a shape or pattern into which information can be arranged. It serves a very basic purpose; it restructures experiences for the purpose of ‘saving’ them. And it is an ancient, perhaps natural order of the mind... By imposing the structure of a story onto some circumstance or happening, greater coherence and sensibility are achieved within the event itself, and otherwise isolated and disconnected scraps are bound up into something whole and meaningful. (5)

The facility with which stories organize random or unfamiliar information makes them very valuable as tools to train new workers. People entering a new work environment can be overwhelmed by the unknown. Not only do new employees not know the tribal language, they may have no point of reference to connect unfamiliar tools or environmental features with something they do understand. It is a daunting task to make sense of this much new information, much less make use of it. Stories, however, provide information about what to do, how to do it, and why it is important to do it a certain way. They also clearly communicate the penalty for ignoring established norms, in that they relate what happened when someone failed to follow the guidelines. People pay attention to, and listen more attentively to stories than they do to more formal types of instruction, making it easier to remember what they heard and to put it into practice. The story has particular power to change work behavior if the storyteller is a recognized member of the culture who has the credibility to comment on the culture and tell stories about it. It’s this authority that Durance, an expert on organizational training, was describing when she stated, “You don’t have to be an expert to use stories to motivate people, but you must be credible” (28).

In the United States, federal law mandates safety training for workers in many industries. Lawmakers believe it is critical that workers in inherently dangerous industries receive what researchers would call “socially relevant information.” Turning that socially relevant information into personally relevant information is the key to effective training. Too often, safety trainers use regulations, facts or statistics, which is clearly socially relevant information, to make their point about a work hazard. Cole points out, however, that “many learners who receive . . . this formally codified and socially relevant knowledge tend to find both the content and the instruction to be burdensome, dull and boring” (334). Statistics and regulations are impersonal and uninteresting, even though every one of them is “written in blood.” There are good teaching stories lurking behind every regulation and every statistical chart. These stories give faces to the impersonal, and make them interesting, because the people in the stories are just like the listeners and are understood by them. There is a shared sense of camaraderie and an understanding that what happened in the story could happen again. Listeners empathize, especially if they are caught up in the story, and they remember the lesson.

Good stories are not difficult to find. Almost anyone who has been working in a job that includes exposure to danger has either heard of or experienced a “close call.” In some cases these experiences end in tragedy. Workers love to share these stories because they not only reveal the

dangers and complexity of their work, they instruct the listener on what to do in a similar situation.

During the course of the training development project, we found that most of the teaching stories we encountered fell into four broad categories. All of them are useful for creating effective training, as long as you listen carefully for the underlying messages.

- **Hero Stories** – These stories take the form of talking about people who are or were “larger than life.” They may be about skilled workers who taught the storyteller how to do the job safely and productively, or about someone who saved a colleague in a crisis. They will almost always refer to traits that are admired by the culture, such as hard work, dependability, toughness, courage, creativity under duress, etc. The hero embodies these qualities, and the story gives guidance to listeners as to what the culture values, as well as what it expects. The unspoken (but strongly communicated) message to the listener is that the hero is the model for them and that this is the behavior and the moral fiber that the culture demands.
- **Villain Stories** – These stories are also about the values and norms of the culture, but view them from the “shadow side,” as Joseph Campbell would describe it. The villain, rather than embodying the valued traits of the culture, has turned away from them, and is therefore one to be scorned, feared, or punished. The norms, however, remain the same. The villain is not courageous, hard-working, kind, etc. These stories reveal just as much about the values and expectations of the culture as the hero stories do, just from the opposite angle.
- **Adventure or Disaster Stories** – These stories are about events, and may have many characters included, all who react to the event. The stories told about the events surrounding the attacks on the World Trade Center on September 11, 2001 are examples. Stories of this nature can be heart-breaking or entertaining (adventures are thrilling by nature), but they can also serve to highlight dangers that are intrinsic to the work environment. If one faces unforeseen danger on a regular basis, as underground miners do, it is necessary to make sense of it. This can be enhanced by sharing stories of what happens, and how people react when it does. As we learned when we were working on the video about a major mine disaster, this ability to make sense of what has happened, and to find the meaning behind it may be one of the strongest coping mechanisms available to workers who must face dangers every day. These types of stories are very good teaching stories because they inform listeners about what could go wrong, and they give them guidance by describing what others have done when this happens.
- **The Fool Stories** – These may be the most valuable training stories you can find. They are about what happens when someone ignores warnings, forgets their training, becomes careless or complacent, and perhaps does something unsafely. When you first hear them they will take the form “I knew a guy once who...” If the storytellers come to trust you, however, the stories will begin “Let me tell you what happened to me one day.” These are warning stories more than anything, because if the protagonist suffers a serious injury or is killed, they become a disaster story. In these stories, the protagonist survives the event, and learns a valuable lesson. The storytellers often tell these stories with humor or with a lot of visible emotion, and admit that they were just plain lucky “this time.” They will always acknowledge that they learned a powerful lesson from the experience, and that others could save themselves the pain and embarrassment they felt if they could just learn from the story. For a trainer, these stories are priceless!

## The Research Project

The pilot project that was funded by NIOSH had a small budget and a smaller staff. Our colleagues at our sister lab in Pittsburgh had a proven track record in creating training materials for coal miners, so we decided to limit our efforts to the underground hard rock segment of the industry. However, over the seven-year life-span of the project, that scope was expanded to include surface mining and aggregate operations. It became obvious in talking with trainers and in visiting sites that most mine sites did not have access to state-of-the-art multi-media training facilities, but they did have the ability to show videos. We agreed with our advisory group that video was probably the best medium to use, since we could capture information and stories visually, produce either VHS or DVD products, and provide them fairly inexpensively to miners across the country.

We began working on the topic at the top of the prioritized “wish list” provided by the technical advisory group, which was how to handle explosives. This was not, they explained, for blasters, who were well-trained in their art, but for others who were working around explosives or who handled them as they were moved to different work areas. We learned a great deal in the development of this video. While we were fairly knowledgeable about mining practices, we did not have in-house capability to do the taping, so we made the decision to hire a professional crew to do the videography work. This was another key decision, because the quality of the footage and sound track controls what kind of product you develop in the end. All of the footage we captured during the duration of the project was professionally shot and of excellent quality. When it was time to put a video together, we were not constrained by poor audio or blurry footage. Working with a professional crew provided the added benefit of allowing us the leeway to focus on the miners and the stories we were capturing. A cautionary note: It is impossible for one person to establish the necessary trust and connection with an interview subject if he or she is also the one behind the camera! In order to tell the story effectively, the interviewees must come to a place where they are able to ignore the camera and talk to the interviewer as if they were alone.

Miners in underground hard rock mines have a unique sub-culture within the mining industry. Many of the mines use what is known as a “gypo” or contract system which means that miners are paid an hourly wage, but also have the opportunity to earn substantial production bonuses. (Their often-stated goal is to triple their “days’ pay”). No bonus is paid if the miner doesn’t “make the round” for the day, so gypo miners are accustomed to working hard and fast. They don’t tolerate interruptions, especially those that might cost them money. When we first started the project, there were many in the industry who doubted the top miners would be willing to work with us because of the tedious and time-consuming process of making a video. Their paychecks would most certainly be affected if they became involved and there was also a very real concern that the miners would view us as outsiders and refuse to cooperate.

Both of these fears proved groundless. Mining is a culture that attaches high value to expertise and skill; every experienced miner learned how to do the job from a master miner who was taught in turn by another master. The status that accompanies recognition as a master miner is prized. We discovered that the miners were very proud of what they did, and that being selected as an “expert” (and therefore recognized as a master-mentor) who would also be a “movie star” guaranteed bragging rights. We did not usually know ahead of time who these people might be. In order to have access to the work sites, equipment, and workers we needed, we worked with individual “gatekeepers” at the mine sites, usually the safety directors or trainers, who would

suggest miners who would be good for certain roles, or who might be willing to work with us. We always allowed people to decide for themselves if they wanted to participate, and very few turned us down. In fact, after a few videos were released and were circulated through the industry, we had more “actors” than we knew what to do with. This was a pleasant problem to have.

When you are working with nonprofessional actors like miners or fishermen, it is very important to be patient and to allow them to grow comfortable with the process. They are not generally accustomed to performing in front of an audience or on camera. We tried, in some of the earlier videos, to write scripts for them, but this quickly proved to be a mistake. Not only were the scripts written in language they would not use (the tribal language common to insiders), miners had difficulty memorizing scripts and this made them even more uncomfortable with the process. We realized that there was more benefit in just telling them what role they were playing, and asking them to do what they would normally do, explaining as they went – this they managed with enthusiasm. If they missed a point we wanted covered, we just shot more video. Generally, we had a list of points that we worked with, but often the miners themselves made suggestions about things they thought should be included, or corrected us if we asked them to do something they didn’t think was accurate. They were well aware of the short-comings of current training, and were ingenious in their suggestions on how to improve it. They also had a good perception of what new hires would need to know in order to both keep them safe and make them productive workers.

The project generated nine videos in its seven-year existence. These are listed in Appendix A. All were screened before release with groups of topical experts who acted as technical reviewers, and who assured us that the material was both accurate and that it met the needs of the industry. The finished products were made available free of charge to safety people, and every “customer” was entered into a database so we could track where they were sent and also have access to trainers to obtain feedback. To date, over 13,000 copies have been requested and sent out to mines in every state in the U.S., as well as to customers from over 50 other countries. They have also moved out of the mining industry and are being used by industries such as firefighting, the military, foundry workers, as well as several university public health programs. The lessons learned during the project have been documented in several publications (Cullen and Fein), (Camm and Cullen), (Cullen), and are being used in other projects designed to create training and safety awareness materials. In fact, we about to release our latest video dealing with safety awareness for deck workers aboard commercial salmon fishing boats. This video also uses stories from injured fishermen as a framework. All of the videos are available from NIOSH, and may be obtained from the Spokane Research Laboratory. A list of the completed videos can be found in Table 1.

## **Evaluation of Effectiveness**

Evaluation of training programs is a recognized challenge, regardless of the industry under discussion. Lewis and Thornhill admit, “There seems to be widespread agreement with the proposition that evaluation is the least well conducted aspect of all training activities [in organizations]” (25). In their study, they find that many organizations don’t evaluate training at all, relying on the “Act of Faith Effect” that concludes that “training must be a good thing” (27) and therefore it is worth doing. One of the primary goals of the NIOSH video project was to evaluate the training materials we produced to determine their effectiveness, and several separate evaluation studies of the individual videos have been completed.



**Table 1. Mine safety videos developed by NIOSH Spokane Research Laboratory**

*Handling Explosives in Modern Underground Mines*



NIOSH Publication #: 99-118v Year Released: 1999 Length: 15 Minutes  
Topic: This video covers the basics of working around explosives in an underground mine. While not intended to teach workers how to use explosives, the video is very useful in keeping them aware of the dangers.  
Audience: New miners, annual refresher training.

*Preventing Rock Fall Injuries in Underground Mines*



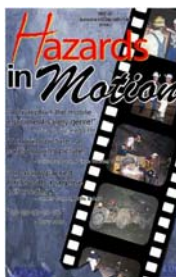
NIOSH Publication #: 99-119v Year Released: 1999 Length: 20 Minutes  
Topic: Winner of the 1999 NIOSH Alice Hamilton Award for Excellence in Education, the Rock Falls video is a great introduction to the mining cycle and how to avoid rock fall injuries. Trainees will learn how to identify loose rock and the proper steps in barring it down safely.  
Audience: New miners, annual refresher training.

*Miner Mike Saves The Day or Ground Support...It's Important*



NIOSH Publication #: 2000-150v Year Released: 2000 Length: 33 Minutes  
Topic: Winner of the Alice Hamilton Award in 2000, this video focuses on the proper installation of ground supports. The video, which was filmed at six different underground hard rock mines, uses real miners to explain concepts and situations. This video works well with both Rock Falls and Zen and the Art of Rock Bolting to create a complete course on hard rock ground control.  
Audience: New miners, annual refresher training.

*Hazards In Motion*



NIOSH Publication #: 2001-151v Year Released: 2001 Length: 34 Minutes  
Topic: Mobile equipment accounts for almost half of the injuries in underground mining. This video uses the adventures of a new hire, Ben, and his hard-working Safety Angel to teach workers about common safety procedures when working around mobile equipment. This video won the CDC Communicators' Round Table Award in 2001.  
Audience: New miners, annual refresher training.

**Table 1 (continued)**

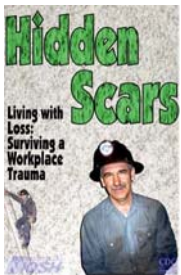
*You Are My Sunshine*



NIOSH Publication #: 2002-132v Year Released: 2002 Length: 67 Minutes  
Topic: This documentary-style video covers the events and impacts surrounding the 1972 Sunshine Mine Fire that killed 91 miners. Composed of interviews of 27 survivors, the video talks about what happened and how the mining culture changed after the fire. A great video for anyone studying the effects of disasters on a culture, this video has been aired on Public Television, and won the prestigious Telly Award in 2003.

Audience: New miners, annual refresher training, anyone interested in mining history.

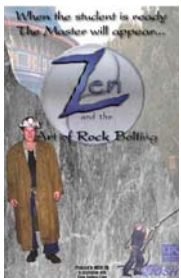
*Hidden Scars*



NIOSH Publication #: 2001-150 Year Released: 2002 Length: 25 Minutes Topic: This video is an account of a fatal rock burst accident that happened in 1994. Don Caparelli and his partner were buried in solid rock for over three hours. Don was rescued and tells his story for the first time. A very moving story of the true cost of injuries in the workplace.

Audience: New miners, annual refresher training, any industrial training or accident prevention program.

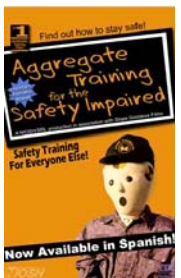
*Zen and the Art of Rock Bolting*



NIOSH Publication #: 2002-131v Year Released: 2002 Length: 33 Minutes  
Topic: The main subject of this video, Jim Mortensen, has worked in an underground mine for over 30 years. This video captures his expertise in safely running a jackleg drill. Jim takes us through the mining cycle step by step, explaining his philosophy of working safely.

Audience: New miners, annual refresher training.

*Aggregate Training for the Safety Impaired*



NIOSH Publication #: 2003-120v Spanish Version: 2003-120v (sp)

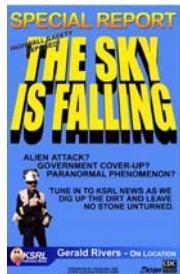
Year Released: 2003 Length: 32 Minutes

Topic: Our first foray into surface mine training, the Aggregate video focuses on 14 safety points for new miners at surface sand and gravel operations. The story follows Ted and his partner Slick as they work at four different aggregate mines, losing their jobs at each for unsafe actions. Also available in a Spanish language version!

Audience: New miners, annual refresher training.

**Table 1 (continued)**

*The Sky is Falling*



NIOSH Publication #: 2004-161v Year Released: 2004 Length: 38 Minutes  
Topic: This video features ace reporter Gerald Rivers who is sent to the West to investigate the phenomena of falling sky. As each of Gerald's theories is debunked we learn more about highwall safety in surface mining. Everything from slope stability to proper behavior around large mobile equipment, Gerald learns it all.  
Audience: New miners, annual refresher training

The first evaluation study on the project, which was done under contract by Dr. Al Fein and Dr. Nancy Isaacson, looked at the initial five videos produced. The team used a mixed-methods approach, standard true-false tests and included open-ended questions as well. They also interviewed a random sample of the trainers who had requested the videos, gathering information from them regarding how the videos were used and how they were perceived by the trainees. Subjects were given the opportunity to provide feedback on the products, which were then analyzed for common themes. The results of the study are available in the team's final report (Fein and Isaacson), and are also summarized in the final report on the project written by Cullen and Fein.

The results of the pre-/post-test questionnaires given to trainees indicated that the videos were, in fact, effective training tools. The miners enjoyed watching them, and freely commented on their quality and on the stories. Fein and Isaacson discovered, however, that miners are not very disposed to taking tests of this type. The videos were shown both to classes of new trainees and to experienced miners during Annual Refresher classes. While the videos themselves were well accepted (according to comments made by the trainers), the tests were not. Veteran miners believed that the true-false tests were disrespectful of their experience, and that anyone could guess the right answers to the questions. Accordingly, Fein and Isaacson developed a different type of assessment tool which has been used to evaluate the remaining videos in the study.

The new assessment instrument also uses a mixed-methods approach and is made up of a limited number of open-ended questions that relate directly to the topic of the video under evaluation. An example would be, "What should you do when first entering your work area at the start of the shift?" The same questionnaire is given before and after watching the video, and the answers to the questions are compared. If the video is effective, there should be both more answers and more specific answers than there were on the pre-test version. This type of tool gives experienced miners credit for prior knowledge, and the video itself becomes a reminder rather than a primary training tool for them. For new miners, however, the video shows how to do the things they will be asked to do underground, which are also explained by a credible master-mentor. Their responses after watching showed significant improvement in awareness and knowledge of what to do and why. The post-test survey also included several questions for trainees that asked them to rate themselves on Likert-type scales regarding how much they learned, how much they liked or disliked the video, etc. A separate questionnaire was developed for trainers that asked them to observe their trainees and report reactions to the video, as well as to rate it for training value, including the effectiveness of the stories that were included. The

details and results of the first use of this instrument as reported by Fein show that the assessment is a better indicator of knowledge gained (or perhaps information remembered) than were the traditional true-false tests.

Similar evaluations, using a mixed-methods approach, were completed for the remainder of the videos. Each video was created to answer a specific question or to meet a specific need. The results of the evaluations show that they were effective in meeting that need. (These studies have been completed, and the results will be published soon by NIOSH.)

## Summary

The project funded as a small pilot-project by NIOSH in 1998, and subsequently funded for six more years, had the goal of creating effective training for the mining industry. The nine videos that were eventually produced were developed in operating mines, using real miners as the role models and teachers. They used the stories told within the industry to convey specific safety awareness messages and they did it in a way that was interesting and accepted by the occupational culture of the trainees. Evaluation studies have shown that the videos are effective, but perhaps their wide distribution in the industry could also be viewed as another measure of acceptance. The videos are provided free of charge to trainers, but SRL/NIOSH has been asked to replace them constantly. The miners, it seems, are “borrowing” them from the trainers and taking them home to show their families. If two necessary keys to effective training are getting the attention of trainees and gaining cultural acceptance of the messages taught, the NIOSH videos would appear to have succeeded. There is no reason to believe these lessons would not be useful for other industries.

## Bibliography

Bruner, J. *Acts of Meaning*. Cambridge, MA: Harvard University Press, 1990.

Camm, T. W. and Cullen, E. T. “Releasing the Energy of Workers to Create a Safer Workplace: The Value of Using Mentors to Enhance Safety Training.” Chap. in *Strategies for Improving Miners' Training, IC 9463*, edited by R. H. Peters, pp. 35-38. Pittsburgh, PA: NIOSH Pittsburgh Research Lab, 2002.

Campbell, J. *The Hero with a Thousand Faces*. Princeton, NJ: Princeton University Press, 1973.

Cole, H. P. “Stories to live by: A narrative Approach to Health-behavior Research and Injury Prevention.” In *Handbook of Health Behavior Research Methods*, edited by D.S. Gochman.: Vol. 4, pp. 325-349. New York, NY: Plenum, 1997.

Cullen, E.T., and Fein, A.H. *Tell Me a Story: Why Stories are Essential to Effective Safety Training*. Report of Investigation # 9664/DHHS (NIOSH) Pub. No. 2005-152. Spokane, WA: NIOSH Spokane Research Lab, 2005.

Cullen, E.T. "The Power of Storytelling in Getting Through to Miners," edited by E.T. Cullen, T. Camm, M. Jenkins, and L. Mallett. Chap. in Information Circular #9484, *Getting toZero: The Human Side of Mining* . Spokane, WA: NIOSH, 2006.

Durrance, B. "Stories at Work." *Training & Development*, 51, no. 2(1997): 25.

Fein, A. H. *Evaluation of Zen and the Art of Rock Bolting*. Report prepared for the Spokane Research Laboratory, Spokane, WA. 2003: 38 pp.

Fein, A.H. and Isaacson, N.S. *Video-based Training Program for Underground Miners Evaluation Report*. Report prepared for the Spokane Research Laboratory, Spokane, WA. 2001: 105 pp.

Hansen, C.D. "Occupational Cultures: Whose Frame Are We Using?" *Journal for Quality and Participation*, 18, no. 3(1995): 60-64.

Lewis, P. and Thornhill, A. "The evaluation of training: An Organizational Approach." *Journal of European Industrial Training*, 18, no. 8(1994): 25-33.

Livo, N.J. and Rietz, S.A. *Storytelling: Process and Practice*. Littleton, CO: Libraries Unlimited, Inc., 1986.

Moen, T. "Reflections on the Narrative Research Approach." *International Journal of Qualitative Methods*, 5, no. 4(2006): 11 pp.

Patton, M.Q. *Qualitative Research & Evaluation Methods*. 3rd ed. Thousand Oaks, CA: Sage, 2002.

Simmons, A. *The Story Factor: Inspiration, Influence, and Persuasion Through the Art of Storytelling*. Cambridge, MA: Perseus Publishing, 2001.

Slater, M.D. "Entertainment Education and the Persuasive Impact of Narratives." edited by T. Brock, J. J. Strange, and M. C. Green. *Narrative impact: Social and cognitive Foundations*. Hillsdale, NJ: Erlbaum, 2002.

Van Maanen, J., and Barley, S. R. "Occupational Communities: Culture and Control in Organizations." In *Research in Organizational Behavior*, edited by Staw and Cummings: Vol. 6, pp. 287-366. Greenwich, CT: JAI Press, 1984.