



**IC 9463**

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# **Strategies For Improving Miners' Training**



**Department of Health and Human Services**  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health



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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health  
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## INTRODUCTION

By Robert H. Peters<sup>1</sup>

This Information Circular from the National Institute for Occupational Safety and Health (NIOSH) documents and supplements the information presented in a series of workshops held during 2002 and 2003. The primary intended audience consists of all who are involved in developing and conducting miners' training.

According to the Mine Safety and Health Administration (MSHA), mine operators reported 240,000 full-time equivalent workers and independent contractors reported 42,000 full-time equivalent workers working on mine property during the year 2000. Unfortunately, these workers have a relatively high risk of suffering serious work-related injuries and illnesses. The mining industry has the highest rate of occupational fatalities among all U.S. industries. The fatality rate is 30 deaths per 100,000 workers compared to 4.6 for all private industry (*Morbidity and Mortality Week Report*, 2001; NIOSH, 2002). Compared to workers in other industries, miners also have a relatively high rate of *nonfatal* lost-time injuries, and their injuries tend to be more severe (Bureau of Labor Statistics, 1999). Many miners are also exposed to significant health hazards, including coal and silica dust, diesel exhaust, and noise. More than 1000 U.S. miners die of lung disease each year (NIOSH, 1999).

Mine safety and health professionals have long recognized training as a critical element of an effective safety and health program. Federal regulations (30 CFR, Parts 46 and 48) require mine operators to provide initial safety and health training to all new miners, as well as a minimum of 8 hours of refresher training each year. The time and money being spent to train U.S. miners is substantial, and so there is a strong and steady demand for new and better mine training materials and methods.

A growing concern among mine safety professionals regards the training of new workers. A major change in the mining workforce is anticipated within the next decade. In major segments of mining, especially coal, relatively few workers have been hired since the 1970's. Thus, as an entire cohort of miners in the current workforce nears retirement, the replacement of these employees will require an influx of new workers. New miners may be young people who lack the ability to recognize and respond to mining hazards in an appropriate manner. They may also have had different educational experiences than their older counterparts. Many safety professionals believe that these two cohorts require different approaches to training. The papers in this report should help prepare mine trainers for the changes about to occur in the workforce and acquaint them with strategies they can use to enhance the effectiveness of their training.

The first three papers present basic principles for teaching adults. The five remaining papers are intended to illustrate how these principles can be applied to the development and implementation of effective training for miners. Below is an overview of these papers.

1. Kowalski and Vaught review the process and principles of adult learning. The learning model they present includes a discussion of goals, content, delivery, assessment, and remediation. Adults are viewed as active learners, experienced-based, expert in their own right in specific areas, independent, real-life centered, task-centered, problem-centered, solution-driven, skill-seeking, self-directing, and internally and externally motivated. Basic aspects of curriculum development are briefly reviewed. For further information about adult learning, see Camm and Cullen's paper.

2. Mallett and Reinke's first paper discusses issues related to training new miners who have recently or will soon be entering the mining workforce. These new generations of miners have different learning style preferences and training needs than Baby Boomers and other older miners. Even trainers who have been highly effective in the past should reassess their training styles and their classroom materials to determine if they are prepared to meet the needs of these young new workers. This paper provides information that will help mine trainers communicate across the generation gap.

3. Mallett and Reinke's second paper provide an overview of training evaluation. Trainers and decision-makers are given a framework for planning and assessing training evaluation strategies. The authors present Kirkpatrick's (2001) model of evaluation categories and discuss how to start an evaluation plan and various ways to collect data. They do not provide detailed instruction in evaluation methodologies, but give trainers a review of the things they need to consider when developing an evaluation plan. A good evaluation plan can inform revisions to a training course, assess trainee learning, and/or answer managers' questions about program effectiveness.

4. Brnich, Derick, Mallett, and Vaught discuss a technique for incorporating worker participation into fire prevention and safe equipment operation training. This technique involves development of short (5 to 7 minutes) videotapes coupled with toolbox talks that ground the content of the videos within the context of a miner's workplace. An example of one of these training modules is presented, along with the results of an evaluation performed on its effectiveness at improving miners' understanding of what types of information they should be sure to communicate during a mine emergency.

5. Wiehagen, Conrad, Friend, and Rethi discuss on-the-job training (OJT) as a method for teaching miners safety and production skills. Much of the training is done by experienced workers. This paper describes how small investments can help improve the effectiveness of on-the-job training. Effective on-the-job training involves some structure and planning in the transfer of responsibility for task performance from the trainer to the novice. Assisting the trainer could involve helping develop up-to-date job analyses and offering strategies for teaching and evaluating job skills. This paper addresses organizational considerations supporting structured on-the-job

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training, general strategies, a typical approach for conducting on-the-job training, characteristics and duties of trainers, and the limitations of on-the-job training as a teaching method. Health, safety, and operational skills can be connected through training. Haul truck operators are used to illustrate some of the concepts discussed.

6. Camm and Cullen discuss the mentor-protege model for teaching miners. Miners know when they see excellence and have a deep respect for experts in their field. By using expert miners as mentors to other workers, training programs can be developed that will have a legitimacy and credibility that resonates with those being trained. Building upon concepts in current theories of adult education, these authors highlight the unique advantages of using mentoring as a teaching method that can make educational experiences both interesting and effective.

7. Varley and Boldt discuss how mine trainers can develop their own tailgate training. Tailgate training—short (usually 10 to 15 minutes) weekly sessions conducted on-site prior to work shifts and involving work crews—is a popular mode of worker occupational safety and health training employed by many field-based companies. Too often the trainer attempts to use generic information, cover too broad a subject, or teach a new skill

during the short period available for training. Toolbox training should be used to refresh knowledge and skills and to communicate new hazards specific to a given minesite. This paper presents methods trainers can use to prepare toolbox training materials and make it relevant to miners and specific minesites.

8. Randolph, Kohler, and Byrne discuss why multiple versions of an educational message can reach a diverse population more effectively than a single version. For instance, some workers are trained in formal classrooms, while others are self-taught. NIOSH has developed multiple versions of a hearing loss simulation to show how a single set of information can be readily adapted to different delivery methods. Three versions of the simulator—an interactive software package, a web-based module, and an electronic slide show—were developed with a minimum of effort and expense when compared to a single, less-flexible version. Interactive software is best for training sessions led by a relative expert in the field (audiological testing) while Web pages are best for an individual worker, and slide shows are best for small, more general training classes. This paper describes additional advantages and disadvantages of different delivery systems and shows what considerations are helpful when designing content that can be readily adapted to alternate presentations.

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