

10. Training and Education for Preventing Work-Related Injury and Illness

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Training and Education for Preventing Work-Related Injury and Illness

Worker training in injury and illness prevention is provided by many employers; it can range from rudimentary instruction about “safety rules” to sophisticated instruction about potential hazards and technologies for their control. Training was at management’s discretion until the Occupational Safety and Health Administration (OSHA) included training requirements as part of several regulations. Unions have rarely had the resources to train members in preventing work-related injury and illness. However, some unions now have (or had) training programs for their members supported by funds from the OSHA New Directions program (see ch. 12). OSHA is the Federal agency primarily responsible for worker training.

The National Institute for Occupational Safety and Health (NIOSH) is primarily responsible for educating occupational safety and health professionals. NIOSH, especially through its funding of Educational Resource Centers (ERCs), has emphasized interdisciplinary education of occupational physicians and *nurses*, industrial hygienists, and safety engineers,

Responsibilities of NIOSH and OSHA overlap. For instance, NIOSH publications are used in worker training and the OSHA Training Institute trains professionals in short courses about OSHA regulations.

The importance of managers and engineers in identifying and controlling workplace hazards has led some professional organizations to discuss educational needs of their members. Both NIOSH and OSHA are participating in developing short courses for these professionals.

It is difficult to measure the effects of training and education programs. Ideally, decreases in illness and injury rates would be associated with the programs, but the rates are influenced by so many factors that clear conclusions are difficult. Currently most measures of success are “process measures” that count the number of students taught or hours of instruction provided.

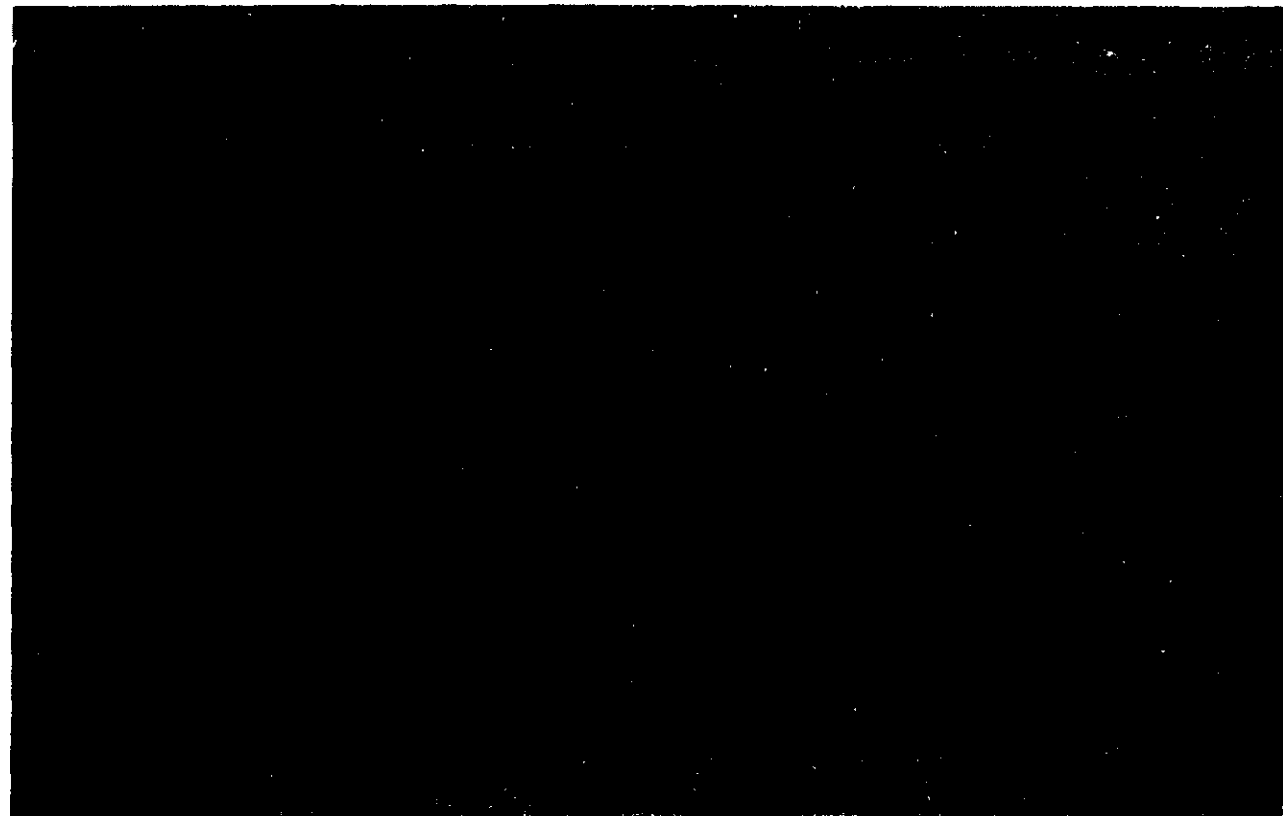
WORKER TRAINING AND EDUCATION

Workers trained to recognize and avoid hazards are an indispensable part of creating and sustaining an illness- and injury-free workplace. In this assessment, worker *training* is defined as instruction in recognizing known hazards and in using available methods of worker protection. Such training, for example, emphasizes physical procedures and skills, such as keeping a shop floor free of debris, proper attention to the locking of machinery during maintenance, or proper use and cleaning of respirators.

Worker education is defined as instruction in analyzing and responding to new circumstances

and unforeseen problems. It prepares the worker to identify potential hazards, to request and collect information about hazards, and to seek ways to eliminate or control hazards.

Although the boundary between training and education programs is often vague, the various programs may be described in four major and logically related categories: fundamentals, recognition, enforcement, and empowerment (227). In general, the narrower the role the worker is expected to assume, the more instruction is “training.” The broader the role, the more instruction is “education.”



Since a comprehensive analysis of worker training and education programs, their effectiveness, and the resources devoted to them is lacking, OTA contracted with INFORM to survey 40 worker training and education programs. Respondents included 8 business firms and trade associations, 10 unions, 4 hospital-based programs, 8 university-based programs, 6 Committees (or Coalitions) for Occupational Safety and Health (COSH groups), and 4 miscellaneous educational programs.

Fundamentals Programs

“Fundamentals” worker training programs instruct about known hazards in order to prevent work-related illness and injury. Such training may instruct workers in:

- * prevention of work-related injury and illness through the proper use and maintenance of

potentially hazardous tools, equipment, and materials;

- emergency procedures;
- personal hygiene as related to use of hazardous materials;
- the need for medical checkups or examinations; and
- use of protective devices such as masks, respirators, safety goggles, or gloves during nonroutine maintenance, where protective engineering methods have not yet been implemented, or during emergencies (227 and see box H).

Of the five “fundamentals” programs in the INFORM survey, three were operated by business firms and two by trade associations. Four teach supervisors, occupational safety and health specialists, or other “keypersons” to convey information and skills to workers. In the fifth case, the health and safety staff of a company instructs both workers and supervisors. The program ob-

jective most frequently cited was to reduce costs of work-related injury and illness.

Recognition Programs

“Recognition” programs prepare workers to participate in a broader range of worksite safety and health activities through:

- emphasizing awareness of the hazards present in the workplace;
- understanding different methods available for hazard elimination or control;
- understanding rights and responsibilities under the law, e.g. right-to-know laws;
- collecting information about workplace hazards, e.g. chemical identity of workplace substances, symptoms associated with exposures, exposure levels;
- observing or informally inspecting the workplace for potential hazards; and
- reporting hazards or potential hazards to appropriate individuals or committees (227 and see box I).

Of the 14 “recognition” programs in the survey, 3 are conducted by businesses, 5 by unions, 3 by universities, and 3 by hospitals; their major objective is to teach workers to recognize hazards.

Problem-Solving Programs

The general objective of “problem-solving” programs is to provide workers with the information and skills necessary to participate in hazard recognition and control. These programs prepare workers to:

- help solve problems that may arise on the shop floor, in an ongoing, regular way, by use of union and management resources and mechanisms; and
- exercise legal rights when necessary and practical, to bring outside agencies, especially OSHA and NIOSH, into the workplace to help address hazards (see box J).

In order to be effective, workers must learn to:

- question work processes and materials to assess whether hazards have been adequately identified; and

- judge the effectiveness of alternative methods of control (227).

Of the 14 “problem-solving programs” included in the survey, 5 are administered by unions, 5 by universities, 1 by a hospital, and 3 by independent educational programs. The major program objectives emphasize teaching workers to use particular mechanisms to address workplace problems.

Empowerment Programs

“Empowerment” programs aim to teach workers the broadest range of skills so as to involve them in defending and expanding their rights to an illness- and injury-free workplace. The major assumption underlying “empowerment” programs is that the goals of cleaning up hazardous workplaces and ensuring the health and safety of workers requires a substantial transfer of political and economic power to workers and their unions. To help educate workers to play a broad social and political role, “empowerment” programs must either instruct workers in the entire range of skills and knowledge offered by “fundamentals,” “recognition,” and “problem-solving programs”—or they must work to ensure that such training is provided to workers by unions and/or management (See box K).

Although INFORM (227) did not collect information about employers’ responses to “empowerment” programs, it is expected that those programs would be opposed. The transfer of political and economic power from employers and managers in any area, including safety and health, would be a dramatic shift.

Six of the seven “empowerment” programs in the survey are conducted by Committees or Coalitions for Occupational Safety and Health. The other is conducted by a nonprofit educational program. The political focus of “empowerment” programs is apparent in the following descriptions of program objectives listed by four groups from the survey:

- empower workers to deal with problems at work;
- build on hazard recognition and problem-solving skills to give safety committee mem-

Box 1.—Example of a Recognition Program: International Brotherhood of Painters and Allied Trades (IBPAT)

In 1982 the IBPAT instructed and equipped 126 field instructors (who reached about 25,000 union members through workshops, conferences and lectures) with information about specific hazards and methods of preventing illness and injury among workers.

The IBPAT program is used by local unions and by vocational or trade schools that offer courses for workers and local union officials. The program is tailored to meet the needs of specific groups of workers for instruction about specific hazards.

Instructional materials prepared by IBPAT include videotape modules, a quiz book, and a course book. These materials are designed to complement lectures as well as to stimulate class discussion.

The major elements of the IBPAT program compare with the basic elements of a "recognition" program to learn:

Recognition programs convey information and skills to workers, enabling them to:

1. recognize different workplace hazards

2. understand methods to control workplace hazards

3. know worker and company responsibilities under the OSHA Act

4. collect information about hazards

5. inspect the workplace for potential hazards

6. report hazards or potential hazards to appropriate individuals or committees

The IBPAT program, for the use of local unions and trade schools, includes materials and course plans for instructing workers in:

1. recognizing and understanding:
 - exposure to silica, lead, asbestos, and carbon monoxide
 - causes of accidents in the glazing trade
 - how harmful substances enter the body and their effects
 - symptoms of neurological, respiratory, digestive, and circulatory disorders, and what substances are believed to cause them
2. control methods for silica, lead, and toluene diisocyanate
 - using personal protective equipment for abrasive blasters
 - using engineering controls, administrative controls, and work-practice controls for asbestos
 - selecting the proper respirator for different hazards, such as asbestos, and isocyanate vapors
3. worker and company rights and responsibilities under the law regarding monitoring, record keeping, medical examinations, OSHA complaints, NIOSH health hazard evaluation
4. using:
 - charts to estimate a substance's toxicity
 - the IBPAT/OSH Dilution ventilation chart to determine ventilation requirements
5. [locals provide instruction]
6. [locals provide instruction]

IBPAT reports that its program has had a significant impact on collective bargaining. According to an IBPAT evaluation of its fiscal year 1982 activities, **5 out of 10 locals or district councils that completed the IBPAT program prior to negotiations of their contracts secured provisions for health and safety committees. Among affiliates that did not receive IBPAT instruction, only 3 out of 10 secured such committees.**

The IBPAT program evaluation also showed that **27 percent of those affiliates that have completed the program won provisions for training programs in their new contracts. This compares with only 10 percent of affiliates that had not undertaken the program. (Both measures of success are complicated because the affiliates who participated in the program may have already made significant commitments to safety and health. If that were so, participation and success in negotiations might be better characterized as two successes stemming from overall commitment rather than any cause-effect relationship.)**

Source: (227).

**Box J.—Example of a Problem-Solving Program:
Labor Occupational Health Program (LOHP) at the University of California, Berkeley**

LOHP offers a variety of programs and services, including:

1. formal education and training courses;
2. workshops and conferences;
3. plant walk-throughs to assist in hazard identification;
4. off-site technical advice;
5. legal advice;
6. **assistance** in collective bargaining; and
7. maintenance of a resource center for public use.

In 1982, LOHP instructed more than 800 workers and union officials through courses, workshops, and conferences and provided educational and training materials to 4,000 workers and union officials.

In addition to providing instruction typical of “fundamentals” and “recognition” programs, LOHP places special emphasis on teaching the problem-solving skills listed **in the chart below:**

Problem-solving programs convey information **and skills to workers** that enable them to:

1. take an active role in seeking solutions to **problems on the shop floor**

- z. **exercise legal and contractual rights and ensure management compliance** with laws and contractual agreements

LOHP offers **the following programs that instruct workers and union officials in problem-solving skills:**

1. **training for participation in joint committees** (such as an annual course for the Oil, Chemical and Atomic Workers International Union, and petrochemical companies in the Berkeley area)
a conference on workers' compensation for workers and trade unionists
workshops on “Collective Bargaining on Health and Safety”
steward training sessions in health and safety for unions
2. **a conference on California right-to-know law**, attended by 150 union and management representatives, professionals, and students
small workshops to aid in the implementation of the state right-to-know law

Source: (227).

Box K.—Example of an Empowerment Program: Dedicated COSH Group

A small town local union representing over 500 workers, and more than 150 individuals, including union officials, workers, health and safety professionals, lawyers, and doctors, are members of this COSH group. The following list of activities illustrates how this group puts the "total" model of "empowerment" programs—empowering and expanding workers' rights under the law—into practice.

The COSH group provides services common to other programs. For instance, it:

- publishes and distributes materials about specific hazards and specific methods of hazard recognition and worker protection;
 - conducts and conducts workshops, conferences, and courses designed to train and educate workers in a variety of subjects including hazard recognition to labor organizations such as building a strong safety committee and winning good working conditions on safety and health issues; technical assistance to workers' groups to remove dangerous work conditions; and call in OSHA; and
 - provides technical assistance to workers' groups in the process of workers' compensation claims.
- The COSH group also works in cooperation with workers and unions in the community to improve safety and health conditions. For example, it:
- prepares testimony for regulatory hearings;
 - organizes workers to participate in public hearings, especially those concerning compensation and workers' compensation;
 - provides the assistance of workers' groups with other community organizations, environmentalists,

bers and local union officials and stewards skills in observing and interpreting air monitoring and medical tests; track trade names of potentially hazardous chemicals; devise engineering control methods; negotiate effective health and safety contract language;

- empower workers and their unions to win illness- and injury-free working conditions; have more control over their working conditions; and
- empower workers with the skills and the confidences they need to prevent work-related illness and injury in their workplaces through collective action (227).

Evaluation of Worker Training and Education Programs

Ideally, effectiveness of worker education and training programs would be measured by reduced job-related injuries and illnesses. However, the data currently available are often limited, especially for illnesses (see ch. 2). In addition, even with the appropriate data, attribution of improvements to one factor requires knowledge of all other factors that might have an effect. In practice, effectiveness measures are generally indirect and include counting the number of workers trained or educated and surveying workers' and management's perceptions of the value of the programs.

OCCUPATIONAL SAFETY AND HEALTH PROFESSIONALS

Congress recognized the **need for training a cadre of occupational safety and health professionals to reach the objectives of the Occupational Safety and Health (OSH) Act of 1970**. Section 20 of the Act designates NIOSH as the agency to plan for and carry out programs to assure an adequate supply of professionals. NIOSH was given authority to conduct programs for this purpose directly, through grants, and through contracts.

Since 1971, NIOSH has conducted short-term training programs for occupational health and safety professionals, developed curricula and training materials, and provided grants to universities. Through a grant program, it has established Educational Resource Centers to train occupational safety and health professionals through interdisciplinary programs, to provide consultation and training for workers and employers, and to conduct research related to worker health and safety. NIOSH has also provided financial support to students through training grants to qualified universities (588).

In addition to NIOSH courses, large companies sometimes train their own professionals. A cooperative agreement between General Motors and the United Auto Workers to train union safety stewards is described in chapter 15.

Continuing Education

NIOSH conducts technical training courses for private-sector and Government professionals and technicians. The cost of the training courses is paid by reimbursements to NIOSH. Short-course topics include:

- . industrial hygiene;
- . occupational safety;
- . industrial toxicology;
- occupational health nursing; and
- occupational medicine.

Special custom courses are produced to meet specific training needs identified by Government and private sector groups. For example, in fiscal year 1982, courses were presented to the U.S. Navy about analyzing asbestos samples taken during ship refitting; to the Health Departments of New Jersey and Arizona to train state officials in

the recognition of workplace hazards; to the Mine Safety and Health Administration Training Academy to provide information about industrial hygiene sampling and analysis for mine inspectors; and to Case Western University to train science department faculty in preventing injuries in laboratories.

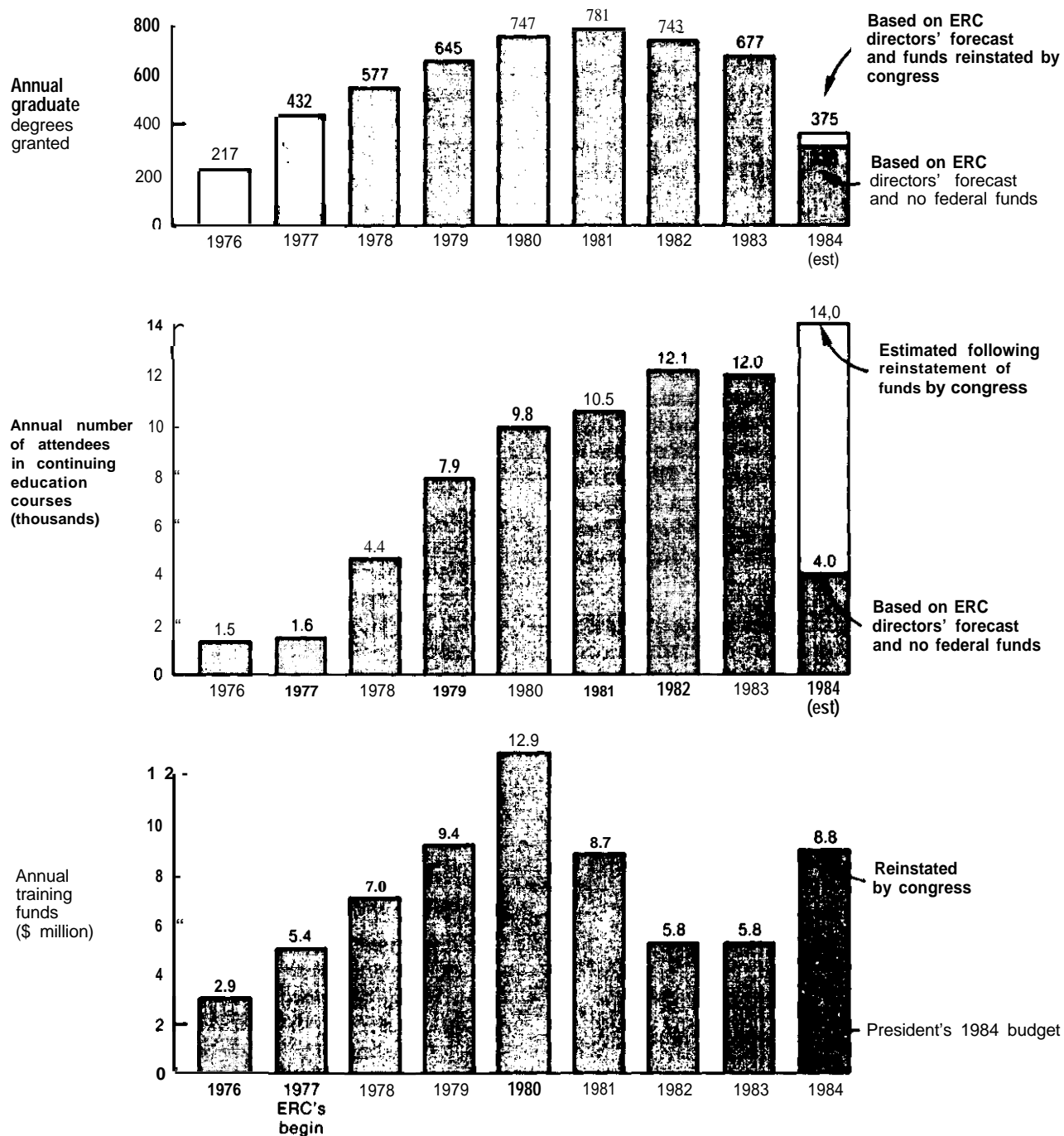
Between 1977 and 1981, continuing education enrollment increased from approximately 1,600 to over 10,000 per year (fig. 10-1). At this rate, enrollment could eventually increase to 50,000 per year if each specialist in the field attended one continuing education program at least every other year. As figure 10-1 illustrates, the number of attendees in continuing education courses increased with funding from 1976 to 1980.

However, a substantial reduction in the number of attendees was projected, based on an assumption of a lack of Federal funding of ERCs in the 1984 Presidential Budget (102). In fact, funding was continued by Congress and the number of trainees is now estimated to be 14,000 per year. The demand for continuing education increased dramatically as OSHA and NIOSH resources for disseminating information to professionals were cut. This is partially because graduated professionals sought to update their knowledge and skills. Funds have been available to meet this demand due to the flexibility of ERCs in rebudgeting funds intended for graduate training, where enrollment has been declining.

Curriculum Development and Dissemination

Refinement and modernization of curricula for short-term and continuing education can improve the effectiveness of occupational safety and health training. One way NIOSH disseminates recent research findings that may help prevent work-related illness and injury among high-risk groups is through the development of curricula. Generally this approach consists of identifying groups who have access to high-risk workers, developing materials that will train these target groups in recognition and means of prevention of harm, and conducting "training-the-trainer" programs so these groups can transfer the knowledge.

Figure 10.1.—Effect of Funding Changes on Numbers of Graduate Degrees Granted and Continuing Education Courses Provided by Both NIOSH and Grant Supported Universities



An example of curriculum development is the joint NIOSH-OSHA program for instructing vocational education teachers how to teach skills in recognition and control of workplace hazards. Introducing such concepts to new workers before they are employed is especially important since young workers are at the highest risk of traumatic injury. Pilot programs were conducted with over 100 vocational education administrators and teachers in Ohio, California, Minnesota, Arizona, Florida, and New York. The program was designed for flexibility so that its 17 units can be taught over 3 days or over longer periods, depending on individual needs.

Another example of training-the-trainer was the NIOSH program to increase the awareness of high school science teachers about hazards in the working environment. In a three-year period, over 100,000 teachers were trained through this program at a cost of little more than \$1 per trainee. This program also resulted in changes that described chemical hazards to workers in a recently published high school science text.

Specific teaching modules have also been developed and made available to appropriate groups. For example, audiovisual presentations on safe removal of asbestos from school buildings were developed jointly by NIOSH, OSHA, the Environmental Protection Agency, and the National Cancer Institute. Over 1,000 copies of these programs were distributed to train asbestos removal contractors. In another case, videotape programs were developed to instruct firefighters and other workers in the techniques of maintaining and donning self-contained breathing apparatus. These tapes featured the latest findings from the testing of these devices.

Planning

In 1977, NIOSH conducted a nationwide survey of governmental agencies and nonagricultural firms with more than 100 workers to determine the current number of employed occupational safety and health professionals and to predict future demand. Based on nearly 3,300 survey responses, NIOSH estimated the number of full-time professionals to be between 104,360 and 110,840 and forecast 3,100 new positions a year would be available by 1990. Growth in demand was con-

centrated in jobs that "inspect, interpret, investigate, and plan," such as industrial hygienists and safety engineers (570).

The future supply of occupational safety and health personnel was estimated in another NIOSH survey by asking 112 programs in occupational safety and health education how many graduates they expected in the future. These results, combined with estimated numbers of personnel trained by insurance companies and by the Federal Government, showed that in 1977 the demand exceeded supply of occupational safety specialists, occupational health nurses, and occupational health physicians, but that the demand equalled supply for industrial hygienists. Due to survey limitations, data collected at that time were insufficient to predict adequacy of supply of occupational safety and health personnel by 1990 (570). A report that updates work force supply and demand information has been completed (584); however, publication of the report awaits OMB approval.

The NIOSH surveys of demand and supply, like all such projections into the future, were based on assumptions about conditions in the years ahead. Because of the sagging economy in the early 1980s, and probably also because of a reduced Federal presence in occupational safety and health, there have been few positions available in this field. *The Advisory Panel to this assessment lamented the fact that occupational safety and health professionals are often among the first*



Photo credit E.I. du Pont de Nemours & Co

Measuring the concentration of potentially harmful gases is one aspect of an industrial hygienist's job

to be laid off from company and union jobs, but could offer no suggestions to alter that condition.

Training Grants

NIOSH's findings of shortages of trained occupational safety and health graduates were cited in successful efforts to expand training grants programs. One part of this expansion was to introduce the concept of multidisciplinary educational resource centers. The other part was growth of single-discipline training grants.

Single-discipline training project grants have been established in 28 universities, and over 100 different academic degree programs were in place in 1980. **Because of budget cutbacks, the number of programs was reduced** to 60 in 1982. The number of professionals graduating from these and ERC programs each year increased from 217 in 1976 to 747 in 1980. As shown in figure 10-1, the number of graduates increased as the funding increased.

Educational Resource Centers

Congress authorized creation of up to 20 Educational Resource Centers for occupational safety and health in **1976. Funding increased from \$2.9 million** in 1977 to \$12.9 million in 1980, and the ERCs now number 15. These centers: 1) provide continuing education to occupational health and safety professionals; 2) combine medical, industrial hygiene, safety, and nursing training so that graduates are better able to work effectively in complex and diverse conditions; 3) conduct research; and 4) conduct regional consultation services. **All ERCs but one are located in universities.**

The centers are distributed as far as possible to give regional representation and to meet training needs for all areas of the Nation. The Federal cost of ERC education is approximately \$7,000 for each degree graduate and \$70 for each attendee at continuing education courses (102).

Recent budget cuts have reduced the current level of funding for Educational Resource Centers to **\$5.8 million**, 55 per cent below the level in fiscal year 1980. According to projections by the Association of University Programs for Occupational Health and Safety, if Federal funding for ERCs had been eliminated as proposed in the President's fiscal year 1984 budget, the number of graduates completing their programs would have decreased to approximately 338 (compared with about 781 in 1981) and only about 25 degree programs of the 112 programs currently in existence could have been expected to survive. Furthermore, there was concern that without Federal funds, multidisciplinary programs would revert to more narrow and limited single-discipline programs.

While the President's 1984 budget for NIOSH contained no request for ERC funding, the Congress added \$8.8 million for the centers.

Other Training Programs for OSH Professionals

Other Federal agencies and private companies train occupational safety and health professionals in special cases. OSHA maintains a training institute in Des Plaines, IL, primarily to give short-term training to State and Federal compliance officers, and the institute also provides short courses to some private sector groups (636). The Mine Safety and Health Administration maintains a Training Academy in Beckley, WV, to give short-term training to its inspectors (452).

Many short-term training courses for workers and occupational safety and health professionals are sponsored in the private sector. The courses, including a wide variety of specialized short-term training in both illness and injury prevention, are announced weekly in journals such as the *Occupational Safety and Health Reporter* published by the Bureau of National Affairs. The number of private sector courses has grown substantially since the passage of the OSH Act.

ENGINEERS AND MANAGERS

Although there appears to be a growing awareness in the business community of the costs of work-related illness and injury (284), little information is provided about prevention in business schools (579). Furthermore, there is little evidence that engineering schools treat the subject at any level, but there are some attempts to change this. Professional engineering societies and trade associations have formed committees on occupational safety and health, governmental agencies are conducting training and information programs, and educators are slowly becoming concerned.

Engineers and business managers are often unaware of the potential for reducing work-related injuries and illnesses either because the hazard remains to be identified or because information about it is new and inadequately disseminated. Even after a hazard is recognized, these business decisionmakers may lack access to information on which to base plans for prevention.

Educating Engineers

The engineering curriculum is one of the few that prepares baccalaureate degree holders for a professional license. Because it provides both an undergraduate and a professional education, the curriculum is a crowded one and under constant pressure to add new material. Occupational safety and health would be a useful addition or augmentation to currently scheduled lectures, but it is difficult to squeeze it in.

Few people more fully recognize the difficulties of the engineering curriculum than professional educators, yet they see some opportunities to increase safety and health instruction. For instance, industrial-hygiene-engineering educators recommend, in a recent report, presenting students with information on recognition and control of work-related injury and illness hazards and making such information available to practicing engineers (587). They single out design engineers as a par-

ticularly important group because the greatest opportunity for change is in the planning stages of industrial processes. "All undergraduate engineering curricula (particularly design courses) should include instruction on the responsibilities of engineers for occupational safety and health engineering problems and solutions" (587). The report also recommends that academic programs in occupational safety and health should be offered to practicing engineers as continuing education. The American Board of Engineering and Technology, which accredits programs in engineering, finds it "desirable" for engineering schools to teach safety (4).

Specific legal responsibilities require professional engineers to protect workers and the public as well as their employers. Professional engineers may be required to act according to the prevailing practice of the profession by State law, but they may lack knowledge about local or Federal regulations or penalties for noncompliance. Indeed, engineers have been held accountable for the actions of untrained subordinates in some cases. In the case of workplace health and safety regulations, training may be absent since few schools of engineering have courses bearing on responsibilities under the Occupational Safety and Health Act.

Complicating problems for engineering schools are current pressures to update curricula to meet rapidly changing technology, to respond to the sudden upsurge in enrollment, and to upgrade faculty and overcome critical staff shortages. Undergraduate enrollment exceeded 387,500 in the academic year 1981-82. This was an all-time high for the Nation's 286 engineering schools (419).

Training Business Managers

According to a national survey of 217 schools of business management accredited by the American Assembly of Collegiate Schools of Business

(a group representing a majority of business management schools) that was conducted by the National Safety Management Society, few specify safety management studies as a degree requirement (311). It is not difficult to imagine that such studies would be of low priority in management schools, but some companies argue that commitment of top management is the single most necessary ingredient in safety and health programs (156).

NIOSH and OSHA have begun Project Minerva to develop occupational safety and health train-

ing programs in business schools. The project will be publicized through a series of briefings given to administrators and faculty at selected business schools. Audiovisual materials will be prepared and a case-study book assembled containing 50 related occupational safety and health articles. These materials will be designed so that they can be used in classwork by the business educators (584).

COMPUTER NETWORKS AS AN EDUCATIONAL TOOL

Improving the quality and quantity of information available about preventing work-related injury and illness depends upon finding solutions and communicating the solutions to people who will benefit from them. The traditional methods of information exchange are journal articles, presentations at professional meetings, and various kinds of consultation. Computer conferences—formed by people who share common interests and who “participate” in the conference by sending and receiving messages in a central computer—are an experimental method of information exchange. They have been tried on a limited scale for the exchange of information about occupational safety and health and on a larger scale within companies to exchange technical information. It is unclear what their eventual value will be, but they have been praised by some occupational safety and health professionals who have used them.

NIOSH Use of Computer Networks

One of the duties of the Technical Information Division of NIOSH is to draft responses to OSHA-proposed rules. NIOSH used computer conferences to respond to two 1982 Advance Notices of Proposed Rulemaking from OSHA. One notice concerned “Hazard Communication” (the “labeling standard”), which details what information is to be provided to workers about the chemicals to which they are exposed. The other dealt

with OSHA’s regulation concerning Access to Employee Medical Records, which stipulates what medical records are to be retained by employers, for how long, and who has access to them. In both cases, NIOSH arranged a conference that involved about 10 NIOSH employees in scattered locations; there was little overlap in the membership of the two groups.

NIOSH participants consider the exchanges to have been a success. The computer-time cost for the hazard communication exchange was \$2,500, about two-thirds as much as a 2-day meeting at NIOSH in Cincinnati, which would be an alternative method of gathering needed responses.

A NIOSH-MIT exchange was organized differently. The Reader’s Digest computer data base, the Source, has software called PARTICIPATE that permits its users to join in conferences. Three professionals with expertise in computers and video display terminals posted a message on the Source inviting comments and discussion. Over a dozen participants joined in; the discussions followed two paths—one concerning possible health effects from radiation and ergonomic considerations, the other stress and quality of work.

Priest (377) sees the NIOSH-MIT exchange as a limited success. It attracted participants, but because it did not have a goal, such as producing a document or answering a question, the exchange strayed, just as undirected conversations do.

Privacy and Trade Secret Concerns

In the late 1970s, a large United States-based pharmaceutical firm with over 60,000 employees worldwide developed its own system of computer exchanges and over 4,000 employees use it. The firm's Vice President for Research and Development considers it a "crucial and integral part" of the firm's development and management operations (377).

The system is used extensively by employees concerned about product safety. Although the firm's representatives stated that they used the system considerably for health and safety purposes, they would not disclose any details about the content or process (377). Concern about disclosing business secrets was partially responsible for the company's not discussing computer exchange of safety and health information. In addition, a company representative stated that sharing its health and safety information with other companies might make the company subject to antitrust actions. Only trade associations and public meetings were seen as acceptable for sharing information (377).

The firm in this situation has made an implicit tradeoff—between, on the one hand, deaths and injuries that might be reduced by disclosing in-

formation about their methods and, on the other hand, their proprietary business interests and desire for privacy. There is also the possibility that the firm was concerned about disclosing information about product safety discussions that might be "discoverable" in a legal proceeding (377).

The Future of Computer Exchanges

Computer exchanges are attractive because they provide fast and interactive communication. The information is "written down" and can be retrieved. However, a company inhibited by desires to protect its privacy will be reluctant to allow employees to participate in a medium as rapid, fluid, and uncontrollable as computer exchange.

The future of government-sponsored and business computer exchanges among occupational safety and health professionals is likely to increase as cost savings become more apparent, as hardware becomes more widely available, and as more people experience and grow accustomed to this communication medium. Information exchange in this manner can enhance face-to-face meetings. There appear to be few advantages of computer conferences that are peculiar to occupational safety and health.

SUMMARY

Traditionally, education and training programs have focused on workers and safety and health professionals. However, with recognition of the importance of designers, engineers, and managers in health and safety, some attention is now given to providing them with the principles of prevention and control.

Both OSHA and NIOSH are involved in education and training programs. OSHA has supported worker training and education; NIOSH grants are used primarily for education of occupational health and safety professionals. Both participate in Project Minerva, with the objective of introducing health and safety into business administration curricula. NIOSH has also sponsored workshops directed towards adding health and

safety topics into the curricula of engineering schools.

OTA sponsored a survey of worker training programs. Not unexpectedly, the survey found that company programs, which are the majority of programs, emphasize fundamentals of safe working habits and recognition of hazards. Union, university-based, and Committee for Occupational Safety and Health programs prepare workers for a more active role in recognition and control. The company programs are the norm; the other programs, which would involve transfer of some power from management to labor, are more controversial and they do not represent the only way to go beyond the traditional programs. For instance, General Motors and the United Auto

Workers cooperate in the training of union safety stewards in General Motors' training programs.

NIOSH's 15 Educational Resource Centers, located across the Nation, represent a departure from disciplinary training for health and safety professionals. They emphasize interdisciplinary training of industrial physicians and nurses, industrial hygienists, and safety engineers. Unfortunately no solid evaluation of the programs has been carried out, but the ERCs are well regarded by most professionals.

The stability, if not the very existence, of ERCs is threatened by uncertain Federal funding. For each of the last four years, the President's budget has recommended no Federal funding. In each year, Congress restored funding. Nevertheless, the threat to the ERCs has seen parallel decreases in the number of graduate degrees awarded.

One of the surest ways to disseminate new information is to graduate new professionals and send them into the work force. As enrollment in graduate programs has declined, ERCs have increased attention to continuing education for practicing health and safety specialists. The flexibility of ERCs in providing both degree and continuing education programs is an argument for their continuation.

Evaluation of Federal education and training programs has consisted largely of counting numbers of graduates and hours of instruction. While those measures provide an indication of how much education is going on, they provide no details of the impact of the education. Careful evaluation would aid in making funding decisions.