DOCUMENT RESUME

ED 131 216 CE 008 172

TITLE Teaching Safety and Health in the Workplace. An Instructor's Guide.
INSTITUTION Occupational Safety and Health Administration, Washington, D.C.
REPORT NO OSHA-2255
PUB DATE 76
NOTE 38p.

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS Employees; *Health Education; Inservice Education; *Labor Education; Learning; On the Job Training; Safety; *Safety Education; Small Group Instruction; Teaching Guides; *Teaching Methods; Teaching Techniques; Training Techniques

ABSTRACT

The primary concern of the Occupational Safety and Health Act (OSHA) is to provide a safe and healthful workplace for every working man and woman in the nation. One way to help reduce the number of injuries and illnesses in the workplace is by training workers to be more aware of the job safety and health hazards and to teach them the methods of reducing and/or eliminating those hazards. To assist employers in carrying out this function, OSHA has developed several training programs that may be presented at the worksite. OSHA has prepared this guide to aid those non-professional instructors who may be charged with the responsibility of training employees. This booklet offers information on the nature of the occupational safety and health problems, on what is presently known and accepted about the technology of causing learning to take place, and on methods recommended to prepare for a teaching session, as well as on tools and methods for conducting the teaching. Detailed instructions showing how to put the principles to work and get the results expected of the professional teacher are given. (HD)

Teaching Safety and Health in the Workplace

An Instructor's Guide

U.S. Department of Labor
W. J. Usery, Jr., Secretary
Occupational Safety and Health Administration

OSHA 2255

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introduction

BACKGROUND

The prrimary concern of the Occupational Safety and Health Act is to provide a safe and healthful workplace for every working man and woman in the nation. One way to help reduce the number of injuries and illnesses in the workplace is by training workers to be more aware of job safety and health hazards and to teach them the methods of reducing and/or eliminating those hazards.

To assist employers in carrying out this function. OSHA (Occupational Safety and Health Administration) has developed several training programs that may be presented at the worksite. While it is certainly ideal to train workers under the best of conditions, and as thoroughly as possible, it is often difficult. Then, too, there may be the absence of professional instructors to present the particular course or program to groups of employees.

Since OSHA has always realized the value of the "training the trainer" principle, in which you reach a multiplying number of trained employees, OSHA has prepared this guide to aid those nonprofessional instructors who may be charged with the responsibility of training employees. This guide, hopefully, will provide some of the tools which such instructors may use.

In training a group of workers, you must know in advance what their occupational specialties are, and you should direct your training to those areas. There are at least two reasons why this is necessary:

Motivation: Motivation—interest in the subject and desire to learn about it—has a powerful influence on learning. Without motivation on the part of the learner, very little learning can take place. You may assume that your learners are interested only in their own jobs and in their own safety and health, and will be bored by subjects that do not appear to relate to their jobs and interests.

Time: There is never enough time for training. Whatever time you have should be utilized to the fullest extent by concentrating entirely on those matters which are of direct interest.

In this booklet, you will be offered information on the nature of the occupational safety and health problem, on what is presently known and accepted about the technology of causing learning to take place, and on methods recommended to prepare for a teaching session, as well as on tools and methods for conducting the teaching.

Finally, you will be given very detailed instructions, showing how to put the principles to work and get the results expected of the professional teacher.

THE LEARNING SITUATION

The term "learning situation" has to do with conditions and constraints under which training must be administered. Ideally, one would like to be able to conduct all training during a full day and in a modern classroom, equipped with all the latest training aids, such as closed-circuit television, slide projectors, audio recorders, motion pictures, and other such aids. However, this ideal is not often achieved, and the learning situation usually is something less than the ideal.

When training workers, it is rare that an instructor can even approach the ideal learning situation. It is more likely that you will not be able to "capture" your audience for more than 1 or 2 hours at a time. You may even find yourself forced to talk above the roar of some piece of heavy equipment or machinery.

In the case of some courses, it is possible that you will not be able to utilize the slides, and will have to rely upon pure narrative, group discussions, and such "live" for-instances as you can find on the scene. Suggestions, in this regard, will be made in this guide.

THE NATURE OF LEARNING

As you will learn, modern educational technologists—many of whom are drawn from the field of behavioral psychology—use the concept of *behavior* as a reference for designing, administering, and measuring learning. That word "behavior" has a special meaning (not "deportment") when used in this context, and further details will be supplied later in this guide.

For the moment, it is sufficient to establish a most general—and practical—definition of learning. For this purpose, learning may be defined as the ability to use and/or apply information. That is, reciting some information to which a learner has been exposed demonstrates memory, but it does not necessarily demonstrate learning. Learning, if it is to be of any use, must be regarded as the ability to use information. For example, a learner may repeat information that a foam-type fire extinguisher is required for an oil fire; but, if that learner then proceeds to buy another type of fire extinguisher for use where oil fires are likely, he or she has demonstrated a decided lack of learning. (His or her "behavior" is wrong, and that tells you that the learner has not learned what you wanted to be learned).

This must always be a consideration in imparting knowledge to others: It must be imparted in such a manner that the recipient will know how to use the information. That is the principle reason for exercises and examples.

In short, to teach, you must first decide exactly what you want to teach—what you want the learner to do or to stop doing. Then you must decide how to present the information to get it across effectively. And then you must decide how you will test to make sure you have succeeded in getting the learner to start or to stop doing certain things.

Later in this booklet, you will be given some specific instructions for doing these things.

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occupational safety and health

A few years ago, occupational safety and health was considered a relatively simple matter. The dangers of fire, falling, being cut or crushed, and other hazards were rather obvious. It was equally clear that flammables and explosives required special care in handling and storage, as did acids and caustic substances. And, in modern times, it has become common knowledge that disease results from unsanitary conditions, such as common drinking vessels and open privies.

Modern technology has changed much of that. The dangers in workplaces have increased dramatically with less obvious hazards, such as radiation, carcinogens, noise, and respiratory ailments resulting from ducts. There has been both an increase in numbers and types of hazards and in medical knowledge which creates awareness of hazards, the existence of which was formerly not even suspect.

"Common sense" is not enough. Safety and health specialists must be especially trained today; they must know their business. Workers must be trained; they must be made aware of the hazards and of the proper safeguards. They must be made keenly aware—highly conscious—of how easy it is to be injured or made ill as a result of failing to learn and apply recommended practices. What you don't know *can* hurt you.

The Occupational Safety and Health Act, then, and the standards it invokes are far more than legal statements or statements of legal obligations; actually, they constitute virtual definitions of safety and health, and of safe and healthful workplaces.

There are three methods for attacking safety and health hazards in the workplace:

- Anticipation and prevention of a hazard before it comes into existence
- Removal of an existing hazard, after identification as a hazard
- Nullification or avoidance of a hazard through physical safeguards, procedural safeguards, and/or education and training

The above methods of attack are in priority order—i.e., hazards should be anticipated during planning of operations or installations and prevented from coming into existence; but if they are not, they should be removed as soon as they are recognized as hazards. Only if they cannot be permanently removed, should they be dealt with by nullification or avoidance.

Compliance with the standards represents the best known, accepted means for preventing or coping successfully with occupational safety and health hazards. But this does not mean that strict compliance with all applicable standards will automatically result in a safe and healthful workplace. No set of standards can anticipate all possible conditions and situations, and it is entirely possible—even probable—that many hazards exist or will come to exist for which there either is no suitable standard or the standards, as written, are not adequate remedies. This means, simply, that human judgment must be employed in selecting and applying standards to hazard analysis and hazard abatement.

The instructor in occupational safety and health must appreciate this, for questions which have no "pat" answers will inevitably arise in classes. The instructor must stress to the learners that they must use good judgment, but that "good judgment" depends heavily on first being familiar with occupational safety and health hazards and controls, at least insofar as they apply to the situation at hand.

Stress to your learners that occupational safety and health is no trivial matter. The stakes are high—one's life and health!

teaching versus learning

It can be and has been argued that there is no such thing as teaching anything to anyone. The rationale is that a teacher can only help a student to learn, and that is the teacher's function.

This is more than a philosophical argument; it expresses the entire modern concept of learning theory. It embodies the idea that you do not teach things to students, but you create conditions under which they can learn, and your effectiveness as a teacher is measured by the skill with which you create proper learning conditions.

In any case, whether the concept is a literal truth or not is unimportant. What is important is that it is recognized that learning, not teaching, is the objective of your work; that only the student's success in learning is a measure of your success as a teacher; and that the burden of responsibility for the student's learning is on the teacher, rather than on the student. Your entire effort must be based on the assumption that if proper conditions for learning are created, learning will take place.

PRESENTATIONS

Many ideas and suggestions will be offered here for making presentations to learners, using methods and techniques that have worked well for many others. The learning situation may not always lend itself to using these methods, since it is probable that you will have to "make do" with temporary expedients and other makeshifts. However, regard the following as basic information of value and as methods to use whenever possible.

As already pointed out, learning is conceived today as behavior. "Behavior" is a special term used by behaviorists and training technologists. Its use enables two-way communication in the training arts and sciences, with far more precision and meaning than was previously possible. The term helps to define learning, for the first time in history. It therefore gives the basis for scientific design, use, and evaluation of learning activities.

In this section, you will be given some general orientation in the terms and concepts of modern training methodology. The purpose of this is to provide greater insight into the reasons for the various training methods suggested here, and to provide the basis for your own innovations and techniques in bringing about learning.

One thing you may note is that this Instructor's Guide generally speaks of learning and "bringing learning about," rather than "teaching." In the most literal sense, you do not teach others, as much as you guide and direct their learning, and introduce whatever measures you have available to facilitate the learning. It is the learner to which all is oriented.

What is Learning?

Until recently—about 15 years ago—the science or art of teaching had been essentially unchanged for some 200 years. The primary vehicle was classroom lecture, with demonstrations, exercises, homework, rewards, and punishment, as aids to learning.

Today, modern training and educational systems are predicated on behavioristic concepts. The word "understanding" and the word "knowledge" have come to be recognized as imprecise terms —they tell us nothing. If, for example, one says that the student shall gain an "understanding" or "knowledge" of fire-prevention methods, very little has been said: for each individual must self-interpret what an "understanding" comprehends.

There is only one way to determine, with any accuracy, what another individual "understands" or "knows" about a subject: the individual's behavior. And that word "behavior" is used in a special sense of what the individual can do to demonstrate or exhibit that knowledge. To say that any individual "understands" the Pythagorean Theorem is merely a claim. The proof is having the individual recite, "The square of the hypotenuse equals the sum of the squares of the opposite two sides." This recitation is a behavior, the behavior that demonstrates the knowledge conclusively.

This concept has revolutionized education and training methods. Today, learning objectives are stated in terms of the desired behaviors—". . . student shall be able to solve four of the following simultaneous equations . . .." etc.

Briefly, a stated behavior must specify what the learner shall be able to do, as a result of the presentations; and the statement must express the behavior in such a manner that it is clearly observable, verifiable, and measurable.

It is for this reason that training programs are discussed in terms of terminal behaviors, and references are made to such terms as "changing behavior" or "shaping behavior." At the beginning of the course, the student exhibited a certain set of behaviors reflecting a lack of knowledge. The purpose of the course is to cause the student to exhibit new behaviors which reflect a gaining and mastery of the subjects taught. If the student can now solve the problems, or otherwise perform actions, he or she was not able to perform before taking the course, you have changed behavior, which is simply a scientific way of saying that you have caused the student to learn something.

It is the difference between saying that someone has gained a lot of weight and saying that 10 pounds was gained. "A lot of weight" is an opinion, and it may not be true. However, if the subject's weight is known before and after some time period, one can tell with certainty—scientifically—if there has been a weight change, because one has some precise, observable, and measurable index.

In stating learning objectives, then, they are stated in behavioral terms: "The student shall be able to state the following priority of actions to take in eliminating hazards." The correct priority would then be enumerated so that anyone could readily determine whether the desired learning had taken place.

The statement therefore contains the criterion item—that by which the learning is measured so that a determination can be made; not only whether learning has taken place, but how much learning has taken place—i.e., how well the learner has mastered the subject and exactly what and where the learning deficiencies are, if any. The criterion items furnish the basis for testing and evaluation—testing the learner and evaluating the course.

Gain Versus Achievement

There are two ways to evaluate a learner's progress: gain and achievement. The first method measures how much more the student knows, after completing a course, than was known when he or she started it—how much the student has gained in knowledge. The second method measures only a student's total knowledge, at the conclusion of the course, compared with the stated goals and objectives for the course—how much the student has achieved, in terms of course goals.

Each measure has its uses; however, time will not be spent on an extended discussion at this point. But one generally tends to measure results in terms of achievement, especially in industrial training; the teacher is usually interested primarily in how well the learner can do the things expected; whether that represents a great deal of gain or only a little gain is not of much interest.

Final tests, therefore, are calculated to measure achievement in most training situations.

Evaluation

The word "evaluation" is generally applied to the training course or program itself, and it is a derivative of achievement testing. Basically, it is a measure of percentage of students compared with average achievement scores. For example, one frequently used measure is "90/90," which means that 90 percent of the learners achieved 90 percent or better in final tests.

It is highly significant that in modern training and educational concepts, the responsibility for learning is placed on the instructor and/or the course materials or training system, rather than on the student. Modern educators hold that student failure to learn is a failure of the instructional system, that the student will learn, if the system is adequate.

This Guide will be discussing motivation and its importance. In this respect also, modern educational technology places the burden of responsibility on the system. The system must motivate the learner, and it is somehow defective if it fails to do so.

Hence, one tends to evaluate all modern training systems, under the premise that good instructors and good training programs cause the student to learn, and failure to learn is traceable to poor systems.

Now, look at some of the factors which affect the quality of instruction and instructional materials.

Methods of Presentation/Behavior Shaping

There are a number of commonly used methods for presenting information to shape or reshape learner's behaviors. The most common, and the most ancient, is the lecture.

A great deal of effort has been expended, in the past few years, to develop and perfect alternatives to the lecture. This is predicated on the assumption that the lecture is the least effective way of bringing about a change of behavior—i.e., causing learning to take place.

It has been said that students retain about 20 percent of what they hear, about 40 percent of what they see, and about 70 percent of what they both see and hear. There is no hard evidence for presenting information in multi-media systems, requiring the learner this, despite the fact that it has been widely cited as a reason to present information in multi-media systems, requiring the learn to apply several of his or her senses.

The fact is, of course, that few lecturers are interesting. lecture does not hold attention, hence, it is unlikely to com cate very much to the listener, much less to change the listene behavior.

It is not the nature of lecturing that is at fault; it is the nature of the lecturer. If, in some manner, a lecturer can be given the rare ability to be interesting, the lecture will "pay off" in learning results.

Demonstration is usually a must. This does not mean that some physical act must take place—e.g., the showing of a model or an enactment of some sort. "Demonstration" includes examples described or shown on a blackboard, analogies, or other illustrations of the information applied. This is a most important point. It is one thing for a learner to grasp a principle—i.e., be able to iterate your words—but quite another to be able to apply it. And only the clearly shown ability to apply information proves that true learning—or, at least, useful learning—has taken place. The following will help demonstrate this truth.

Suppose the students have been lectured on the importance of "grounding" all electrical equipment. You, the teacher, have explained what the term "ground" means, electrically, and why grounding protects the individual from possible electrical shock. The student has listened, taken notes, and given responses indicating that he or she has understood and remembered the words and can repeat them. Is this now proof that the student has complete and adequate understanding of grounding as anti-shock protection? Suppose you now exhibit a line drawing of a piece of equipment and say, "Now show me what portions of this equipment you would ground and just where you would make the connections."

The probability is that the student could not do this. Why? For two reasons (at least): (1) Electrical grounding is an abstraction to anyone not thoroughly familiar with and experienced in electrical/electronic work. and (2) you have probably not been as explicit in your teaching as you think you have been. One frequently falls into this trap of overestimating the student's ability to absorb new knowledge in all its details.

It is very much as though you had taught a law student the principles of the right of *habeas corpus*. Having now grasped the legal protection and technical terms explaining the right to be protected against unlawful incarceration without formal charges, is the law student ready and able to draw up the necessary documents and present them properly to a magistrate or judge to have a client released. Of course not; the student has learned a principle, but not the details of application.

It must be remembered, then, that much of what one teaches is theory or rationale, and is not useful without application knowledge: the details of how to do it.

Demonstration provides how-to-do-it information. But, even now, the teacher is not finished. The student now knows how to ground a piece of equipment (or, inversely, check a piece of equipment to verify that it is grounded), presumably, but he or she should get some experience doing it, even if only on paper.

For this, you use exercises, another ancient educational aid. You give the student practice, and this serves more than one purpose. It:

- Enables the student to make a self-assessment as to whether he or she has fully grasped the method and can perform it. If not, the student adjusts his or her performance until a satisfactory level of skill is reached.
- Enables the instructor to assess the learning effectiveness and detect the need for further instruction, if any.
- Provides student involvement or participation in the learning process, deemed an important need by modern educational technologists, especially in its contribution to motivation of the learner.

Perhaps most important, the exercise achieves the primary goal of the instruction: it imparts a specific functional skill which you want the learner to carry back to the job. A great deal of literature is available on the subject to explain the many advantages, but the true advantage is simply that it is a direct method for doing what you set out to do—provide useful, needed skills to carry out certain job functions.

There are, of course, many kinds of learner participation and involvement other than exercises—role playing, problem-solving, group discussion, scenario enactment, research projects, in-basket exercises, and others. As many of these should be used as possible to relieve the tedium of endless lecturing, if for no other reason, but also to generate and sustain participant interest. Active roles generate more interest than passive roles, in any case.

Finally, there is the matter of interaction of the instructor or learning system with the learner. In programmed instruction, whether the programmed instruction is a plain printed text or a sophisticated audio-visual machine program, the learner and the program interact. The program reacts to the learner's response by confirming the response as correct (reinforcement) or by providing a corrective action (remediation).

The principle is valid for all instruction, whether "programmed" or not. The instructor should always require responses of some kind (e.g., frequent questions asked of individuals or of volunteers) and then react to those responses immediately by affirming them as correct or providing corrective in[illegible]tion. Questions should be invited from the participants [illegible] relevant discussions should be encouraged. A clas[illegible] into two or three small teams and each team a[illegible]blem to solve together (group dynamics). Or, each tea[illegible] assigned the same problem, for competition in solving the problem.

Motivation

Motivation has been mentioned as a goal in designing and presenting a program of instruction. The immediate objective of motivation is to cause participants to attend classes, pay attention to the presentations and other activities, and to persevere in mastering and completing the course. There is, however, another reason not mentioned as often as it ought to be. Motivation is probably the most effective means for causing learning to take place. People learn extraordinarily well when they want to learn. That is why a student may be "A" caliber in music and "C" in science. That is why the high school dropout may become a successful businessman. That is why the failure in geometry may subtend angles with amazing skill—over a pool table. And the math failure may parlay horses and calculate odds more rapidly than an electronic calculator. People learn when they want to learn, and they learn what they want to learn. Every "successful" sales representative knows this.

The "successful" sales representative detects or creates a want, then fans it into a desire, and, finally, into a buying action. And the successful instructor must be a seller, "selling" knowledge and skills by aiding the learner to want the knowledge and skills.

Motivation is of two kinds, extrinsic and intrinsic. When the learner pursues the course of study successfully to gain a diploma, for example, the motivation is extrinsic: the learner's want is not directly related to the knowledge itself but to some result of completing the course. When the learner finds the course experience —the learning process itself—an adequate reward for the effort expended, the motivation is intrinsic, inherent in the material and presentation.

Little control can be exercised over extrinsic motivation. It is difficult to cause learning to occur in the reluctant student who is there because of force, and is determined to "get through" it with as little effort as possible. Moreover, it is just as well that there is little or no control over extrinsic motivation, because it is far less effective in causing learning to occur than is intrinsic motivation. You can do something to achieve intrinsic motivation, fortunately, and this is one of the chief hallmarks of quality in instruction, for it produces superior results in learning achievements.

It is a basic premise in learning technology that [illegible]sic motivation [illegible] the inevitable result of inv[illegible] the learning pr[illegible]s, through such methods [illegible] [illegible]en mentioned. However, it must not be assumed that this is entirely true, for educators all have witnessed the reluctant student performing exercises mechanically, forced to do so; yet gaining nothing in the way of knowledge. The involvement must be emotional, not mechanical, if it is to be effective. The learner must care about the work and its results; be interested in the process.

Communication

The best of educational design and materials can still fail, if communication does not take place. The instructor with a good platform personality tells amusing anecdotes to put the learners at ease and makes them receptive. This kind of instructor is likely to be highly effective, provided the instructor knows the subject well and communicates well.

Little learning is likely to take place if you teach that the earth is an oblate spheroid, because relatively few people know what either of those words ("oblate" and "spheroid") mean. But they would have no trouble with, "The earth is shaped somewhat like an orange, round but flattened slightly at each end." (Although information gathered by artificial satellites have revealed that the earth is actually shaped more like a pear). The point is that a learner—the receiver of information—must receive exactly what you, the instructor, transmit—or thinks you are transmitting. Otherwise, there is learning, but it is erroneous learning.

To communicate effectively, you must use a common language, of course. You may, for example, be a technical expert in some field—perhaps chemistry, electricity, explosives, etc.—and therefore use technical jargon from your field almost automatically, never realizing that your class does not follow this jargon.

The standards are replete with technical jargon. Even the simple term "grounding," which one is enjoined to do for all electrical equipment, is jargon. It means literally to make an electrical connection between certain portions of the equipment and the earth. However, the casual observer cannot perceive that such is the case. The casual observer perceives the equipment connected to some point which is identified as an electrical "ground." Much less does the casual observer understand the electrical significance of and the need for this connection. But there are synonyms for "ground," such as "earth return" or simply "return." Should you use any of these instead of "ground," without explanation, communication would most certainly become ineffective.

It was for this reason that "inflammable" and "nonflammable" became "flammable" and "nonflammable" a few years ago. The marking "inflammable" on a container was misinterpreted by too many people as meaning noncombustible. In short, you must take measures to be sure that the learners are receiving your messages, loudly and clearly.

There are several ways of ensuring this. The first and most obvious is to have an accurate understanding of the average language level of your learners. This is usually stated as their listening vocabulary (which is almost always different from reading and speaking vocabularies), at some grade level. A second way is to ask questions and give formal or informal quizzes. A third way is to have the learners recite, in some manner, and judge by their recitations whether they have grasped the material accurately.

This latter way is the most widely used and advocated by proponents of modern behavioral theory in training and education. The presentation of information and (eventually) the request to the learner is a stimulus. Learner recitation or action is the response. The instructor can then compare the actual response with the desired response to judge the accuracy of communication and/or the degree of learning that has taken place.

Feedback

Once you have heard or observed the learner's response to a stimulus, you either reinforce the learner by confirming the accuracy of the response or you provide remedial instruction to correct the learner's erroneous learning. This information to the learner about his or her learning (or lack of it) is called "feedback."

Feedback is an automation concept. It describes to the engineer a method for controlling a process, usually an automatic process. The output of a system is measured, compared with some standard or reference, and information is sent back to adjust the process, if the output is not what is desired.

For example, if pickles were being packed automatically, the reference standard for a full barrel might be its weight. Perhaps a full barrel of pickles should weigh 180 pounds. As each barrel of pickles is filled automatically, it stands on a scale. When the scale measures 180 pounds, the "full barrel" signal is sent back to the pickle source to stop the flow of pickles, and to the motor to start the belt moving again and move a new, empty barrel into position for filling.

The Feedback Concept in Training

Information to the learner regarding his or her response has been identified as feedback. There is, however, another kind of feedback in the training system: the response is itself a feedback to the instructor. It tells you how well the delivered information was understood. If it is correctly understood, it is your "A-Okay" signal. If it was not correctly understood, it flashes an error-signal to you to adjust the learning system.

Viewed in this manner, the instructor is perceived as the learning system and the learning that takes place—or fails to take place—is perceived as the output of the system. The correct answer to each stimulus (the answer the instructor wants to see or hear) is the reference standard.

In principle, an instructor—or learning system—goes through a specific, proceduralized set of steps:

1. Exposes the learner to (presents) information to be learned.
2. Supplies a stimulus to the learner, requiring the learner to respond and thereby demonstrate behavior which represents learning.
3. Reacts to the learner's response by:
   a. Recognizing the response as the correct behavior and reinforcing the learner by confirming the correctness of the response, or

b. Recognizing the response as incorrect and remediate the learner immediately by corrective teaching.

In practice, there are many ways to do this, some more effective than others, depending on the situation. Here are a few general guidelines:

- If the learner is simply to recall—memorize the information (e.g., a set of technical terms, the wording of a regulation, etc.)—the exposure should include drills and simple correction of incorrect responses until the learner has it "down pat."
- If the learner is to master a manipulative skill of some sort or a straightforward procedure, such as looking up a standard, very much the same set of tactics is appropriate.
- But, if the learner is to exercise judgment, analytical skill, or otherwise draw selectively from a large body of knowledge to which the learner has been exposed earlier, the problem is a bit more complex: the learner has to reason, drawing upon principles, methods, procedures, and a body of facts learned earlier. This is not rote learning; the learner must analyze and synthesize.

This is "getting it all together"—assembling a number of behaviors mastered earlier into a coherent skill. The learner must decide which of the earlier-mastered behaviors are relevant to the problem and how they shall be assembled and performed.

Experience indicates rather clearly that although a learner may master each behavior of a long chain of behaviors, "getting it all together" for the first time is a decidedly different proposition. Hardly anyone will get it right on the first try.

The method that appears to work best in this situation is a work sample—critique procedure. The learner is assigned a relevant piece of work to do—an exercise, for example. The instructor then examines the piece of work and critiques it, pointing out where the learner went wrong or, at least, in what areas or manner the work could have been done more expertly. Then—and this is most important—the instructor corrects or improves the work sample to demonstrate the specific application of the critique.

Done in exactly this manner, this method works extremely well. Learners master new skills rapidly, because incorrect behaviors are not permitted to become fixed and the learner gets highly specific application instruction. The learner can perceive exactly where, how, and why the work went wrong or how the theory was applied imperfectly.

The method is somewhat time-consuming, because each work sample must be individually studied, critiqued, and corrected. If the class is a large one, it may be an impractical method, for this reason. There simply may not be time to critique each learner's sample. In such case, a variation is possible: prototype critiquing.

In prototype critiquing, the instructor reviews the work samples and identifies the common errors. The instructor conducts critiques and corrections of several before the entire class, covering the majority of problems and allowing questions. This is not quite as effective as individual critiquing, but it does work.

Peer critiquing is also possible, wherein the learners offer critiques of each other's samples. This can be somewhat dangerous, however, unless it is carefully controlled by the instructor. Probably the best way to do this is to first ascertain which of the learners have produced the best work samples, in the particular case, and use them as aids to critique others. CAUTION: The learner who produces an excellent work sample in one exercise may produce a poor sample in another exercise. Therefore, selection of aids must be done afresh for each case.

Other variants are possible: A learner may be called upon to conduct a critique of a typical work sample before the class. This will not save time, but it has the advantage of getting the learners involved closely in the learning process.

In all cases, make every attempt to involve the learners in the process. It is important, however, that the learners not be embarrassed or humiliated in these exercises and involvements. Do not compel the obviously introverted person to lecture from the rostrum. Do not identify the author of a work sample being critiqued publicly. Do not allow the learners to feel threatened by the learning situation in any manner. High-threat learning situations inhibit the participants, and inhibition—especially fear—inhibits learning.

Competition is motivating, and many kinds of competition are possible. Individuals may compete for distinction, groups may be formed for group work and competition with each other, and individuals may compete with themselves—i.e., to better their earlier efforts.

Group competition is especially effective in a classroom situation, since it is usually a low-threat condition, whereas individual competition (with each other) represents a high-threat condition to many individuals. The class may be formed into several small groups—three or four in each group—and work collectively on exercises, problems, or projects.

It is important to a learner that he or she experience a sense of achievement. Achievement to one may give no satisfaction at all to another. It depends on the individual's level of aspiration. In general, for an individual to get a sense of achievement—and satisfaction—from an act, that act must be of a recognized difficulty —not too easy. On the other hand, it must not be too difficult to do, for the other side of the coin is frustration and that does not enhance learning either.

Exercises, problems, and projects must therefore be designed with these facts in mind. They must be realistic, in terms of the course coverage, represent a reasonable degree of difficulty for the given target population, yet be possible of solution by that population.

Examination questions and answers should never be "trick" questions, turning on a semantic nuance or on a minor technicality. They must be relevant to the material and to the type and lev[illegible] expected of the learner, once back on the job. They should cover essence—principles—not fine technical points which the learner would ordinarily look up, on the job, rather than attempt to commit to memory.

This is an important point. You must distinguish between what the learner should carry away stored in memory and what he or she need not remember because it is more properly looked up, when needed. One should not attempt to remember all the provisions [illegible] the National Electrical Code, for example, but only the major provisions and principles of electrical safety. Nothing is demonstrated by requiring a learner to memorize the wire size required for a given type of equipment; rather, the learner should remember that a given wire size is required for each application, and that the correct size may be found in some source document or by some prescribed method. A most important part of such a course is learning what standards and other reference documents must be kept at hand and how (and when) to use them.

Augmentation Coverage

The point was made earlier that no set of regulations, or standards, can foresee and provide for every industrial situation and set of conditions. Even if they could, a new set of conditions would arise regularly. Therefore, the regulations, laws, and standards address the typical situations and provide a sound basis for meeting all situations. Employers must analyze and address the standard in terms of their own situations.

To do this effectively, employers must understand both the letter and the principles of the standard. They must understand the hazard. For example, it is generally known that electrical equipment must be grounded, but how many people know what that word "grounded" really means, and why grounding is important. The following pages of text are intended to help you alleviate that problem by providing augmentation to the lesson plans—principles of electrical safety by explaining what "grounding" means and why it is important, and some similar coverage of fire and explosion hazards and health hazards. A fe[illegible] ciples are explained, in each case, as a general gu[illegible] may be supplemented by a little additional research [illegible] ture, some of which are cited for your reference a[illegible] ommended to the learners as supplementary reading.

GROUNDING AND ELECTRICAL SAFETY

The principle considerations in electrical safety are grounding, insulation, and circuit protective devices. To understand these fully, the learner should grasp the basic principles of electrical current flow and the meaning of the word "circuit."

A "circuit is a complete loop. Electric current can flow only if it returns to its source, in a complete loop—a "circuit." Anything which breaks that loop stops the flow of current: hence the name "circuit breaker" for safety devices is intended to stop the current flow when conditions make that current flow dangerous.

The path through which the current returns to its source is called the "return" or ground. The reason for the term "ground" is that the earth is used—literally—to provide the return path. If the return side of the circuit at the equipment is connected to damp earth—a metal rod pressed into the earth to a point where the earth is always damp and therefore conducts electricity (a depth of about 5 feet)—and another, similar connection is made at the power source, a complete circuit is formed. No matter how many miles separate the equipment from its power source, the electrical connection is made. In practice, ground connections are made to water pipes or other metal objects which will provide reliable contact with damp earth, since they are buried in the earth at some point.

Now, what has this to do with safety? Just this: our bodies are normally at or near what we call "ground potential." That is, there is no "potential" or difference in electrical values between our bodies and ground. Therefore, we may safely touch anything else which is at ground potential.

As a result of this, any part of electrical equipment which we might touch must be placed at ground potential—connected to ground—to be safe. If it cannot be placed at ground potential, we must be protected from it by insulating it with rubber, glass, porcelain, or some other material which will not conduct electricity.

Consider, for example, the metal housing around a motor or the metal box in which electrical switches, circuit breakers, and controls are placed. These are not part of the circuits, but they exist to protect the equipment from dirt, moisture, and the like, as well as to prevent contact with exposed wiring and connectors. They are not connected anywhere in the circuits of the equipment they house, but are insulated from that equipment. There are hazards, however, (1) a malfunction within the equipment—frayed insulation perhaps—may cause a "hot" wire to touch the housing, thereby making the housing dangerous to touch by placing the housing at high potential; and (2) static electrical charges can be built up in metal housings, especially in the case of motors and other electromagnetic devices. These charges may or may not be dangerous of themselves, but even a small shock to a person causes the person to jerk involuntarily, which may lead to a true accident. Moreover, static charges can cause electrical sparks, and sparks can cause fires.

To prevent these things from happening, metal housings are connected to ground. If static charges are present, they run off and never build up in the housing. And if the housing is connected by a high-potential connection or wire, a short-circuit results, which trips the circuit breaker or blows the fuse. This stops all current flow.

The practice is, therefore, to place all such housings and containers at ground by connecting the housing to an "external ground," such as a water pipe, or a third wire which is connected to ground.

Most electrical equipment today—e.g., power tools and appliances have three wires and plugs with either three prongs or two prongs and a pigtail. In either case, the third wire is connected to the housing and other exposed metal parts, and the third prong or pigtail connects the third wire to ground—specifically, the receptacle housing, which is connected to ground.

There are many other metal devices which require grounding: conduits (pipes) carrying electrical wiring, the metal outside skin on "BX" conductors, the cover plates on electrical receptacles, to name a few. In all cases, the principle is the same—to protect people from possible electrical shock and/or sparks which may cause fire and explosion by keeping exposed metals at ground potentials.

FIRE AND EXPLOSION HAZARDS

Like electrical hazards, fire and explosion hazards are obvious to some extent, but not entirely so; many of us do not know, for example, that flour suspended in the air is an explosion hazard.

Fire is always a danger. Even a "fireproof" building can have a disastrous fire. By "fireproof," we generally mean that the main structures of the building—walls, foundations, joists, floors, and roof—are made of stone, brick, concrete, metal and other non-combustible materials. This does not mean that a fire is impossible in such a building. Buildings are full of combustibles—wood in trim and panels, rugs, draperies, desks, and other wood and fabric furnishings. And many industrial buildings have abundant quantities of oil, greases, and volatile solvents on the premises. In a fire, the shell of a "fireproof" building may survive, but the fire would nevertheless be a disaster.

It is not possible to divide all materials into two mutually exclusive categories of "combustible" and "noncombustible." Many materials fall into the in-between regions of not-easily-combustible or combustible-under-certain circumstances. The flour just mentioned might not ordinarily be thought of as combustible, but it can be ignited, especially when it is a fine powder suspended in the air. The metal magnesium will burn with an extraordinarily hot flame, when ignited, although we generally tend to think of metals as noncombustible.

There are, therefore, degrees of fire hazard. There are the easily combustible materials, which may be ignited by a tiny spark and may even be explosive, when mixed with air. And there are materials not easily combustible and perfectly safe under most conditions, yet extremely hazardous when finally ignited. In fact, these are extremely hazardous, when ignited, because usually they are ignited only by very high temperatures and they then burn at very high temperatures.

Some of the most hazardous materials, in terms of being easily ignited (and sometimes easily forming explosive mixtures with air), are flammable gases, such as hydrogen and propane; volatile solvents, such as naptha, kerosene, and gasoline; and granular or shaved solids, such as excelsior, straw, sawdust, and shredded paper.

Pure oxygen is a hazard of a special kind. Combustion or burning is, of course, a combination of a combustible material with the oxygen in the air. In our normal atmosphere, about one-fifth of the volume is oxygen. Any material which burns in the atmosphere burns much more readily and with much greater speed in pure oxygen. Therefore, special fire precautions must be observed when pure oxygen is present. Sparks and flames must be scrupulously avoided. A lit cigarette would flare up into open flame in pure oxygen, for example; hence, the special precautions when handling oxygen.

To extinguish fire, we must deny it oxygen and/or reduce the temperature of the burning material to a point below its combustion point or flash point. Most fire extinguishers aim primarily at smothering fire—denying it oxygen, and water is commonly used for this. However, water is not always suitable to do the job.

Some materials which burn—gasoline and oils—are lighter than water. Water has no effect on them, because they simply float to the surface of the water and continue to burn. Many fire extinguishers therefore have other means for smothering fire. This is why we have extinguishers which use carbon dioxide, a heavy, noncombustible gas, and foam, a heavy semisolid.

NOISE AND AURAL HAZARDS

We know that high noise levels can do permanent damage to one's hearing, and we have standards providing specific protection against high noise levels. Here again, however, the specific danger is not always apparent.

The human ear does not hear all sounds equally well. Sound is vibration, and the human ear can detect vibrations ranging in frequency from approximately 15,000 cycles per second. The low frequencies or low pitches are such things as rumbling sounds—drums, bass instruments, and the like. The high frequencies or high pitches are the shriller sounds—whistles, violins, flutes, etc.

Human hearing falls off pretty sharply as 15,000 cycles per second is approached, and many of us hear sounds of those pitches poorly or not at all. (Women tend to hear the high-pitched sound somewhat better than do men). This would lead us to believe that the potentially harmful noise levels are all sound within this range of 20 to 15,000 cycles per second. This is not necessarily true, however, as there is some accepted evidence that our inner ears may be damaged and our hearing permanently impaired by "noise" above this level, noise which we cannot consciously hear.

The hearing impairment resulting from prolonged exposure to high noise levels is permanent. The standards recognize the hazards and provide for several types of protection. As a general rule, it pays to play safe; one may be injured by sounds he or she cannot hear.

HEALTH HAZARDS

Occupational health hazards are in some ways the most dangerous of all hazards simply because they are concealed. We all know, probably, that acids burn, that cyanide is toxic, that lye is much like acid in its effect on the skin, that carbon monoxide is a deadly inhalation, etc. These are classic dangers, and they are "obvious" to the extent that their danger is well known to most of us. But other dangers are not readily apparent, and their deadly effects are not immediate; they are therefore especially hazardous.

Inhalation of carbon tetrachloride fumes is such a case. Only a few years ago, we became aware that inhalation of carbon tetrachloride leaves a residue of poison in our systems. The body does not rid itself of carbon tetrachloride, and the effect builds up over many years, although there is no apparent ill effect immediately.

Lead was another such case. Painters and paint workers were poisoned slowly by lead for many years before modern science discovered lead's accumulative poisoning effect. Recently, it was discovered that vinyl chloride is a dangerous agent, connected with cancer.

It is important to be aware, then, that not all poisons and other health hazards make their effects known immediately. Even radiation is relatively slow working, and its full effects on the human body are not yet completely known.

We tend to think of radiation in connection with nuclear devices and X-rays. There are, however, many sources of dangerous radiation, including high-powered radio and television equipment. All of these devices—and others, such as "radar ranges"—can produce electromagnetic emanations: alpha, beta, and gamma rays, neutrons, and other such "particles," all of them potential hazards to health and life.

Our knowledge of all these chemical agents and radiations is not complete. We are learning new things almost daily. The standards will have to undergo steady change, modification, revision, and expansion for years to come (at least), to keep pace with the new knowledge we uncover, probably to a far greater extent than will the standards covering the more classic and obvious hazards. This fact should point out a need to be constantly aware of new or revised standards. Only constant vigilance can keep you "on top" of the situation. What is today a safe practice or material may be recognized tomorrow as a serious hazard.

HANDOUTS

Alert instructors can add much to the course by developing their own handouts. Magazines and newspapers are a ready source for many of these. The stories and articles cover news of accidents, new medical discoveries, new safety laws, and other related subjects. These handouts can be used in several ways to:

- Illustrate points made in lessons;
- Furnish the basis for discussions;

- Furnish the basis for exercises and problems:
- Illustrate the effects of compliance or noncompliance; and/or to
- Furnish a basis for review examinations

The instructor should be the catalyst in discussion groups used with these handouts, but not the discussion leader. The instructor may ask provocative questions, such as, "What standards are being violated in this case?" Or, "How would you go about investigating this accident?" Or, "Could this have happened at your worksite?"

Many handouts may be developed from publications readily available from the U.S. Government Printing Office, the National Fire Protection Association, the National Safety Council, and other such sources. There is an abundance of readily available literature on a variety of safety subjects.

Other handouts may be color representations of safety markings, signs, and other such visual information required by law. These are especially useful as the basis for drills and exercises.

Another interesting and useful set of handouts may be made up of (relatively) "ancient" safety laws and regulations. These will illustrate the point made earlier that safety is a dynamic subject, changing as technology, industrial methods, and human knowledge grow and evolve. The public libraries and safety associations should serve as good informational centers when researching these kinds of materials.

making the presentation

TAILORING THE COVERAGE

An effort has been made to demonstrate that each presentation must be tailored to the class—i.e., the topics must be of interest and relevant to the individuals.

Some topics are, of course, general, and everyone should know what the Act is, what the standards are, the distinctions between safety and health hazards, and other such general information. But from that point on, the topics should have been carefully selected in advance to fit the class.

However, even in terms of topics, the manner and orientation of the presentation must vary from class to class. There may be little point in lecturing a class on egress in case of fire, when the class consists of outdoor pipeline workers or bridge builders.

In the section, "Teaching Versus Learning," you were given coverage on some rules and principles of learning technology. In this section, you will be given some specific application notes—how to apply the principles to the specific case.

THE BASIC LECTURE

Lecturing is probably the oldest method known to man for aiding another to learn. At the same time, it is far from being the only way, or even the best way. It has many shortcomings, as well as many advantages. The most serious shortcoming is that many instructors are not good lecturers—i.e., it isn't the lecture idea which is not good, but the lack of lecturing skill.

Lecturing is a natural talent, with some people. But the success of a lecture presentation is not all natural talent. There are many techniques which can be learned, and which will improve the individual's ability to lecture well.

Some general observations about lecturing are offered in the next few paragraphs, suggesting ways to make the lecture more effective. And, at the end of this section, some highly specific instructions are offered to aid you in putting on a good instruction session. Study these carefully and follow them faithfully, according to your needs.

Lecturing does not have to be dull, even with subjects which are, by their nature, not especially interesting. Lectures can be made more interesting by several techniques:

Socratic Method

It was the practice of Socrates to ask questions, rather than to make statements, when teaching, The method is used today to good effect, especially by good sales representatives. The questions are not chosen at random, however, but are carefully designed and sequenced to lead the student to a conclusion—i.e., "sell" him or herself! For example: What are the hazards in a coal mine? Are there respiratory hazards? Should respiratory equipment be used? What kind of respiratory equipment? This method of teaching stimulates the learner to think and enables him or her to participate—become involved—in the learning process. It provides the learner with an active role, and relieves the tedium of listening passively.

Demonstration

A course may provide some demonstration of equipment relevant to the safety subjects. The Socratic method may be combined with these demonstrations to provide exercises in identifying such things as points to be guarded in mechanical equipment, location of safety devices, recognition, of poor insulation, and other practical applications of the lesson content. As an excellent variant on this, one learner may be asked questions while another is asked to judge the accuracy of the response. Learners may be questioned in turn, in a progressive series of questions: one identifies the potential hazard; the second judges the response; the third names the remedy; the fourth judges that response; the fifth identifies the applicable standard; etc.

Role Playing

Another widely established technique is having the learners assume and play roles. A learner may assume the role of supervisor, for example, and interact with another learner who is playing safety inspector. Or the instructor may play the safety inspector, if the learners are not prepared yet to handle the role. Many other roles are possible: superintendent versus supervisor; supervisor versus worker; safety director versus supervisor, to [illegible] a few [illegible]lities. These [illegible] not be use[illegible] view [illegible] exercise. If the instructor plays the leading role, [illegible] she [illegible] deliver the basic in[illegible]on [illegible] this role, with far [illegible] effec[illegible] would be pos[illegible] straight narrative lecture.

Visual Aids

There are many types of vis[illegible] available that will assist the trainer in his or her presentation.

SLIDE AND FILMSTRIP PROJECTORS

Slide and filmstrip projectors pr[illegible]t transparent pictures onto a screen. Both are effective communication aids which project large life-like images. Charts, diagrams, and pictures can be made into slides, or you can take actual on-the-scene photographs, which can add realism to your presentation.

CHALKBOARD

The chalkboard is a simple aid which is inexpensive, yet quite versatile. Because it permits spontaneity in presentation, it is often used to develop a topic with the group, to list problems, and record progress. It can be used for anything in which you want the participants to take part.

CHART PAD OR FLIP-CHART

The chart pad may be used in much the same manner as the chalkboard. However, the pages may be flipped over which makes it possible to turn back pages for review. Pages of the chart pad can be prepared in advance, which is an advantage. Pages from a chart pad can also be torn off and clipped to holders or taped to walls around the room. This leaves the material on the pages in view of the trainees for their reference.

CHARTS

A chart is any poster or pre[illegible]are[illegible] gra[illegible] [illegible]ce. [illegible]an be made of almost anything—photograph[illegible] [illegible] drawings, graphs, work messages, or any comb[illegible]ation. [illegible] Charts are permanent and portable.

FLANNEL BOARD

The flannel board is simply a piec[illegible] [illegible] [illegible]ned over a board or metal or wooden frame. W[illegible] [illegible] [illegible]ps, or pictures are backed with flannel or fuzzy [illegible] [illegible] [illegible]dvantage is that it permits a step-by-step presentatio[illegible] [illegible] [illegible] shifted or changed easily, thus enabling action or [illegible] [illegible] [illegible] between ideas to be shown.

HOOK 'N' LOOP BOARD

The hook 'n' loop board is similar to [illegible] [illegible]rd, except that it has nylon fabric instead of flann[illegible] [illegible] applied to the visual aid to be presented, this tap[illegible] [illegible] of multidirectional small hooks of nylon plastic [illegible] [illegible]d grab the hook 'n' loop fabric, and releases easil[illegible] [illegible] [illegible]ual aid or product is removed. It is very durable [illegible] [illegible]used thousands of times.

OVERHEAD TRANSPARENCY PROJE[illegible]TO[illegible]

The overhead projector permits the proj[illegible] transparencies. These transparencies may be reprints ma[illegible] [illegible]cial transparent paper, or they may be made by writing [illegible]dr[illegible]ing with grease pencil or special felt markers on acetate. [illegible] [illegible]lass slides may also be projected.

MOTION PICTURE PROJECTOR

A movie projector projects motion picture[illegible] [illegible]and may be used with a sound track. Since it shows motio[illegible] [illegible] can be quite effective. It presents material in a few minutes [illegible] [illegible] take much longer to describe effectively in words.

MOCK-UPS, CUT-AWAY MODELS

Mock-ups and cut-away models are ve[illegible] use[illegible] [illegible] the actual equipment is not available or if you want [illegible] [illegible] the inner workings of a mechanism. These items usuall[illegible] permit you to give a working demonstration and can be examined after the presentation.

TELEVISION

Closed-circuit television (CCTV) and video tape recording (VTR) systems are among the most versatile tools available to training specialists. A vast array of equipment is accessible, ranging from a simple television set for receiving educational broadcasts on local public service channels to complete studio and mobile facilities for producing televised training presentations. The medium of television can achieve results unattainable through any other type of visual aid. These visual aids serve a number of purposes:

- They are more dramatic; therefore, more impressive illustrations than printed pages.
- They focus the learners' collective attention on the points being made.
- They serve (or can be made to serve) as focal points for the techniques just discussed.

Some Other Advantages of Lecture Alternatives

The advantage of minimizing lecture has been pointed out as relief of tedium and sustaining of interest. There are other advantages, however. The instructor, who uses alternatives in which he or she is a catalyst or control, rather than the focal point of the information, is able to devote at least some attention to the learners. Doing so makes it possible to judge more accurately how the points are getting across and where the need exists for amplification, remedial instruction, or other help. The instructor can perceive flagging interest, confusion, uncertainty, or other problems. Also, the instructor can compare the various techniques being used for instruction and judge which are proving to be the most effective, thereby improving the presentations.

Changes of Pace

Any technique, no matter how effective, will become tiresome if it is continued without variation. Conversely, even those methods considered to be of secondary effectiveness are valuable if used sparingly to vary the routine.

Therefore, a cardina rule ... holding a class for 8 hours ... daily is to vary the techniques frequently. After an hour of active participation, many learners welcome a passive role—listening to a lecture—for a period.

Critiquing

When properly done, learner performances is also a most effective technique. It is, of course, "remediation," which is covered in detail later. However, it is remediation specific to a learner response or performance rather than general remedial instruction or instruction. As such, it is part of the process of teaching skills through drills and exercises.

Course Planning Guides and Aids

To present any course effectively, you must have an understanding of the participants: who and what they are, why they are in the class (how they will use the information and skills they are about to gain), and how much they already know about the subject. Obviously, you should know this before the class is assembled, but it isn't always possible. Hence, you may have to gather most of this information in the first hour. This information will enable you to judge where to place the emphasis in your presentations and to know the materials of interest. You may find that some of the lessons should be modified or deleted.

If, for example, all the participants are electricians, there would be little purpose in attempting to present the basics of electricity, but you might concentrate on the OSHA standards for electrical safety. If none of the participants represented occupations handling flammable or explosive materials, you would hardly dwell on those hazards at any length. If all had a good knowledge of safety and health generally, you would not go into great detail on the rationale of the standards or on the basic hazards themselves.

PUTTING THE PRINCIPLES TO WORK

A number of teaching (or learning) principles have been presented. Leading among these are the principles of feedback and reinforcement or remediation, motivation, and application. Alough these now ... well-established as principles and widely accepted, putting them into practice is a matter somewhat different from understanding them as principles.

FEEDBACK, REINFORCEMENT, AND REMEDIATION

"Feedback" ... means knowledge of results. When you offer information to a learner ... exposing that learner to information, but you do not know whether he or she has learned anything from the exposure ... find out whether the information has caused anything to ... learning should have happened). You need to probe.

You probe by use of ... educational technologist calls a "stimulus." This means ... ask the learner to do something that will give you the opportunity to see whether anything has happened. Ask a question, for example, or ask the student to solve a problem—to apply the information. By observing ..., you can tell whether anything has happened—i.e., whether the student has learned something.

In lecturing, you should do this often: Ask questions every few minutes. Ask specific individuals or ask for volunteers (Socratic method). If you keep getting the same volunteers, start asking those who never respond; they are probably the ones who are not following what is going on and need some help. Be gentle, when you do this. Do not cause embarrassment to the individual. This will defeat your purpose.

Hold frequent reviews. After perhaps 5 minutes of lecture (learning ... exposures), review by asking a series of questions.

If you have a blackboard, use it. Put key items on the blackboard, and leave them on the blackboard to aid the students in following your logic. ... them use the blackboard notations to answer your review questions, during your stimulus-feedback sessions.

When you ask questions, use the answers you get. If they indicate that everyone is "getting it" okay, continue. If some or all are not following the material satisfactorily, review, explain further; ask questions to ferret out the nature or reasons for the misunderstanding.

Feedback ... means to determine what your learners need in the way of instruction—... from you. Use it for that purpose, and for no other.

When learners ... correct responses to your questions, reinforce their answers. This means, simply confirm that they are correct. When they are not correct, they need remediation—fresh explanations, amplifications, discussions—whatever it takes to get them to understand.

Above all, when you discover that some or all of your learners are not following some part of your instruction, do not go any further until you have clarified the problem. To go on, when there already is a lack of communication, is to compound the confusion.

"Reinforcement," then, is simply confirming that their understanding is correct, and it should be done with obvious approval. "Remediation" is corrective instruction to clear up misunderstanding. "Feedback" is the response you get from questions and exercises which lets you know if the student understands. As a result of feedback, you should always either reinforce or remediate. After you have "remediated," always get feedback again to confirm that the problem is solved, and that the learners now grasp the idea correctly. Then you must reinforce.

Let your students use the blackboard, especially if you are having them solve problems. Encourage and help them when they are at the blackboard. Being in the spotlight represents great stress to some people. (Although you may have a "clown" or two in your class, who revel in the spotlight, be careful with this type; they can be entirely disruptive.)

If circumstances permit, take your class out to the job site—the workplace—and use live demonstrations to illustrate your points. Let the students pick out observed unsafe practices and tell the class what should be done. Such live experiences are most impressive, and they usually have a profound effect on learning. The memory of such an experience is much greater than the memory of hypothetical classroom cases.

If possible, use a variant of this. Send the class out to the site, on their own, for 20 minutes or so, armed with pencil and clipboard and instruct them to make up a list of [illegible] or unsafe practices and conditions they observe. Then hold general discussions of those lists with the class. Or break up the class into task teams assigned to do that and render a report to the reassembled class.

Call on participants to present stories from their experiences to relate safety to their work. Let them tell the class about safe and/or unsafe acts and incidents they have experienced.

As a variant on this, let them write up such incidents or experiences as a brief, informal essay. (Some students would rather write about it than stand before a group and talk about it.)

Bring in some safety equipment, especially personal protective equipment and clothing, for demonstration purposes. Build exercises around the equipment by asking the class to identify the equipment by name, to explain the circumstances/conditions which call for the use of each type of equipment or clothing, or, conversely, to identify the equipment or clothing called for by various circumstances and working environments.

Ask the students to write or speak about their own situations, circumstances, or working environments on the particular project where they are currently employed. Let them tell you or the class what they think of the safety and health situation and what they think should be done about it, if they do not find it entirely satisfactory.

On the practical side, if you are holding the class informally, outdoors behind the tool shed or in some equally rough and improvised "classroom," try to prepare for it in advance by arranging for pencils, paper, clipboards, and some sort of large easel (to substitute for a blackboard). If these items are not possible to arrange, plan to work without them—i.e., plan to have entirely oral presentations and student activities.

Be prepared to explain the logic behind the safety and health principles and practices and the OSHA standards. For example, there is information included in this booklet on electrical principles, especially what "grounding" means and why it is used for safety's sake. Likewise, there are some principles of flammability and explosion and of health explained. But be prepared, also, to explain the logic of and necessity for other subjects you must get into. The student will more readily accept a "rule" when he or she understands the logic and reasoning behind it. In general, steer away from asking students to accept things merely on your "authority"—because you say it is right and proper—and ask them to accept it on the basis of their own reasoning and understanding of the logic behind it.

Don't hesitate to depart from the text of the formal course material, if you think circumstances warrant such departure. Bear in mind at all times that every case is different, to at least some degree, from every other case, and the formal course materials could not possibly be designed to fit all possible circumstances and conditions; they were meant to be a general guide.

SUMMATION

This "Guide" has attempted to present certain basic messages about instruction. It also has offered a few aids to make the instructor's task a bit easier. Safety and health instruction can be made interesting.

The cardinal rule for making a presentation interesting to a listener is to put the information into terms of the listener's own personal interests—the things he or she cares about. In this case, you must somehow make it clear that the topic is the listener's own life and health.

People sometimes tend to be uninterested in safety and health because they have some trouble identifying the hazard with themselves, just as some soldiers have a subconscious feeling that death happens to someone else but not them—until it comes close.

Traditionally, some instructors use horror stories, intended to shock and frighten the listener into paying attention. Logic says that this should be an effective technique, but experience casts considerable doubt on this. It does not seem to work very well. Perhaps people automatically and subconsciously "turn off" their receiving apparatus when they are made uncomfortable.

Probably the best method is to impart to the learner a technical understanding. An electrician, for example, is far less likely to "get across" a hot line simply because he has good enough understanding of electricity and electrical equipment to automatically—instinctively—avoid doing something so incorrect. This is the "conditioned reflex," and the method is used to train soldiers. Soldiers are exercised over and over, until they react correctly to anticipated situations without conscious reflection—by reflex action. The sound of an airplane or shell sends the trained soldier to the ground automatically, without conscious thought.

Technical training, therefore, yields two benefits. It is far more interesting to know "how" and "why," rather than "what," and knowing "how" and "why" provides a better appreciation of the hazard, as well as a rational knowledge of what to do about it. For that reason, stress is made on teaching the "how" and "why" of such subjects as electricity, fire and explosion, and health hazards. The instructor is urged to go further in pursuing in-depth knowledge of these and other topics relating to occupational safety and health hazards in the workplace.

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