

INDUSTRIAL TRAINING

Industrial training has been referred to as the shadow educational system (H. Goldstein, 1980). As with most shadows, the features are blurred and distorted. In the case of industrial training, the distortions come from general lack of knowledge about this extensive learning enterprise.

One purpose of this article is to clarify the nature and goals of industrial training, and the research and issues related to it, so that the field of education will be better able to support and scrutinize this growing instructional system. The importance of industrial training is reflected in several recent publications ("Education/Training," 1980; "Training in Industry," 1978), which suggest that private-sector training may replace military training as a major contributor to the advancement of learning theory and learning technology (Swanson, 1978). This forecast is based on economic considerations and their ultimate effect on training decision making in the private sector.

The case for industrial training, whether it involves on-the-job skills training or advanced seminars offered by prestigious universities for business executives, is grounded in the quest for increased profits. A correlate of increased profits is increased productivity. Increasing productivity, in its simplest sense, requires (1) improved equipment and processes or (2) gains in worker knowledge and skill (Jacobs, 1981; McDonnell, 1981). The latter implies training that will ultimately result in increased productivity.

Current industrial training practices are seldom described in research publications. Unlike public-sector industrial psychologists and educators who study the training process or who function as academic critics, industrial trainers are the primary participants in the private sector. Although their responsibilities may regularly demand the same rigorous analysis, synthesis, and evaluation behaviors found in published research, their accomplishments are typically disseminated informally to members of a work group or to management in the form of proposals or reports. Unfortunately, there is little time or encouragement to disseminate findings any farther than these immediate work settings. In fact, industrial training personnel are often discouraged from disseminating research and development data because of the sensitive or proprietary nature of the information. Thus much of what is occurring in industry cannot be easily evaluated.

The distinction between education and training has been debated among learning professionals and nonprofessionals for generations. However, it is generally conceded that intent to control the information the learner receives and establishment of specific performance criteria distinguish training from education. Controlled information is acceptable for training but constitutes an unacceptable educational experience. Education requires the review and evaluation of alternative positions on a given topic.

Within the industrial training profession there is no certification or degree program that prepares practitioners

to enter it. University programs to prepare persons specifically for the private-sector industrial training profession are a recent development (McCullough, 1981). Furthermore, training is a secondary organizational goal that exists to support the production of selected goods or services. These conditions make it almost impossible for an outsider to predict the role, staffing, methods, or facilities devoted to training within any company. Each company independently determines its goals, content, and methods of training. The training function is directly affected by the inner workings of a specific industry or business. The major influences upon training are the financial and nonfinancial goals of the company involved. Training efficiency and training effectiveness are two additional important influences. Measures of these influences often serve as proxies for a company's financial goals.

The remainder of this article addresses the two major influences on training, the three principal types of training in use today, and the four job roles involved in providing training. The research and policy issues in each are presented and discussed.

Influences on Training. The question of means versus ends may initially appear to be a very elementary issue as related to industrial training. An analysis of the issue reveals that the research methods most widely possessed by professional trainers are particularly adaptable to studying questions of means rather than questions of ends (Copa, 1981). As a result, the questions of "how to do it" and the pressures of "getting it done" easily lead the industrial trainer away from the goals of the organization. Furthermore, these departures from the organization's goals lead to the criticism that training practices are fads which gain support through reported success that is seldom based on systematic data collection (Campbell, 1971).

Industrial training activities considered in isolation from the context of a firm's financial and nonfinancial goals are prime targets for this criticism. Therefore, it is important to understand these goals and their influence on training.

Financial goals. It is a simple truth that American industry exists to make money, not to train its employees. No goods-producing or service-producing industry would opt to have a training department if it were able to hire and retain fully competent employees at a fair market cost. Employees are trained because less than competent employees reduce the productivity of the organization and therefore reduce profits. Training, therefore, is an investment with an expected return. Training decisions made outside this context are destined to be short-lived (Doutzat, 1970).

The investment-return perspective clarifies one's view of the private sector's training function. This perspective suggests that a \$300 training program resulting in a \$350 return is a bad investment compared to a \$1 million training program resulting in a \$2 million return. Within this framework, training is not a dispensable company frill. Rather, it is a tool for economic survival.

Research on the cost analysis of training is extremely

important to the vitality of industrial training. Limited empirical studies are reported in the literature. One such study has provided benchmarks for manufacturing industries in the training of semiskilled workers (Cullen et al., 1976). In comparing unstructured buddy-system training to structured training, questions such as time required to become competent, overall cost comparisons, break-even points, and projected savings were empirically answered. As one views the literature, it becomes obvious that this study is an exception (Antil, 1972; Zemke, 1978).

Profit, one of the two major driving forces behind industry, is a stepchild in much of the professional training literature, which emphasizes means rather than ends. The literature is inundated with evidence of "how to do it" rather than "did it get done." Even in this context, right or wrong, financial investment-return decisions about training are made. These decisions may be based on empirical data or subjective judgments; they may be made by training personnel and top management or by top management alone. The voids in the literature on the cost analysis of training are not totally representative of practices in the profession; some training cost analyses are methodologically rigorous (Cullen et al., 1978; Rosentreter, 1978). However, many of them represent informed and systematic estimates. These estimates are totally acceptable to the profit-seeking enterprise but unacceptable to academic scholars. Thus, most reports could never appear in the literature because of their lack of rigor and generalizability.

The primary research that appears to be guiding many locally adapted cost-analysis efforts is rooted in the quantitative sciences (Passmore, 1978; Thompson, 1980). Practical adaptations from the literature, with attention to the cost-accounting methods that exist within specific companies, characterize the methods typically used by trainers to analyze the cost of training.

Nonfinancial goals. Nonfinancial company goals are the second major influence on training. Often ignored in the training research literature, since they are overshadowed by the concern for profits, these goals can be stated or unstated, logical or illogical. For example, companies that establish a corporate personnel policy of hiring from within whenever possible establish parameters that affect the training function. Likewise, policies of companies committed to being the financial or technological leader in their field also influence the training function.

Since company goals and their effects on training are almost totally ignored in the training research literature, techniques for analyzing company goals, along with the training constraints and opportunities that would result, are nonexistent. Since the training profession does little to study these ends, it is not surprising that it is often dumbfounded when it hears of large training departments being suddenly eliminated or of highly touted training centers having little or no effect on the actual work performance of trainees.

In an effort to conform as closely as possible to company

goals, trainers often rely on narrow measures of training efficiency and effectiveness, such as serving more trainees this year than last year with the same resources or increasing posttraining test scores. These measures are often used to satisfy management's concerns about training's contribution to the financial and nonfinancial goals of the company. Such measures are most satisfactory in companies that are fiscally sound, that have widely held nonfinancial goals, and that have an established and reasonable training function.

Types of Training. Of the many complicated forms of training that exist today, three principal types can be identified: skills and technical training, management and subject-matter training, and motivational training.

Skills and technical training. Skills and technical training is primarily concerned with worker-machinery interactions. This training is related to the production of goods, the sale of machinery and tools, and the maintenance of hard goods.

There has been abundant interchange of knowledge and practice among skills and technical training personnel in the military, in public-sector vocational and technical education, and in industrial training. Job and task analysis techniques have been researched for decades in all three fields and are widely accepted in each. It is interesting to note that recent regulatory agency pressures for fair employment practices have renewed the training profession's commitment to job and task analysis (Gordon, 1978).

Some of the recent modifications to job and task analysis have at times taken the analyst away from direct observation of competent workers as the data source (DeCaro, 1978; Folley, 1969; Rosenfeld & Thornton, 1976). Empirical evidence supporting the validity of these indirect methods for specific job settings is thin. Prien (1977) draws attention to the need to match particular methods of analysis to specific training problems or situations. In an effort to evaluate more systematically the importance of tasks within a job, efforts have been made to develop a task-scaling method (Ammerman, Essex, & Pratzner, 1974; Ammerman & Pratzner, 1974, 1975, 1977).

It should be noted that these more indirect efforts have come from public-sector vocational educators and that these persons are necessarily more concerned about transfer of training than their private-sector counterparts. Private-sector personnel are more likely to rely on traditional methods utilizing direct observation of a highly skilled worker and a detailed analysis of that person's behavior in order to identify tasks and their relative importance (Musick, 1981; Ridley, 1980). In addition to carefully selecting a skilled worker to analyze, researchers often observe multiple workers and record tasks in greater detail. Furthermore, information, such as learning difficulty (Mager, 1967) and classification of the domain of behavior required for task details, is analyzed (Groppe, 1974; Swanson & Poor, 1981).

Standard job and task analysis techniques are very effective for determining observable worker-machinery inter-

actions of a procedural nature. For example, the details of setting up a machine, running it, and shutting it down can easily be determined. Another aspect of a machine operator's job that is not so easily understood is troubleshooting the equipment.

Whether troubleshooting a faulty production process (e.g., imperfections in extruded ten-inch-diameter plastic pipe) or a malfunction in the process equipment (e.g., inoperable plastic-pipe extrusion machines), the required know-how is complex. The oil-covered maintenance man of yesterday is more likely today to have a white shirt and an oscilloscope. Industry demands have changed. At present there are extremes in equipment size—massive to miniaturized—and equipment is very expensive; equipment is also more specialized, more difficult to keep running, and more difficult to repair once broken than it used to be; and there are lower on-site inventories of backup equipment and parts (Petzinger, 1981).

The financial consequences of using an unskilled work force within these conditions can be substantial. Because of this possibility, a recent study by Johnson (1980) is of interest. Within his computer-based troubleshooting-training program, he also teaches the cost-effectiveness considerations of diagnostic alternatives to specific equipment problems. In a more elementary mode, it should be noted that the analysis required to determine the knowledge and skills necessary to troubleshoot equipment goes beyond understanding procedures. Troubleshooting has largely been ignored by the private-sector training and development profession in the United States. It appears as though the majority of research and development in the area of industrial process and troubleshooting analysis is being done in Europe (Frank & Smith, 1969). Available research into the areas of process analysis and the use of process simulations (Roberts, 1976) points to an interesting public-private sector issue. The movement in engineering education away from applied studies and the concentration of public vocational schooling on procedural skills leave a void in the general work force. Since the industrial training profession draws from the engineering and production fields, there is an equivalent shortage of persons in training who are competent in the area of process and troubleshooting analysis. The nature of industrial technology and the problem of keeping it running demand greater attention by private-sector and public-sector trainers. The high degree of hardware standardization in the military has allowed it to stratify and proceduralize the troubleshooting behavior of its technical personnel and thus maintain efficiency and effectiveness with a minimum of worker training (Foley, 1978). It does not appear that private-sector skill and technical training will ever reach this point of sophistication, because of the diversity and competitive nature of industry and its hardware.

Management and subject-matter training. Management and subject-matter training deals with worker-worker and worker-idea interactions. Topics like organizational communication, employee appraisal, decision

making, management by objectives, time management, and fiscal management are representative of management training programs. Management training, at face value, often appears luxurious when compared to skills and technical training. Managers making decisions about the training of managers tend to be more forgiving in respect to costs, immediacy of returns, and inclinations toward ceremony (Adams, 1976).

Before the emergence of the career development movement in the 1970s (Morgan, 1977; Walter, 1976), general management training helped to fulfill the implementation of career progression programs in large companies (Bright, 1976). The pattern was rather simple and effective, and still exists today. Promising managers are selected to attend one of a sequence of management courses at company headquarters. Here they are taught general job-related management information and are introduced to selected corporate operations and personalities. Participants are observed as much during out-of-class events as in the training sessions themselves. High-potential people from among the participants are noted by management and tagged for later promotion. The cycle of training and promotion continues, with each visit to headquarters becoming more selective. This cycle is usually capped off with intensive management seminars held at prestigious universities and lasting from one week to three months.

Almost nothing in the literature treats methods of analyzing specific subject matter dealing with management behavior. Research and literature on assessment of training needs have provided effective methods of determining whether training is necessary to solve a particular problem (Harless, 1975), and yet there are no equivalent methods for specifying the precise subject matter that should be covered within the particular area of need. For example, determining that training for first-line supervisors is needed is quite different from determining what content should be covered.

The issue, in a nutshell, is that the rather powerful job and task analysis tools that exist for skills and technical training do not exist for management and subject-matter training. This void results in a reliance on external consultants in the area of management and subject matter training who typically emphasize training programs that deal with general management topics. Furthermore, these programs are often the target of the criticism of training faddishness (Campbell, 1971).

As one might expect, consultant services are costly and encourage the organization to hire in-house persons with the same analysis and design competencies. At the same time, the direction in management training is away from general training to more specific knowledge and practice, with closer scrutiny of payoffs in respect to financial and nonfinancial goals. The additional design and development time required to produce these more specific programs has created a dichotomy of sorts. On the one hand, an increased number of companies are marketing their training programs on the outside, in order to gain a profit on

their investment. On the other hand, there are efforts to limit competitors' knowledge of training programs in that they are perceived as proprietary and the source of a competitive edge. Training programs that have important financial consequences often end up being guarded just like new products, manufacturing processes, or raw-material formulations.

Motivational training. Motivational training is designed to influence human attitudes and beliefs. It might be tempting to equate such training with sales training, but that would clearly be a misrepresentation. For example, the intent and method of many safety-training efforts and management seminars can be classified as motivational training. Likewise, much of what goes on under the name of sales training can be best categorized as skills training or management training.

The relation of means to ends in motivational training is a critical ethical concern (Clement, Pinto, & Walker, 1978). Training with intent to manipulate someone to accept a predetermined position without that person's ever being made aware of the process or intent is considered unethical.

Sensitivity training as a method of motivational training gained much attention and was widely implemented in the late 1960s and early 1970s. However, the implications of efforts aimed at changing deep-rooted values so as to modify organizational behavior have been challenged from a number of positions (Campbell & Dunnette, 1968). I. L. Goldstein (1980) noted that sensitivity training lacks a theoretical base; Smith (1976) highlighted the lack of long-term effects; and Cooper (1975) reiterated that ethical concerns still appear to be the most significant issue surrounding sensitivity training. Newer methods of attitudinal training, such as organizational development and quality circles, although still largely unproven, do not rely on the revivalist type of techniques frequently found in sensitivity training. They appear to be grounded in both human and organizational needs and seem to rely on more straightforward methods to obtain desired changes (Miller, 1976; Yager, 1981).

Job Roles in Training. The four training job roles are instructor, media producer, designer, and manager. All four job roles are related to the three principle types of training: skills and technical training, management and subject-matter training, and motivational training.

In the past ten years, the learning professions have been very active in specifying learner outcomes in the form of competency statements (Storey, 1979). A logical extension of this activity is to apply the competency concept to the training profession itself. What are the important or necessary competencies of a trainer? This basic question has been addressed by several important research studies. One such study conducted by the American Society for Training and Development (Pinto & Walker, 1978) revealed the following fourteen areas of trainer competencies: (1) program design and development; (2) management of external resources; (3) job-related and

performance/related training; (4) individual development planning and counseling; (5) training research; (6) group and organization development; (7) material resources development; (8) professional self-development; (9) management of the training and development function; (10) management of internal resources; (11) management of working relationships with managers; (12) needs analysis and diagnosis; (13) conducting classroom training; and (14) determining appropriate training approaches.

Another way of viewing the job roles within this professional *mélange* is to match them with the typical phases of the training process. The five phases of a training program include analysis, design, development, implementation, and control (Swanson, 1980).

<i>Training Phases</i>	<i>Job Roles</i>
Analysis	Manager, designer
Design	Designer
Development	Media producer, designer
Implementation	Instructor
Control	Manager, instructor

Instructor. Some trainers only instruct. These persons provide one or more of the three types of training. A trainer's forte may be instruction skills quite independent of content, and thus he or she may be found teaching in all three areas: skills, management, and motivational training.

In large training organizations entry-level trainers are often hired into instructor positions. Furthermore, they may be restricted to one type of training (e.g., management training) and a limited number of specific courses. In some instances the situation parallels a military-training mode. This mode allows prospective instructors to take the courses they will teach and ultimately to teach these courses precisely as they had learned them. These conditions suggest that the designer of the training is pulling all the strings and that the instructor is relegated to robot status, but these jobs are usually enriched by adding design responsibilities once instruction skills are proven.

Recent training literature is almost void of research and development work on the selection of instructors, the process of instructing, and the evaluation of instructors. Extensive reviews of the training research literature by Campbell (1971) and I. L. Goldstein (1980) provide no evidence of inquiry in the profession on this topic.

Although not adequately reflected in the literature, instruction and communication skills are highly valued in industrial training. This is abundantly clear in the training profession when the issues of retention, promotion, and perceived program effectiveness are examined. It is interesting to note that the widely accepted, anecdotal evaluation methods that ask trainees how they like their experience are for the most part aimed at instructor effectiveness. The forty-eight industrial training methods identified by Wenig (1978) require a complex repertoire of instructing skills that are apparently being taken for

granted in the literature. Likewise, the extensive body of related knowledge and research in the area of teacher education, and specifically in vocational-industrial teacher education, is being ignored.

Trainers are expected to have adequate instruction skills, and those full-time trainers who prove to be deficient in these skills are often terminated. Attention to the development of instruction skills is often reserved for part-time trainers, who, in the area of skills and technical training, are often people with good interpersonal skills chosen from the ranks of supervisory or hourly workers. Their work experience provides face validity to the trainees, and, at times, job knowledge. The literature does report efforts at developing the instructor skills of supervisory and hourly workers (Murphy, 1981).

Media producer. Many persons back into the training profession as a result of media production skills. For example, a person trained as a photographer may be hired on a training staff to produce photographs used in training materials. This person may be viewed as a technician in one situation. Yet a similar person with expertise in producing slide and cassette programs may be catapulted to a training design or management position in a company that suddenly commits itself to training primarily through the use of these media. Artists, writers, movie producers, and video producers are some of the other personnel in this media production category.

It is also interesting to observe manufacturers of media hardware moving into software production. This is usually done as a means of marketing their primary hardware product. Media software and market interactions are particularly dynamic. The desire to accommodate a good client or to utilize available human talent and available production hardware at times guides nontraining enterprises into the training business (*Training in Industry and Business*, 1976).

In the balance, experimental research has shown various media to be effective, but not the key to learning. Media methods have been important components of many training innovations, but effectiveness is moderated by relatively high costs. However, rapid change in communications technology—from communications satellites to sophisticated low-cost home computers—and the resulting shifts in cost-effectiveness may shake the very roots of the training profession (Bonini, 1975).

Designer. Those who design industrial training are in a position to thoughtfully interpret and synthesize the many variables affecting training. Less is known about the design function than about the functions of instructing, producing media, and managing training. Training design is presently more of an art than a science. Training systems advocates often place "design" in their set of training flow-chart boxes but know little about what the trainer actually does in conceptualizing an appropriate strategy. Concerns such as the goals of the company, training goals, delivery options, trainee characteristics, and time constraints must

all be taken into account in providing the best training strategy.

Areas of research related to design are presently being considered by the profession. Now that computer-assisted instruction (CAI) is proving to be cost-effective, training designers need computer knowledge. The computer allows the designer to rethink who gets training, how, where, and when (Bonini, 1975). CAI is freeing the designer from many long-established constraints and establishing a whole new set.

Modeling theory and research are now visible in the training literature (Goldstein & Sorcher, 1974; Latham & Saari, 1979; Smith, 1975). The behavior-modeling method requires presentation of principles, presentation of model behavior, role playing, and reinforcement. In some companies, management training has been significantly influenced by behavior-modeling theory. Although it has not been reported in the literature, one corporate management training group has established an elaborate evaluation scheme for selecting believable actors to perform as role models on videotapes (Sisson, 1979).

Manager. The person who manages training is ultimately held responsible for its contribution to the financial and nonfinancial goals of the company. In pursuit of these goals, he or she is required to orchestrate the instructors, media producers, designers, and other resources of the training department. The tools of general management are also the tools of people who manage training. Two unique and critical training management tasks are worth highlighting. They include assessment of training needs and evaluation of training effectiveness from cost and behavioral perspectives.

The major goal of training-needs assessment is to separate training-related from non-training-related problems. In addition, it is important to categorize training problems as (1) present sources of organizational pain, (2) nice improvements, or (3) considerations in future or long-term planning. Although there is need for continued research and development, several tested methods of training-needs assessment exist (Harless, 1975; *Successful In-Company Training Programs*, 1974). As one might expect, trainers regularly unearth non-training-related problems during needs-assessment work. Depending on the position of training in the structure of the organization, training managers may get involved in nontraining problems. The interface of training personnel and nontraining problems is usually organizational development (OD). OD solutions typically contain training and nontraining proposals. The nontraining proposals often deal with some form of work redesign (Murrell & Vaill, 1975).

The second unique and critical training management task is to evaluate training effectiveness in terms of cost and behavior change. The issue of cost analysis is the ultimate accountability problem for the manager. The same can be said of the behavioral effectiveness of training. The body of knowledge about evaluation far outstrips actual

practice in the training field. This fact may be partially explained by a general belief that practice is an integral part of training and is in itself a good evaluation. Further, evaluation is often viewed with hostility, and thus training managers tend to deemphasize it in order to maintain cooperation in training programs, especially those not mandated by the company. The computer may provide a stimulus for redirection in the area of evaluation and other training management functions. Computer-managed training allows trainees to report individually and thus dictates a different means of monitoring behavior. One such management system goes beyond evaluation into a total record-keeping system (Murphy, 1980).

Summary. Selected research and development issues in industrial training will be highlighted as a means of summarizing this article. Two overriding issues, stated in the form of questions, overlay training as a whole, including types of training and job roles in the training profession. This overlay allows one to extrapolate from the questions more specific issues within each of the categories.

The major issues that transcend all forms of training in industry pertain to financial and nonfinancial goals. Specific methods of inquiry to answer the following questions are high-priority issues. (1) What are the costs and benefits of training? (2) What are the goals of the organization? It is appropriate to raise these questions across the board, by type of training and by job role.

The selected issues within each of the types of training and job roles in training highlight the needs and future direction of the industrial training profession. These include (1) analysis of processes and troubleshooting behavior; (2) analysis and synthesis of subject matter; (3) ethics of attitudinal training; (4) development and evaluation of instructional skills; (5) new high-technology media-communications systems; (6) understanding of the training-design process; (7) needs-assessment methods; and (8) computer-managed training.

The vitality of industrial training will largely be a function of its ability to pay attention to the major issues confronting the profession. Distractions abound and have traditionally bled off much professional energy. Focus of purpose and method within the profession will need to be continually monitored by both researchers and practitioners.

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See also Labor and Education; Trade and Industrial Education; Vocational Education.

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