Beyond Instructional Design: A Model for Improving Human Performance

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Abstract. The performance improvement model expands and encompasses instructional design models to provide, in one model, methods and techniques for solving human performance problems. The model guides the user through a series of processes, beginning with a definition of the performance discrepancy and a brief analysis of the cost/benefit associated with resolving the discrepancy, then through an analysis of behavior to identify feasible solutions to the performance discrepancy. A more complete cost/benefit analysis is followed by a comprehensive design implementation and evaluation scheme. Accomplishments, not behaviors, are the primary focus of analysis. Only after accomplishments have been identified in quantitative terms is behavior of interest. Behavior is analyzed in terms of both the individual and the environment to find appropriate solutions to the performance problems. Environmental analysis includes investigating data about the job, job aids available to provide guidance while performing the task, tools and equipment used, and the consequences associated with performing as desired. The repertory the individual brings to the job is analyzed in terms of required knowledge and skill and physical capability to perform the job. The behavioral analysis may lead to many solutions. A cost/benefit analysis identifies which are most likely to yield the biggest payoff. Using this information, a plan is devised, materials are developed, programs are implemented and evaluated. Based on the evaluation, changes are made as required.

Introduction

Training and education departments have limited themselves to instruction as the only solution to performance problems. Instruction is not the solution to most human performance problems, and even when it is one choice, other solutions can be more effective and less expensive to implement. Given an instructional problem, instruction can still fail to solve the problem. For example, a person who performs in the desired manner at the conclusion of the training program may, in the actual situation, fail to do the job. In this case, action is required to solve the environmental problems that cause ineffective training and the associated waste of money. Current instructional design models do not allow training professionals to do this. To ensure that training is not provided when a more cost-effective solution is available, a performance improvement model (Figure 1) is required. This model encompasses and expands upon a variety of techniques to provide practitioners with an approach that not only changes behavior, but also changes total performance.

The present model, which has its roots in the techniques of performance engineering as proposed by Gilbert (1978), differs from other models in that the primary emphasis is shifted from instructional development to performance systems development. The performance improvement model extends our objective from the development of individual job tasks or behaviors to the improvement and maintenance of job functions or performances. Further, the model is not based upon a field or discipline but rather on knowledge, methods, and techniques derived from such diverse disciplines and fields as industrial and organizational psychology, educational psychology, educational technology, adult education, engineering psychology, industrial sociology, operations research, systems development technology, economics, and accounting. This broad perspective enables the practitioner to take advantage of the vast number of solutions applicable to any one problem.

Although the model draws from many fields and disciplines, it is not eclectic. The techniques and methods used have been combined in what Gilbert describes as a useful, simplistic, and coherent system for engineering human competence. Further, it uses social learning theory (Bandura, 1977) as a theory of human behavior that serves as a basis for analyzing and determining solutions to performance problems. People are seen as being motivated by a continuous interaction between personal and situational sources of influence. Thus, when people aren't performing as desired, it is normally because something other than their own "motivation" is the cause. In general, it is hypothesized that people fail to perform as desired for one of two reasons: Either they lack the required skill, knowledge, or physical capability to do the job; or the environment does not support the desired behavior. Environmental nonsupport runs the gamut from such problems as people not knowing what they are to do, to people being punished for doing what they are supposed to do. Between these extremes lie inadequate feedback, poorly designed tools, lack of job aids, and so on.

Level

Because the performance improvement model is accomplishment based, a great deal of flexibility exists in the problems analyzed and the level at which they are analyzed. It provides a means for identifying "what is," "what should be," and "what could be." Kaufman (1979) insists this must be done at an organizational as well as a societal level if the changes that the performance and instruction fields are

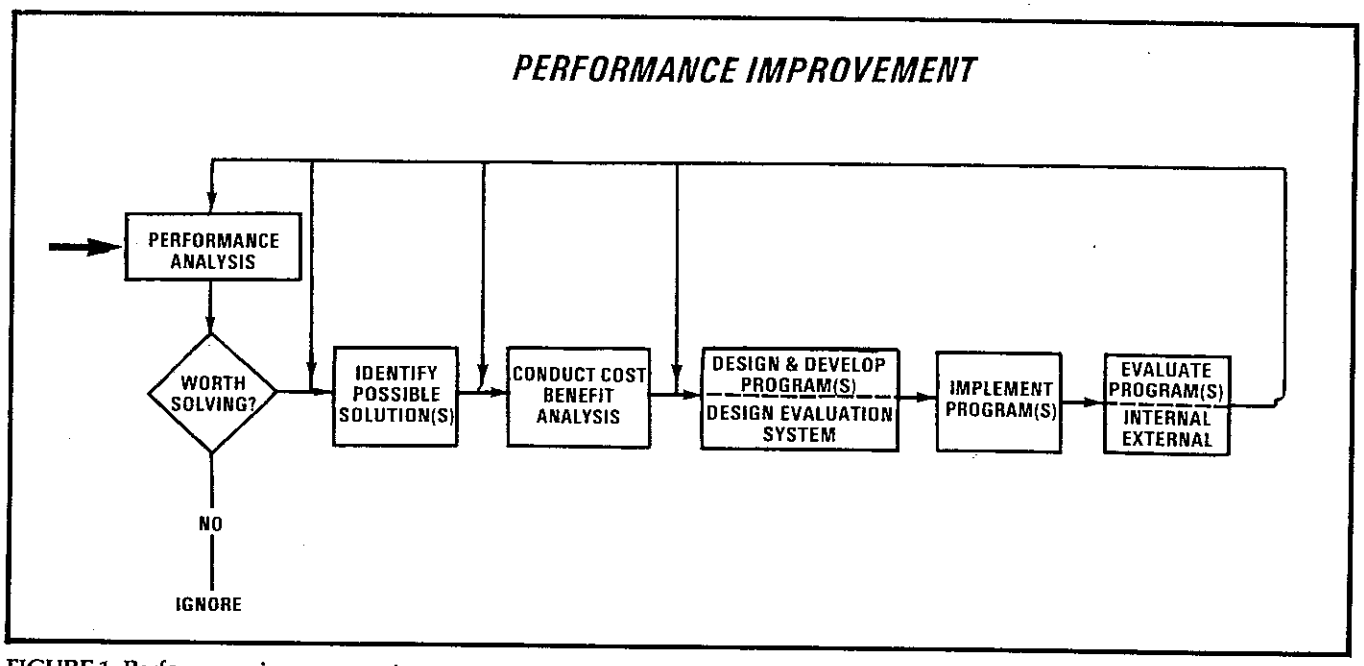

FIGURE 1. Performance improvement.

capable of bringing about are to occur. The model can be used to solve existing problems or to prevent future problems. By utilizing the model when making change or when implementing new programs, large payoffs can be obtained. It ensures that the change or new program is in line with society's goals, the organization's goals, and the goals of all subgroups involved. It helps to ensure that proper communication takes place and that the required organizational climate is established.

Because the instructional development portion of this model differs only slightly from other ID models, the remainder of this paper will be dedicated to a discussion of the non-ID aspects.

Performance Analysis

Performance problems are normally brought to the attention of a training or education department by someone wanting a course either to solve a perceived problem or to prevent an anticipated problem. Regardless of why the request is made or of the organization level of the requester, the first step is to determine the expected outcome. This should result in a statement of desired performance which meets Gilbert's (1978) ACORN test. That is, the performance is described in terms of an *A*ccomplishment. This accomplishment is under the *C*ontrol of the worker, supervisor, manager, and so on. It is the Only overriding objective or goal of any role. It is *R*econcilable with other objective goals or missions of the organization. And finally, it can be measured, a *N*umber can be put on the accomplishment. The "only" is dropped from the mnemonics when working with subgoals and objectives.

Failure to describe the desired outcome in this manner often can result in wasted time and effort in solving the wrong problem or, even worse, designing a program that creates a problem. To amplify this, let's look at a situation in which a department within a large university describes their mission as:

Accomplishment:	Students graduated with degrees in X
Measurement:	Number of students graduating
	Number of honor students

This mission looks good. It is an accomplishment statement and can be measured. The department can control the number of students graduating, and this could be their main mission. However, the mission fails when looked at for reconcilability with the goals and missions of the university and the goals (values) of society.

Once the desired performance has been stated in the terms described above, it is usually possible to compare what is actually being done with the stated accomplishment. At this point, the discovery is often made that no problem actually exists. The requester may have been reacting to behavior rather than looking at performance. Ordiorn (1973) has described this as the "activity trap."

If a discrepancy does exist, a determination is made as to whether or not the problem is worth solving. In many cases, even at this early stage of analysis, it becomes obvious that the cost of solving the problem is not justified.

Identification of Possible Solutions

Once a performance problem is identified and the desired result stated in quantitative form, the behavior of the people involved is analyzed to identify possible solutions. Most models start by determining whether the failure is a skill or knowledge deficiency before examining environmental solutions to the problem. In the Performance Improvement model, environmental solutions are questioned first. This is done because, quite often, even when a skill/knowledge deficiency exists, solutions other than instruction are viable, usually less expensive, and often more effective. Figure 2 depicts the order in which a problem is attacked and several of the possible solutions that can be implemented for each hypothesized cause. It should be noted that, quite often, more than one cause/solution exists for each performance discrepancy identified.

Data

Data (see Figure 3) are investigated first because often people fail to perform as desired because they do not know what they are supposed to do, how they are supposed to do it, or how well they are doing. The literature abounds in studies demonstrating the efficacy of feedback in improving performance.

The power of feedback is evident in the following case involving stockroom workers who receive orders for large quantities of small electronic components used in the manufacture of printed wiring cards. Once given the order, the workers "pick" the required number of each component from the various storage bins and send them out to the requester. If a picker selects the wrong component or the wrong number of components, time is lost in the manufacturing process, either because the wrong component is placed on a printed wiring board or restocking and reordering of needed parts is required.

Pickers provided randomly with feedback concerning their picking accuracy improved accuracy from a level of 90% to a level of 96%.

One last word about feedback. Feedback itself is not intrinsically good as Nadler (1977) points out. It is a useful tool only when the users understand why information is important, how data affect behavior, and how to use it.

Another form of data that improves performance is the job aid. Simple job aids can improve performance, especially if a task is performed infrequently or is rather lengthy and complex. Quite often job aids are not used because they are not readily available to the person needing them. In one case, a supervisor kept the job aids locked up because he felt they were too expensive to keep where the workers could get to them easily. Needless to say, they weren't used because it was time-consuming and difficult to get them from the supervisor. In this kind of situation, it is easy to explain to the supervisor why job aids should be made available to those who need them.

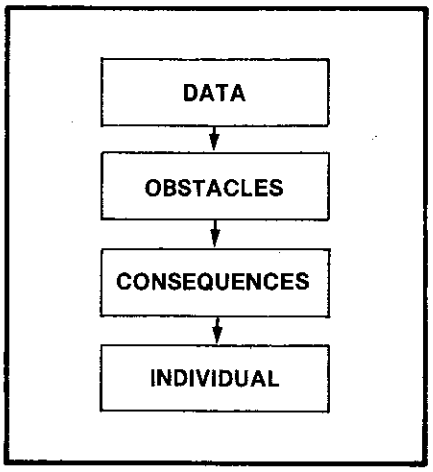

FIGURE 2. Troubleshooting behavior.

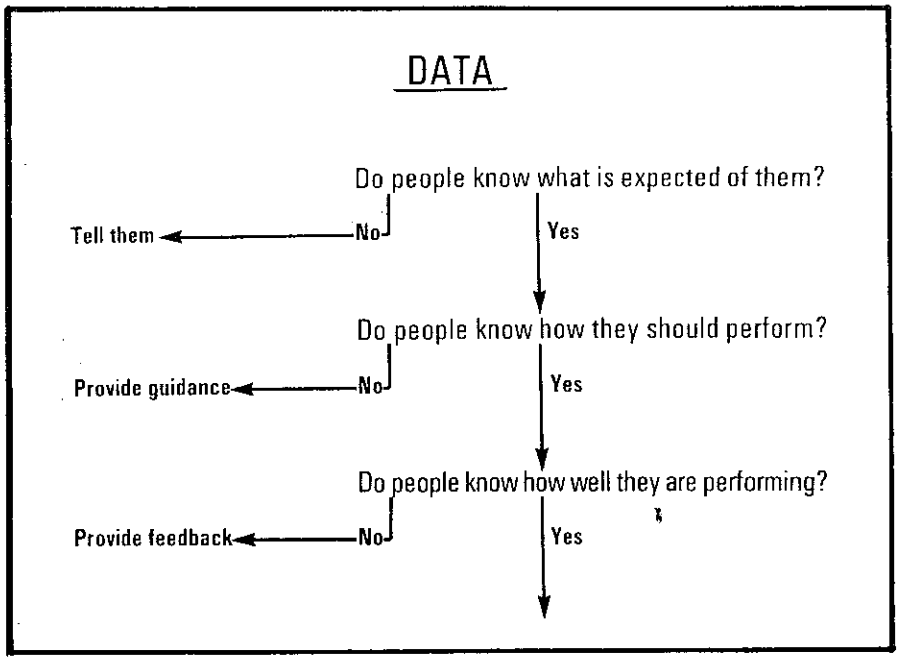

FIGURE 3. Data.

Telling people what is expected of them is another form of data that can be very powerful. Far too often, performance problems occur because people are not told what they should do, what the job priorities are, or when certain things should be done. If you have a hard time accepting this fact, think about your own job. Have you been told what you are to accomplish and how these accomplishments will be measured? If you are still skeptical, think about your secretary or the department secretary. The secretary probably does work for several people, has a variety of tasks, and is left to his or her own resources to determine what the priorities are.

Obstacles

Obstacles (see Figure 4) come in all shapes and sizes, ranging from the wrong tools to constantly ringing telephones. In one instance, a clerical staff was losing a tremendous amount of time because of ringing telephones. This group was responsible for answering phones for a group of approximately 40 instructors and for doing the typing, filing, and other clerical tasks. The phones were arranged so that each time an instructor's phone rang, it also rang on the answering box used by the clerical staff, who would stop work and count the rings. If it rang more than three times they assumed the instructor was out of the office and would then answer the phone. By changing the system so that calls were diverted automatically to the clerical staff after three rings, productivity was improved. Now if their phone rings, they answer it. In manufacturing operations, workers often don't have the tools they need. In an attempt to save money, first line supervisors may put off buying the tools required, not realizing the detrimental effect this has on productivity. As pointed out previously, obstacles come in all shapes and sizes. Mager (1970) describes a situation in which a plant manager came looking for a training program because his 60 employees kept falling asleep on the job. The training director looked around, talked to people, and did all the other things required to determine the real cause of the problem. He found the answer in the medical department. The workers were suffering from a disease that shows up in symptoms of sleeping sickness. Once this obstacle—their illness—was cured, their work improved.

Another obstacle to good performance is overconcern with behavior as opposed to accomplishment. For example, a new clerk was hired to perform a task. The person teaching her insisted that the new clerk do the job as it had always been done, even though there were many ways to perform the task. This overconcern with behavior resulted in less output from the new person and in unnecessary frustration with the job.

Consequences

What happens when workers perform as desired? Are they rewarded in some way? Are they punished? Are they ignored? It is possible that any or all of these possibilities occur. The same is true when they do not perform in the desired manner. Figure 5 provides some of the questions to ask to determine whether the consequences of behavior are the cause of poor performance. Close inspection of the consequences of behavior often yields surprising results. A striking example of inappropriate consequences can often be found in manufacturing operations where employees are paid based on the quantity of parts produced per day. Management also wants high quality output and cannot understand why high quality is not maintained. In situations like this, no amount of training, pleading, begging, or any other so-called motivational technique will have a long-term effect on performance. To obtain long-term change, the method of compensation must be modified.

Numerous other examples can be found. Connellan (1978) describes a situation where students going through a self-paced course were assigned KP, and other equally enjoyable jobs, when they completed a section of the course early. Needless to say, soon the students were using up all the time allotted to learn the materials. Once the training specialist involved realized what was happening, the procedure was changed to give the students three-day passes when they completed materials early; no one was put on a "special" detail because of early completion. Students were soon finishing well ahead of the time it had taken to cover the same material in the old course using conventional methods, and the test scores were as high or higher than before.

As these examples point out, consequences play a powerful part in determining people's behavior. However, consequences are tricky. What one person views as a positive consequence may well be viewed as negative by another. Some people may be concerned only with immediate consequences, while others are concerned with future consequences. To complicate the situation further, the same person may be responsive to different consequences at different times. Thus, when looking at consequences, it is imperative that the individual be considered. Theories such as Maslow's (1970) Hierarchy of Needs, and Herzberg's (1959) Hygiene/Motivation Theory are useful when analyzing consequences, because they provide a body of data, developed over time, about individuals and the consequences they are responsive to.

There are times when the consequences associated with a given job can't be modified. The job must be done in the prescribed manner; the pay, hours, breaks, just about every aspect of the job is locked in. In these cases

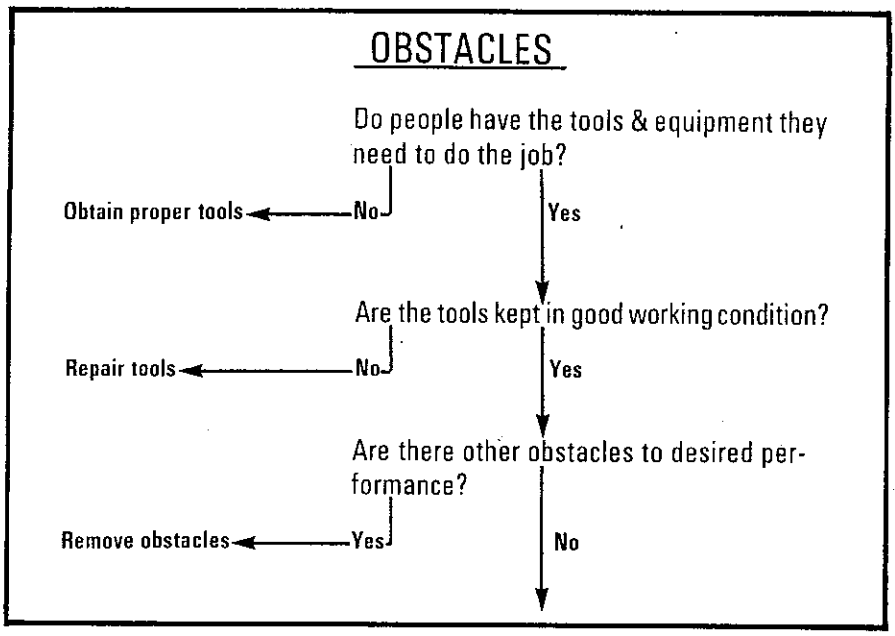

FIGURE 4. Obstacles.

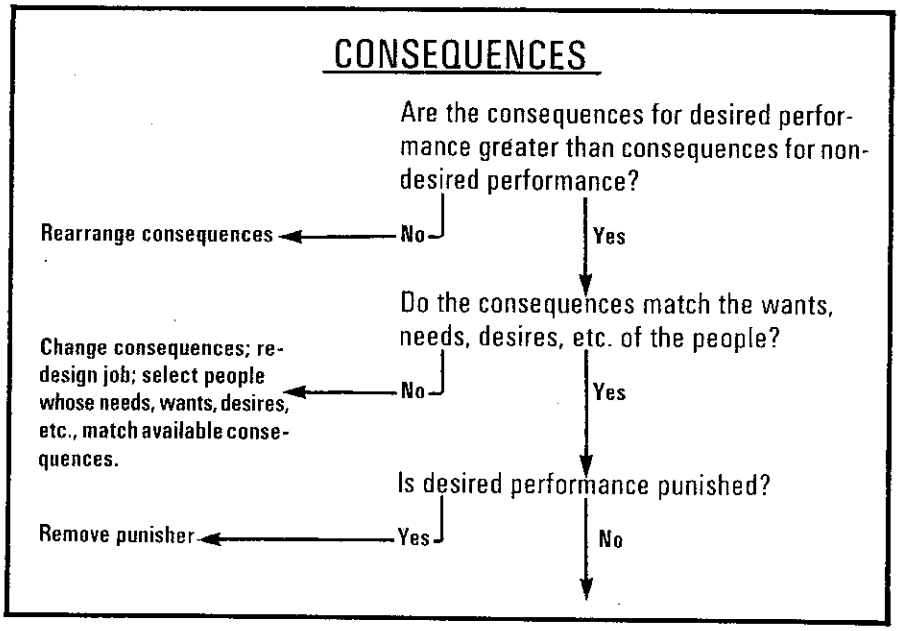

FIGURE 5. Consequences.

extra care must be taken to hire people who will find the existing consequences positive.

Individual

So far, we have described only environmental aspects affecting a person's ability to perform in the desired manner. However, individuals may bring elements into a situation that prevent them from performing as desired. (Figure 6.) One of these is the knowledge that they bring to the job. Do they know how to perform in the desired manner? Or as Mager (1970) puts it, could they perform as desired if their life depended on it? If not, then instruction may be the solution. But even in cases where instruction seems to be the solution, it behooves us to look not only at the training required, but also at the job structure to see if it can be changed. It may be that some well designed job aids can greatly reduce the amount of instruction required.

It may also be that just providing the required training is not enough. The environment may not support the behavior. Consequently, it may be necessary to look at the environmental aspects of the problem situation, and not just assume that the training program will solve the problem.

The following case history demonstrates a situation in which training was *a* solution but not the *only* solution.

Considerable difficulty was occurring in the manufacture of electronic equipment because employees were mishandling a component that was extremely sensitive to damage from static electricity. Investigation showed that most people did not know proper handling techniques. Further, they were unaware of the damage caused by mishandling the components. Investigation showed that the grounding straps provided to keep static electricity from building up on workers were seldom used, and supervisors seldom insisted on their use. The antistatic tools provided were not always used and in some cases were not easily accessible.

To solve this problem, a self-instructional program using a videotape and workbook was developed to teach proper handling techniques and to let people know why proper handling was important. Further, pocket-size cards were made up which outlined proper handling. These served as reminders, reinforcing the importance of proper handling. Also, perhaps most importantly, sufficient tools were provided, and tools not to be used were removed from the area. Because one of the original problems was supervisory apathy, supervisors were involved in setting up the program, including the design and production of the videotape. The result was a significant reduction in failures because of improper handling of the sensitive components.

Another cause of poor performance, brought by the individual to the situation, is physical inability to do the job. If a job requires that a person be able to discriminate colors, a color-blind person can't effectively do the job unless it is redesigned so that ability to discriminate colors is not necessary. As Gilbert (1978) points out, it is seldom as certain and proven as we might like to think that one must have special aptitudes, intelligence scores, verbal skills, manual dexterity, and so on, in order to perform in an acceptable manner. Well designed jobs, combined with

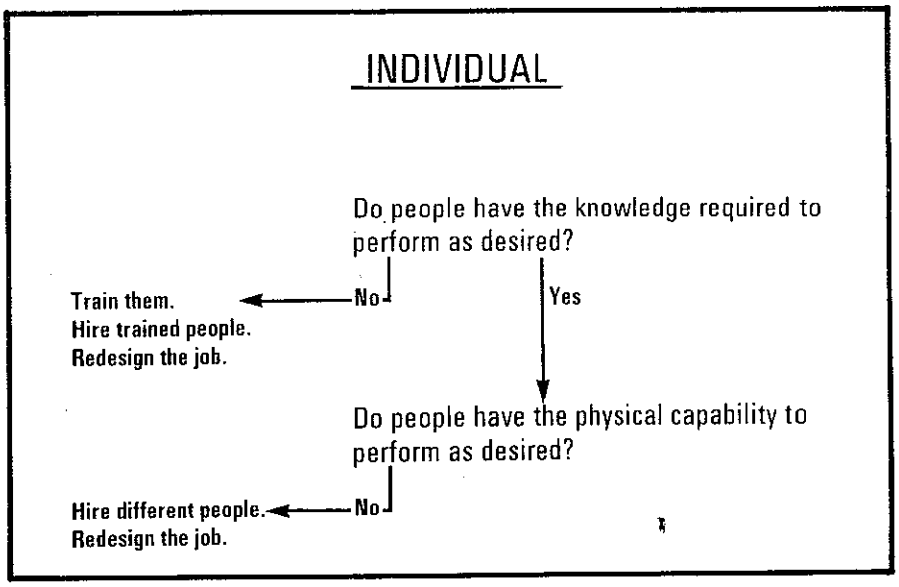

FIGURE 6. Individual.

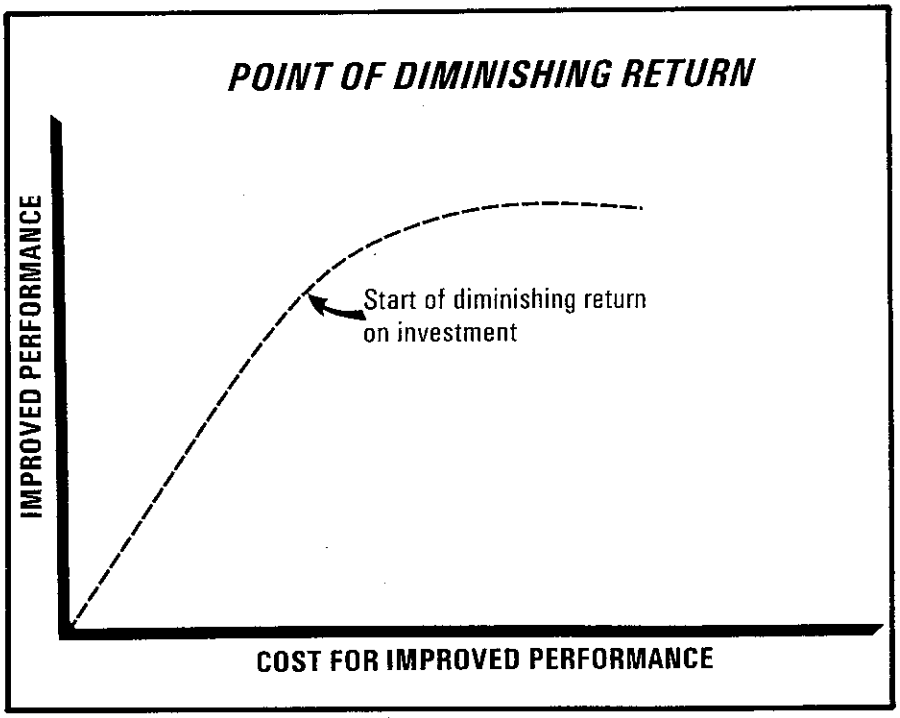

FIGURE 7. Point of diminishing return.

well designed instruction, can do a lot to reduce the differences between individuals.

Figures 2 through 6 show the order, the major questions, and some of the solutions that might be implemented for each of the questions answered, indicating that they might be a possible cause of the problem. The solutions listed sound somewhat simplistic, but their implementation is not always simplistic. As pointed out above, design of solutions may require knowledge of many fields and sometimes a definite expertise in a specific field. It should also be noted that the overall model is seen as a dynamic model and changes in solutions are being made constantly based on information obtained from evaluation.

Cost/Benefit Analysis

With one or more solutions to the performance problem identified, an analysis is once again made to determine whether the problem is worth solving. At this point, a better estimate of the cost of solving the problem can be made and the most cost-effective solutions can be determined.

Quite often it may be cost-effective to improve performance to a certain level, but not worthwhile to go beyond that level of performance. Figure 7 graphically depicts this concept.

There are a few exceptions to this: one may be the training of a surgeon, another an airplane pilot. Failure to accept this concept may result in very elegant performance improvement programs that are scarcely more effective than less elegant and costly programs.

Program Design and Development

The design and development of the program depends on the solutions identified and the problems associated with designing, developing, and implementing each solution. In a case where people aren't performing as desired because they don't know what is expected of them, design and development are simple. In a situation where instruction, job aids, feedback, and tools are involved, program design will probably be complex enough to require development of a program for scheduling and control, and the involvement of many specialists to work on the design and development of the various phases of the program. Such a program could include instructional designers working with subject-matter experts to develop the instruction required; someone else working with the department supervisor and some of the employees to design a feedback system; and still others to develop job aids and tools.

Evaluation

Evaluation takes place at two levels. The first is the measurement of the program's effectiveness. Concern is with measuring the performance specified during the performance analysis phase. The question being answered is, "Is the individual, group, department, or organization performing as desired?" If the answer is "Yes," no further evaluation is required. If the answer is "No," it is necessary to conduct a second-level evaluation, which consists of evaluating each of the individual change programs implemented. This evaluation may indicate that one or more of the individual programs should be modified. This is to be expected. The performance improvement model is a dynamic one, which not only allows for, but anticipates that change will need to be made continually.

Conclusion

The performance improvement model shifts the emphasis from instructional design to performance problem solving. This shift has major implications for those involved in training and education.

Instruction becomes just one of many tools used to solve problems. For the designer or presenter of instructional programs this may be advantageous in the long run because the likelihood of the training being effective has now been increased greatly. It also means expanding into areas heretofore considered out of bounds. Most nontraining solutions have previously been the prerogative of line management; so was training at one time. But now, because of the complexity of training, there are staff groups to provide the training function for line management. So why not have a staff group assisting line management to develop and maintain a work place that supports the desired behavior (Patton, 1980)? Like instructional design, performance improvement techniques require a body of knowledge and a set of skills that the manager, with the day-to-day problems of the operation, cannot possibly develop and maintain.

References

Bandura, A. *Social learning theory.* Englewood Cliffs, N. J.: Prentice-Hall, 1977.

Connellan, T. K. *How to improve human performance: Behaviorism in business and industry.* New York: Harper and Row, 1978.

Gilbert, *T. F. Human competence: Engineering worthy performance.* New York: McGraw Hill, 1978.

Herzberg, F., Mausner, B., & Snyderman, B. *The motivation to work.* New York: Wiley, 1959.

Kaufman, R. Achieving useful results beyond performance and instruction. *NSPI Journal,* 1979, *18,* 10.

Mager, R. F., & Pipe, P. *Analyzing performance problems.* Belmont, Calif.: Fearon, 1970.

Maslow, A. H. *Motivation and personality.* (2nd ed.). New York: Harper and Row, 1970.

Nadler, D. A. *Feedback and organizational development: Using data-based methods.* Boston: Addison-Wesley, 1977.

Ordiorn, G. *Management and the activity trap.* New York: Harper and Row, 1973.

Patton, F. D. A third dimension: The future of educational technology in industry. *Journal of Instructional Development,* 1980, *3,* 3.