

Maintenance Systems: The Neglected Half of Behavior Change

*Karen S. Brethower**

Successful training involves two phases: acquisition and maintenance of behavior. This subdivision of the training function is important because it separates the process of acquiring some particular skill from the process of examining the environment in which the employee will practice that skill. Step one in any training analysis should be to examine the goals and standards set for the employee. Since each of us behaves according to some system of consequences, step two is analyzing the immediate, the long-term and the overall consequences of performance or non-performance. The third area in the initial training analysis is determining how the employee receives feedback concerning his job performance. The information gathered up to this point is still related to the initial job analysis and to whether the problem is one of acquisition or maintenance. Surprisingly enough, many problems originally marked for acquisition training are really maintenance of behavior problems. For any system to maintain the desired behavior of its employees the following conditions must prevail: (a) allow the behavior to occur with some frequency, (b) do not punish it, (c) reinforce it, and (d) do not reinforce behaviors which conflict with the desired behavior. While the interaction of the forces acting on the employee is not readily apparent, the suggested deficiency guide will assist in pinpointing conflicts. It is quite possible that the information derived from the job analysis and the deficiency guide examination points to a problem in the acquisition of skills. In that case, the question is which training techniques including programmed instruction is best suited to achieve the acquisition goal.

INTRODUCTION

Failure looms for programmed instruction projects in which there is inadequate consideration of maintenance systems. What happens to the trainee *after* training via programmed instruction is at least as important to job performance as the training itself.

* Program Director, Center for Programmed Learning for Business, University of Michigan.

This paper originally appeared as Chapter III (pp. 60-72) in *Managing the Instructional Programming Effort* (1967), edited by Geary A. Rummeler, Joseph P. Yaney and Albert W. Schrader. Ann Arbor: Bureau of Industrial Relations, University of Michigan. Reprinted with permission.

The intent of this chapter is to enumerate the conditions in the job environment which determine how long any specific behavior will continue to be successfully performed after the training has ended. Ways of maximizing the effect of training through control of conditions in the job environment will be suggested. The conditions which will be in effect after training will affect the decision of whether to train and if so, what to train. Guidelines will be provided on how to make these decisions.

THE TWO HALVES OF CHANGING BEHAVIOR: ACQUISITION AND MAINTENANCE

Acquisition of Behavior

In acquiring a behavior one becomes proficient in a skill which he previously could not perform. The skill is often acquired through training of one sort or another, such as classroom lecture, text, programmed instruction or on-the-job coaching. At some point the trainee is tested and the decision is made as to whether he can perform up to standard. If he can, he is probably put out on the job.

Maintenance of Behavior

At this point the emphasis shifts from acquisition, or *getting* the performance up to standard, to maintenance, which involves *keeping* the performance up to standard. Some ways of maintaining the behavior are by providing the person with feedback on the quality of his work, providing positive consequences to the person for performing at or above standard. Feedback and positive consequences are provided by structuring the job environment so that it provides them through supervision, other sources of recognition, discipline, social contact, money or other meaningful consequences.

MAINTAINING BEHAVIOR

Conditions for Maintaining Behavior

If a system is to maintain a behavior it must do four things: (1) allow the behavior to occur with sufficient frequency; (2) not punish it; (3) reinforce it; and (4) not reinforce behaviors which conflict with it. Two examples will illustrate specific ways in which the above four requirements may be met, and the slight cost involved.

Example 1: In an industrial production company, quality is of great concern. The Quality Control Department checks the quality of a worker's production at unpredictable times. When they find exceptionally high quality work they send a green card to the employee, which states, "The last four units you produced were of especially high quality."

For a very little cost a high level of quality and quantity is maintained.

Example 2: On a production line with a high accident rate the foreman agreed to a policy of (1) thanking production workers for reporting or altering unsafe working conditions and (2) refraining from comments about safety activities slowing down production.

By not punishing accident prevention behavior and, even further, by reinforcing it, the supervisors cut the accident rate.

Examining the world in which we live, we find the same people who state that a given behavior is important often suppress that behavior by advocating a system that does not support the behavior. The following example is a case in point.

**Example of not
Maintaining
Behavior**

Example 3: Freshman nurses calculate dosages better than experienced senior nurses. Examination of the conditions in which freshmen worked and those in which seniors worked showed:

- (1) Seniors were in a hospital, under pressure to administer the correct dosage to a patient; freshmen were in a classroom and required to compute correct dosages on paper and pencil exams.
- (2) Seniors had a pharmacist available who was glad to calculate dosages for them; freshmen had to rely on themselves.

During the freshman year it was worthwhile for a nursing student to be able to compute dosages: her academic advancement depended on it. By the senior year, paper and pencil computation had been replaced by the more attractive alternative of calling a pharmacist.

Increased training for freshmen in calculating dosages would not solve this problem. Similar situations face managers and anyone else who works with people under a variety of conditions.

**Principles of
Behavior**

Two basic principles will equip us to analyze and modify job behaviors. First, if a behavior leads to positive consequences for a person, he will continue to emit that behavior. Secondly, if a behavior leads to negative consequences for the person he will stop emitting that behavior. The key to using these two principles in analysis of a problem or deficient behavior is the phrase “consequences *for a person*.” No one can decide with certainty what will be a positive or negative consequence for another person. By observing what someone talks about and does in his free time, we can make fairly accurate predictions. But, in the final analysis, an event or consequence such as the opportunity to present a plan at a staff meeting may be something that John would work diligently to get and Bill would work hard to avoid.

**Corollary
Statements**

From these two principles, some corollary statements follow, which allow us to see how the two principles specifically affect whether a job behavior will increase in strength, decrease in strength, or disappear. Each corollary statement below is accompanied by an illustrative example.

1. If one behavior is asked for and a second behavior is reinforced, the reinforced behavior will be the one emitted.

Example: A new supervisor attempts to handle all grievances at his level, as he has been told he should. Within a month he learns that if he passes the grievances up to the next level, he doesn't have to worry about them. If he tries to settle the grievances, he gets arguments from his subordinates and has to work overtime to make up for the time spent trying to come to an agreement.

He passes more and more of the grievances on to the next level.

2. If a behavior leads to positive consequences for a person under one set of conditions and negative consequences under another, he will emit the behavior when it leads to positive consequence, and not when it leads to negative consequences.

Example: It's 20 minutes until the end of shift. An accumulation of paper and broken cartons surrounds the work station.

Desired Behavior: Shutting down production and cleaning up debris.

Situation 1:	versus	Situation 2:
Production is running at about standard. There's a cleanliness campaign on.		Production is running 6% below standard.
Unless the operator stops to clean up the mess, he'll get yelled at.		If the operator stops to clean it up, he'll get yelled at.
He shuts down the production line.		He does not shut down production.

3. If behavior is not called for on the job or has no consequences when emitted, it will eventually stop being emitted.

Example: The utility repairman dutifully submits equipment reports when first on the job. He hears nothing more of them; and when he forgets to submit one, nothing happens. He soon stops submitting the reports.

4. The more similar conditions of job performance are to conditions of training, the more likely a person is to perform as trained.

Example: The ROTC graduate trained in precision drill and tactics has a much more difficult time in his defense job of hand-to-hand combat than does the soldier trained in guerilla warfare and survival techniques in tropical jungles.

The further removed in time a consequence is from a behavior, the less effect that consequence will have on that behavior.

Example: A man whose boss compliments him on the tough contract he landed this week works harder on getting more contracts than he would if the boss waited until the annual appraisal (7 months hence) to mention it.

These two principles and, the five corollary statements (1) explain day-to-day performance problems and (2) can serve as a guide in deciding what elements of the job environment must be changed to achieve the desired job performance.

IDENTIFYING THE FACTORS INFLUENCING MAINTENANCE

Programmed learning, designed to teach a job skill, is appropriately judged by whether or not that skill is later performed on the job. It is therefore important to consider the maintenance factors that will affect whether the skill is performed. The employee must not only *know how* to do the job, but also *perform correctly* on the job, in order for the programmed learning to be judged successful.

Supportive Job Environment

A good maintenance system can make the difference between long-term success or failure for your self-instructional program. Stated job requirements must be consistent with the job conditions if they are to be met. When examining the job conditions which will be expected to maintain some specific bit of job performance, one should ask: "Will these conditions support or reward the behavior required?" For example, if we hire or train second line supervisors who can set up and administer a results-oriented appraisal system will the job conditions support the supervisors administering such a system?

Case Study of Maintenance System

The following case will illustrate how a good maintenance system made the difference between a job behavior being performed well and a job behavior being performed poorly. The good maintenance system reduced a company's illegible price markings by 15 per cent.

Case Study

A program designed to teach personnel to discriminate between legible and illegible price markings (*Price Marking; Why Care?*)* was evaluated in the following way: each of the three evaluation teams conducted an item investigation in the Grocery and Frozen Food Department of three different stores. They inspected 6000 items per store, examining the items most likely to be taken by the next customer. Each mismarked item was tallied, using the standards developed in the program. The number of mismarked items totaled approximately 20% of the entire sample.

* Basic Systems, Inc., Educational subsidiary of Xerox Corporation.

Each store then used the program, *Price Marking; Why Care?* The performance of personnel was again evaluated after training. Figure I illustrates the differences between the program’s effect on performance in the three stores.

By taking the programmed instruction materials the trainees improved their performance from an average of 20% unacceptable price markings to an average of 5.5% unacceptable price markings. The acquisition phase was considered successful.

Figure I

Performance in Price Marking

	Before Training	1 Month After Training	Store Activity During Next 3 Months			4 Months After Training
	% Unacceptable Price Markings	% Unacceptable Price Markings	Turnover	New Employees Trained	Management Follow-up	% Unacceptable Price Markings
Store X	22.5	7.1	High	No	No	13.8
Store Y	17.7	4.8	High	Yes	Yes	6.1
Store Z	20.1	4.6	Low	No	No	8.8
Average	20.1	5.5				9.6

The maintenance phase varied in success from questionable to successful. Where the program was treated as one-shot remedy its effect “wore off” quickly. Where a thorough maintenance procedure (management follow-up) was used, the program was effective even four months after training.

If the program had been tried in *only* Store A, where there were 13.8% mis-marked items three months after training, the program would have appeared to be of transitory value. As it is, the comparative results in the three stores indicate that if one uses the program, it is worth doing follow-up to support the skills trained. People quickly adapt to different conditions. If we train them in one job skill, such as quality of price markings, and then, on-the-job, pay attention to a different skill, such as rapidity of price marking, they will act as if quality is important in the training environment and rapidity is important on the job.

In order to make training effective, the training should be compatible with job goals. If, for example, we get all automatic stamping machine operators to agree that safety is more important than a several unit increase in hourly production, will their bosses accept and support that back on the job? The job environment should be analyzed to see in what ways it will support, and in what ways it will punish the skill or behavior that we propose to introduce.

Training Behavior Compatible with Job

**Identifying
Rewards and
Punishments**

Identifying the reinforcement-punishment ratio may not be a one-step job. It can require the exploration of consequences of all levels, with some adding up of the final margin of reinforcements or punishment in the system. Although the exploration of consequences is a complex task, it is an essential one since without it we frequently *assume* that the system reinforces required job behaviors. Many training dollars and much time could be wasted in trying to change a job behavior via training if this assumption is wrong. The assumption could lead us to conduct a costly training program which would have only a temporary effect in a system which punished the behavior we trained.

The list of questions in Figure II illustrates the nature of the task of identifying the reinforcement-punishment ratio. It is not an exhaustive or exclusive list of questions that should be answered but rather an illustration of the kind of questions that will help you decide whether any given skill would be maintained in a specific environment.

Figure II
Examining a Maintenance System

- I. Goals and Standards
 - A. Does the employee know what's expected of him and under what circumstances?
 - B. Does the boss assess conditions and standards so that his appraisal matches the appraisal of the employee (and of the trainer)?
- II. Consequences of Behavior

If an employee were to perform according to specifications what would be the:

 - A. *Immediate* consequences for him?
 - (1) from peers
 - (2) from subordinates
 - (3) from supervisors
 - (4) in terms of distasteful things he'd get out of doing, or enjoyable things he would not be able to do
 - (5) others
 - B. Long-term consequences for him?
 - (1) promotion, raise, recognition
 - (2) reduced time on this part of his job
 - (3) fewer crises
 - (4) cut his budget
 - (5) less/more contact with employees
 - (6) more/fewer chances to be noticed by upper management
 - (7) more/fewer grievances to handle
 - C. Overall consequences for him
 - (1) Immediate
 - (a) more positive than negative?
 - (b) more negative than positive?
 - (2) Long-term

- (a) more positive than negative?
- (b) more negative than positive?
- (3) Overall
- III. Feedback of Knowledge of Quality to Employee
 - A. Would the employee learn that his performance was superior?
 - If so,*
 - (1) How?
 - (2) From whom?
 - (3) In what form? (print-out of quality control sheet, backhanded verbal compliment)
 - (4) How long a delay between completion of job and feedback of quality to employee?
 - (5) Is there a cumulative consequence of continued superior performance?
 - If so,
 - (a) What is that consequence?
 - (b) What are the chances of getting it?
 - (c) How long a continued superior performance is needed?
 - (d) How long after the time requirement (c) is met does the consequence occur?
 - B. Would the employee learn that his performance was inferior?
 - If so,*
 - (1) How?
 - (2) From whom?
 - (3) In what form?
 - (4) How long a delay between completion of job and feedback of quality to employee?
 - (5) Is there a cumulative consequence of continued inferior performance?
 - If so,
 - (a) What is the consequence?
 - (b) What are the chances of incurring that consequence?
 - (c) How long a continued inferior performance is required to incur the consequence?
 - (d) How long after the time requirement (c) is met does the consequence occur?

**Decision to
Train or
Alter
Environment**

If you determine on the basis of questions such as those in Figure II that the job environment will support the skill or behavior you plan to introduce, you can go on to determining the most efficient means of acquiring personnel with the desired skills. If the job environment will not support the behavior, you have the choice of:

* Repeat question sequence 1-5 as often as needed

1. abandoning your plans for introducing the particular skill into that job environment; or
2. determining (a) what changes are necessary to maintain behavior in the job environment (e.g., changes in supervisory practices, redesign of a job aid, or automation of some function); (b) what those changes would cost; and (c) whether it's economically more sound to make the changes or ignore the problem.

CHANGING BEHAVIOR THROUGH CHANGING ONLY MAINTENANCE

Problems can be solved by ignoring acquisition and working only with maintenance procedures. It is worthwhile to work only with maintenance for any problem in which the personnel once knew or could not learn by themselves the skill or behavior being considered. The following example illustrates such a problem.

Example: Warehouse employees didn't lift cargo properly when loading trucks. When they were told that the next item they lifted was going to be a test of whether they could lift properly, all men performed up to standard. A change in the job environment, i.e., the maintenance system, solved the problem – men lifted properly on the job with no changes in the means by which they acquired the skill.

You can determine whether your problem arises from a deficiency in acquisition or in maintenance by following the questioning in Figure III (the "Analysis of Type of Deficiency Form"). The question of whether the warehouse employees lifted improperly due to deficiencies in the acquisition or the maintenance system had to be answered to solve the problem. Solution of the problem in this case meant:

1. Reduced amount of money in medical benefits paid due to back injuries.
2. Reduced number of grievances on working conditions filed by warehouse employees who lift.
3. Reduced number of hours worked by substitutes hired to replace employees who are off the job due to back injuries.

Use of the "Analysis of Type of Deficiency Form" revealed that (1) people knew what was expected of them; (2) the men performed adequately immediately after training; (3) there were no high and low performers who could be observed; and (4) men *could* perform the job if they had to do so.

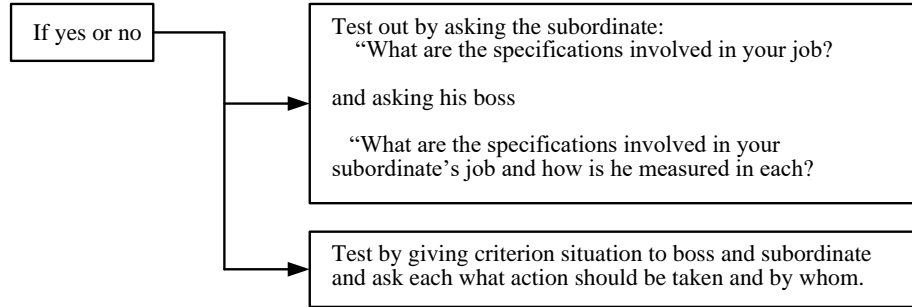
Figure III

Type of Deficiency: Analysis Guide*

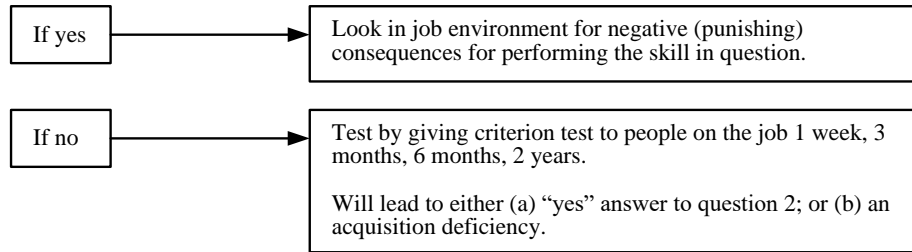
Objective: To determine if problem is an acquisition problem (can't do) or a maintenance problem (won't do).

Questions and Suggested Actions:

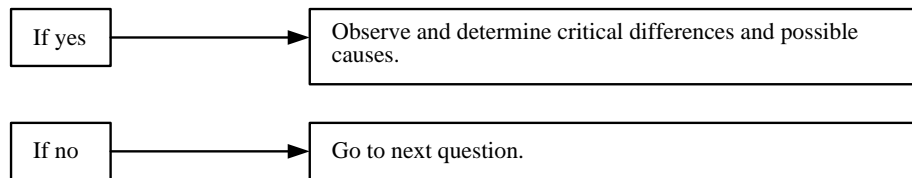
1. Do people know what is expected of them?



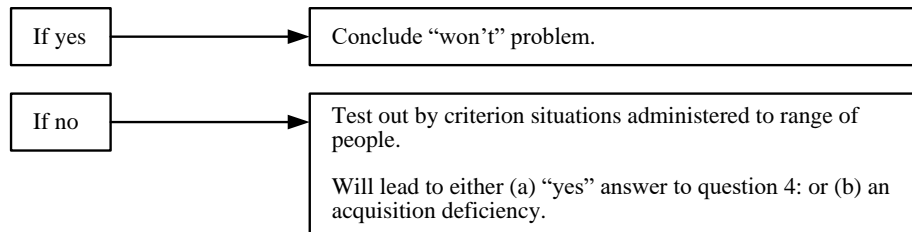
2. Do most men perform adequately when they are first on the job?



3. Are there high performers and low performers who could be observed to see the differences in behavior?



4. Could most men perform the job if they had to (i.e., their lives depended on it)?



* "Type of Deficiency: Analysis Guide" designed by Geary A. Rummler, Center for Programmed Learning for Business.

Based on the fact that the men performed adequately just after training, job conditions were investigated further. On the job, supervisors reprimanded employees when they saw them lifting improperly. When they saw employees lifting properly, the supervisors didn't reprimand them and went on about their business.

Changes in the job environment followed this analysis. The plan was that a supervisor (1) would ignore improper lifting, and (2) occasionally make a supportive comment when he noticed proper lifting. Under these conditions, men could no longer get their boss upset by lifting improperly; in other words, the positive consequences for improper lifting were removed. The supervisors were given some training and practice in the techniques of (1) and (2) and sent back to their respective warehouses.

After three months the division had only one back injury as opposed to an average of eight for the same time period in the past.

In this case restructuring only the maintenance system led to a dramatic improvement in performance. No changes were made in the acquisition system. If satisfactory performance of a given job behavior is ever exhibited, it's economically a sound decision to investigate maintaining that satisfactory level of performance by changing only the maintenance system.

SUMMARY

What does this mean to writers and users of programmed instruction?

Analyze any problem you face to see whether it stems from a deficiency in maintenance or from a deficiency in acquisition. If this analysis had not been done in the "proper lifting" example it would have been assumed that the problem was one of acquisition of proper lifting skills, and a programmed instruction course in "How to Lift Properly" would probably have been written for warehouse employees. Instead, the problem was analyzed, and turned out to be one of maintaining a previously acquired behavior. A programmed instruction course was written, but it was for *supervisors* to help them provide the job conditions necessary to support proper lifting by their subordinates. The analysis led to effective behavior change through programmed instruction, rather than "just another training course."

Analyze and restructure, as necessary, the job environment in which employees are to use the skills trained. If this is not done, programs can fail for lack of job support. In designing your program, keep in mind that programmed instruction is a means of acquisition and, as such, only the first part of a behavior change system. Without maintenance acquisition is temporary.

ENDNOTE

At the time I reproduced this paper, Karen Searles Brethower, Ph.D., was President of Executive Consultation, LLC., a Connecticut-based leadership effectiveness consulting firm that focused on executive assessment and coaching, negotiation and conflict management, and facilitated planning. Dr. Brethower also served as Vice President and Director of Manpower Planning and Executive Development at Chase Manhattan Bank and was also employed by Ford Motor Company. She held national office with ASTD and with NSPI (now ISPI).

Sadly, Karen passed away in 2018. Remembrances of Karen have been written by Judy (Springer Steele), Danny Langdon, and myself. They are posted on Guy Wallace's web site where Guy also has an in-depth look at Karen's career and contributions to the field of human performance improvement. Here is a link to that section of his site: <https://eppic.biz/2015/10/02/my-1st-friday-favorite-guru-series-karen-brethower/>