

MANAGEMENT OF BEHAVIORAL CONSEQUENCES IN EDUCATION¹

JACK MICHAEL
Western Michigan University
U.S.A.

I. AN ANALYSIS OF THE EDUCATIONAL PROCESS

A. *One Teacher—One Learner*

1. *An example.* Consider the type of tutorial situation, quite common in the past, in which an adult is teaching a child to read and write the alphabet. The teacher writes a letter on a slate and names it, then asks the child to repeat the name while looking at the letter. Next, the child is asked to copy the letter made by the teacher, and repeat its name as he attempts to draw it. New letters are introduced, rapidly at first, and then more gradually as it becomes necessary to devote more time to reviewing letters already introduced.

Throughout the process, the child's efforts at naming or drawing the letters are reacted to by the teacher in that he indicates that the child has behaved correctly or that he has made an error. The nature of the error may be explained or the child may simply be told that something is wrong, and to try again.

2. *Two functions of the teacher.* The teacher's behavior toward the child in this situation serves two important functions. One is to present a task or stimulus situation which takes maximum advantage of what the child already knows regarding the material being taught. In the present example the child obviously has already learned to imitate vocal sounds and to draw simple figures on a slate. In working with a child who has had no previous experience in drawing, the teacher would first instruct him in this skill, but would probably use simpler material than letters of the alphabet in the early stages of this instruction. It is wasteful of time and effort to teach something which is already known, or, on the other hand, to attempt to develop a repertoire when prerequisite skills are inadequate.

A second function served by the teacher's behavior toward the learner is to provide the differential consequences that result in correct or adequate behavior being more strongly developed than incorrect or inadequate. If for some reason a child misnames one of the letters and is not corrected, there is no reason to expect him to behave differently when that letter is next presented.

¹This discussion is divided into two parts. Here presented is what we shall refer to as Part A, while the second and final portion, Part B, is due to appear in the December, 1969 issue of this publication.

3. *Maintaining participation.* Our description of the tutorial situation will not be complete, however, until we consider the factors responsible for the child's participation. (We will take the teacher's motivation for granted in this analysis, assuming that he either benefits directly from the child's increased knowledge, or that the culture maintains his teaching behavior by remuneration of some sort.) Why does the child attend the tutorial session and why does he cooperate with the teacher in the educational activity? The maintenance of participation, unlike the two previous functions, is not usually the sole responsibility of the teacher. In the present example it would not be unreasonable to suppose that the child was sent to the teacher by his parents and "given to understand" that he should obey the teacher and try to learn as much as he could. The consequences of a child's failure to cooperate with his parents are, in the case of effective parents, likely to be less satisfactory than those of cooperating. This differential effect might be brought about by punishment for disobedience, or by praise, admiration, and other advantages and privileges that are contingent upon cooperation. In older times, parents commonly delegated considerable authority and responsibility to the teacher for the control of the child's behavior, and this is still done in some cultures, although not so much in our own where, for example, parents are generally unwilling to allow teachers to utilize corporal punishment.

It would be a mistake to emphasize the advantages of participation as consisting primarily in avoiding punishment for recalcitrance. There are often many positive ways in which education competes with other activities. In a culture where there is no universal education it may be a great honor to be sent to school, and schoolwork, even though onerous, may be much less so than the work being done by those who do not go to school. Some teachers are personally very effective sources of positive control, combining the talents of the entertainer and the affectional characteristics of a good parent with their teaching skills, although this form of personal effectiveness plays a smaller role when one teacher must work with many pupils. And of course, a variable that sometimes plays a role in maintaining participation is the utilization of the skill or knowledge learned from the teacher in obtaining some favorable consequence outside of school.

Most realistic situations actually involve a complex mixture of many of these factors and others besides, with the mixture differing from child to child. However, if these controlling variables are successful in maintaining participation, this means that the consequences of participating are more favorable than the consequences of engaging in other behavior.

Differential consequences, then, are responsible for the ultimate

advantage that correct or more adequate behavior gains over incorrect or less adequate behavior in the educational process, and they are also responsible for the learner's participation in the educational activity.

The importance of the consequences of the learner's behavior in the tutorial instruction is not surprising when one considers the emphasis on behavioral consequences in modern psychology. There are areas of interest and theoretical approaches within psychology in which it would be fair to say that the primary concern is with the details of the relations between the consequences of behavior and subsequent changes in behavior. The expressions "learning theory," "behavior theory," "reinforcement theory," "operant conditioning," "behavior modification" all refer to areas of investigation where the consequences of behavior are among the most frequently studied independent variables. Of course, in all these areas it is recognized that behavior is not determined only by its consequences; eliciting stimuli as in reflexes and instincts, deprivation and satiation with respect to basic biological requirements such as food and water, genetic factors, and others are all recognized as important. It would be safe to say, however, that one of the most rapidly developing areas within modern experimental and applied psychology is the science and technology of behavioral consequences, and before continuing with an analysis of instruction, it will be convenient to introduce some of the terminology and principles of this science.

II. THE SCIENCE AND TECHNOLOGY OF CONSEQUENCES

This section is a temporary interruption of Part I, which will be resumed after some of the technical aspects of consequence manipulation have been introduced. This technical material is ordinarily presented in the form of a set of basic concepts and principles, stated in abstract and general terms. In this form the logical structure of the knowledge can be appreciated most easily, and it is also a form which permits rapid scanning when a novel problem must be dealt with. On the other hand, implications of this body of knowledge most relevant to educational practice are conveniently presented in a more concrete form—a set of principles and rules of effective usage.

A. *Basic Concepts*

The set of concepts and principles presented below is by no means a complete set of the known principles of behavior. As mentioned above, there is more to behavior than relationships involving consequences. On the other hand, the material presented is a little more complete and detailed than is actually necessary for the analysis of the role of consequences in education, and for the suggested applications that follow. However, the more complete presentation will

increase the effectiveness of future contacts with this body of knowledge as well as future attempts to utilize the knowledge in other areas of application than those herein considered. It is also quite possible that some of you, in your attempts to verify for yourselves the consistency and adequacy of this material, will raise questions and construct situations requiring the more complete presentation.

1. *The term "operant."* At one time it was thought that all examples of behavior could be divided into two almost mutually exclusive categories: behavior for which a prior eliciting stimulus could be identified, as in reflexes such as salivation to the stimulus of food in the mouth; and behavior for which no prior eliciting behavior could easily be found, and which was affected by its consequences, as when food is given to an animal after he lies on his side and as a result of this consequence he lies on his side more often in that particular situation. B. F. Skinner (1938) coined the terms "respondent" for the behavior which was elicited by a stimulus and "operant" for that which was sensitive to its consequences. He further noted that, in general, respondent behavior involved protective reflexes which maintained the internal economy of the body, and operant behavior acted on the external environment.

The general adequacy of this dichotomy is in some question at the present time, but the term "operant" has become widespread as a way of labeling behavior which is affected by its consequences, or processes and relations involving consequences.

In the preceding material when it has been stated that behavior is affected by its consequences, "behavior" has meant "behavior similar to that which had the particular consequence." Naturally, behavior which is completed cannot be altered. What is altered by a consequence is the likelihood that that *kind of behavior* will occur again. When a child is praised for some protective act toward a younger sibling, that act is over and unalterable at the time the praise is given. The effect of the praise, however, may be to increase the occurrences of similar protective behavior when future opportunities for such behavior arise. Most readers probably took this implication for granted, but it is important that it be made explicit at this time, since the principles which follow all assume this "behavior of a certain kind" meaning of the term "behavior."

2. *Operant strengthening: reinforcement.* In any particular situation there are environmental changes or stimuli which increase the frequency of some of the behavior that preceded the change. For that situation such environmental changes are called *reinforcers*, and the relation between a reinforcing operation and the resulting increase in behavior is called *operant conditioning*. Some reinforcing

events can be easily interpreted as the presentation of something which was not previously present, as when food is given to a hungry animal. Others can be clearly seen as the removal of something which was previously present, as when an unpleasantly loud noise is turned off. This possibility has led to a classification of reinforcement operations as *positive reinforcement* when behavior is strengthened by presentation, and *negative reinforcement* when it is strengthened by removal. However, as more reinforcing operations are studied, especially with humans, more are encountered that are ambiguous with respect to an interpretation as presentation or removal. Furthermore, even when the interpretation is not ambiguous, the strengthening resulting from presentation does not seem to differ in any fundamental way from that resulting from removal. For these reasons, and in view of the considerable communicative confusion that the positive-negative dichotomy has always produced, it will not be used in the material which follows. Perhaps it is sufficient to say that many environmental changes which function as reinforcers when made in one direction, will function as punishers when made in the opposite direction, and vice versa.

3. *Operant weakening: punishment.* In any particular situation there are environmental changes which decrease the frequency of the behavior preceding the change and these are called *punishers*. There is no generally accepted term for the relationship between the punishment operation and the resulting decrease in behavior. "Punishment" is sometimes used in this way, but most commonly refers to the operation of delivering a punisher rather than the relation between this operation and the subsequent change in behavior. There seems to be no simple opposite to "conditioning" that would be appropriate to the weakening effect of a punisher. Perhaps it would be convenient to adopt the expressions "operant strengthening" and "operant weakening," which retain the sense of behavior operating on the environment and permit the use of the simple descriptive terms for the effects of the environmental change on behavior.

The effects of punishment have been more difficult to study than those of reinforcement because these effects cannot be easily studied without the simultaneous involvement of reinforcement. To study operant strengthening or conditioning a type of behavior can be brought up from an almost zero frequency of occurrence by reinforcement to a relatively high frequency, and all within a short time period. It is not similarly feasible to study the effect of punishment on behavior which rarely occurs, so the behavior to be studied is usually brought to a high frequency by the use of reinforcement and then punished, either while it continues to be reinforced, or at the

same time the reinforcement is discontinued. Many complications arise from this mixture of punishment and reinforcement but recent research, particularly the work of N. H. Azrin and his colleagues (e.g., Azrin and Holt, 1966) has experimentally untangled this mixture of effects and seems to confirm the common sense interpretation that punishers function as simple opposites to reinforcers.

4. *Conditioned reinforcement and punishment.* An environmental event or stimulus change which does not function as a reinforcer (or punisher) will do so after it has been paired (presented at the same time) with one which does. Such an event is called a *conditioned reinforcer* (or punisher) in contrast with *unconditioned reinforcers* which do not require pairing with another event in order to have reinforcing value. The effect of pairing is temporary in that repeated presentations of the conditioned reinforcer by itself will result in its losing its reinforcing characteristic. Another situation which develops conditioned reinforcers is a chain of successive events or consequences so related that each member of the chain is a necessary condition for obtaining the next member, with only the terminal condition functioning as a reinforcer prior to exposure to the chain. Some events, then, become reinforcers because they frequently occur at the same time as other events that already function as reinforcers; the process of pairing stimulus events—some become reinforcers because they are conditions which are in a means-end relation to other conditions in which some form of reinforcement can be obtained; the process of chaining. The two processes are obviously closely related but not so closely that one process can be derived in any simple fashion from the other.

5. *Reinforcers and punishers.* A good deal of time and effort has gone into the attempt to classify the events that function as reinforcers and punishers, especially with the aim of identifying such events without having to first try them out. At the present time, however, there is no completely adequate way to be certain whether an event will function as a reinforcer, a punisher, or as a neutral consequence (one which has no effect on behavior), without using the event as a consequence and then observing its effect on behavior. But while we cannot be certain, we can usually make good guesses. Many members of many different animal species have been studied under a wide variety of situations, and several quite reliable generalizations have emerged.

a. *Events related to evolutionary history.* Some events are reinforcers and punishers because of our biological make-up, or, said another way, because of our evolutionary history. All humans seem to come equipped with the capacity to be reinforced by food when

they are food-deprived, water when they are water-deprived, and by a number of other of bodily conditions which are related to the survival of the individual or of the species. Similarly, we all have the capacity to be punished by those kinds of stimuli that we call painful or unpleasant: blows and cuts on the surface of the body, distortions of certain inner organs, as in a stomach ache, extremes of heat and cold, and so on. These biologically relevant events can be relied upon to affect most humans in pretty much the same way and are usually called *unconditioned* or primary reinforcers and punishers as distinguished from the conditioned or secondary reinforcers and punishers to be described next.

b. *Events related to individual history.* Only a small proportion of the important consequences of human behavior are unconditioned reinforcers and punishers that have evolved as a part of our biological make-up. A far larger proportion is related to our own individual history, the conditioned reinforcers and punishers developed by the processes described in Section 4 above. These are events which function as significant consequences because of their relation to other events, with which they are frequently paired, or for which they are necessary preconditions. For most people the approval and disapproval of other people function as such events. Money is another example, as are most of the things money can buy with the exception of the unconditioned reinforcers and punishers which do not need to be related to other consequences. For a hungry man food is an unconditioned reinforcer, but a city map which enables him to locate a restaurant, a bus token, the appearance of an appropriate bus, the conductor's call of his point of departure, the appearance of the restaurant as he turns a corner, the arrival of the waitress at his table, the descriptions on the menu, etc., are all conditioned reinforcers if he has had the experiences with these events.

c. *Activities as consequences: the Premack Principle.* Many significant consequences for humans can be described as *activities*. Examples of reinforcing activities for children (and for some adults) are playing in water and swinging on a swing. Punishing activities are having to perform a very effortful task and having to sit quietly and do nothing. Not all reinforcers and punishers can be so described. For example, social praise and painful stimuli do not seem to be activities and are more accurately described as reinforcing or punishing *stimuli*. The fact that many human reinforcers are activities, however, has led to the development of a rather useful principle for identifying such reinforcers. (Unfortunately, the principle has not been easy to apply to the assessment of punishing events.) This general rule was first stated by a psychologist named David Premack (1959) and has become known as the Premack Principle.

It states that of any two activities, the more probable one will function as a reinforcer for the less probable one. This requires some elaboration, however. Consider that we observe a child in a play area by himself who has free access to several activities, and we keep track of the amount of time spent in each. We observe that he spends about 25% of his time in the sand pile, 40% playing with a water pan and faucet, and 15% on a swing. The 20% of his time which is not accounted for by these three activities is taken up in many different activities, no one of which occupies much time. Let us further assume that we have observed the same child during several different play periods and his percentages are fairly stable. What the Premack Principle tells us is that if we now restrict access to the water play area, and make such access contingent upon a specified period of play on the swing, that is, we require the child to play on the swing in order to gain access to the water play area, we can increase the amount of time spent on the swing. Or, said another way, water play functions as a reinforcer for play on the swing. Likewise, if we restrict access to the sand pile, we can use such access as a reinforcer for play on the swing. Water play will also serve as a reinforcer for sand pile activity. In other words, a more probable or frequently engaged in activity will serve as a reinforcer for a less probable one.

As will be described later, this principle can be put to good use in getting children to spend more time in educational activities. All that is necessary is to require a certain amount of educational activity before permitting a period of time at a higher probability activity, such as some form of play. Of course, access to the higher probability activity must be restricted in some way and become possible only when the required lower probability activity has been carried out.

d. *The relativity of consequences.* An important but often insufficiently emphasized aspect of significant behavioral consequences is their relativity. Having identified an event as a reinforcing consequence in a particular situation does not imply that it will function as such when the situation is changed. This seems obvious when these concepts are first introduced, and the relativity of the effect of a consequence to situational variable is often stated as a part of the critical definition of the consequence. As the concepts of reinforcement and punishment become more familiar, however, this qualification is sometimes forgotten, and for this reason will be elaborated on somewhat at this time.

The unconditioned reinforcers and punishers are dependent upon certain establishing conditions. Food, for example, is a reinforcer to a hungry man, but is a punisher to someone who is nauseated, and

probably is of neither reinforcing nor punishing value to someone who has just finished a satisfying meal. If we are inadequately clothed for cold temperatures, to go from a room at zero degrees F. to one at freezing is a reinforcing consequence, but to go from a room at 60 degrees to one at freezing is a punishing consequence. The description of the consequence is not completely given by the statement "to go into a room at freezing temperature." The description must include the condition which existed before the change.

The culturally developed reinforcers are even more sensitive to the circumstances surrounding their occurrence. Signs of approval such as someone saying "good" and smiling usually function as reinforcing consequences, but it is not simply the statement and the smile that are reinforcing. The general circumstances must be considered as well. This is illustrated by the example of walking along with a person, tripping over some object and falling in such a way as to produce considerable pain. If, at this point, our companion smiles and says "good," it will certainly not function as a reinforcer. In our culture money is a reinforcer and loss of money is a punisher, but only under relatively specific circumstances. Money that we earn in an employment situation is quite obviously related to the maintenance of the work for which we are paid. On the other hand, to be offered money for something which was given as a favor or as an act of affection may function as an insult.

Another form of relativity is illustrated by the example of the Premack Principle. Recall the hierarchy of activity probabilities: water play was more probable than sand pile which was more probable than play on the swing. Is play in the sand pile a reinforcer? An absolute answer is not possible. It is a reinforcer for play on the swing, but certainly not for water play. Parents often encounter this situation in an attempt to induce a child to stop engaging in some activity which is punishing in some way to the parent. They offer an alternative activity and when it is refused by the child are often heard to say, complainingly, "but I thought you liked to . . ."

Perhaps a useful way to conceptualize reinforcement is in terms of the common sense expression "improvement"; similarly, the concept of punishment is conveyed by the term "worsening." Both of these expressions imply the relativity inherent in significant behavioral consequences. Any change for the better, whether it be from a very undesirable condition to a less undesirable one, or from happiness to ecstasy is a reinforcing consequence. On the other hand, any change for the worse is a punisher, whether it be from ecstasy to only mild happiness, or from a condition that is bad to one that is wretched.

The complexity in the identification and use of consequences im-

plied by the preceding considerations has tempted some educators to reject this approach, and to seek simpler and less ambiguous variables. This is unfortunate, since even with the qualifications implied by the term "relativity," the manipulation of behavioral consequences has proved to be a very powerful technique for the control of behavior. Food is only a reinforcer for food deprived organisms but this has not prevented the use of food reinforcement in many important investigations of lower animal behavior. We can usually produce an appropriate level of food deprivation, or at least know from the keeping of accurate records what the state of deprivation is at any particular time. Money does not always function as a reinforcer for adults, but it usually does, and its use in purchasing services or in maintaining various kinds of work is generally quite successful, as is its use in laboratory research on the effects of various kinds of reinforcement and punishment contingencies with humans. The use of the Premack Principle might seem unnecessarily intricate, but as illustrated in the example of the work of Lloyd Homme and his colleagues, given below, it is often quite easy to overcome the intricacies by various administrative strategies.

The identification of reinforcers is often a "hit or miss" affair at first, but with increasing familiarity with a particular child or with a particular socio-economic level or with a particular sub-culture their discovery and utilization become increasingly reliable and effective. This material on the relativity of consequences should, however, alert us to the necessity of careful and continued consideration of the general circumstances surrounding the use of consequences.

6. *Extinction.* The strengthening and weakening effects of reinforcers and punishers are, in general, temporary. When the reinforcing environmental change no longer follows a particular kind of behavior, the frequency of the behavior decreases. This process is called extinction, or *operant extinction*. There is no term for the analogous process in the case of punishment, but similarly, if the frequency of some behavior has been decreased by punishment, then when the punisher no longer follows that kind of behavior its frequency increases. It would probably be convenient to extend the term extinction, thus referring to the extinction of operant weakening effects as well as the extinction of operant strengthening effects.

7. *Specificity and generality.* With respect to the strengthening effect of reinforcement, the weakening effect of punishment, and also with respect to the extinction of these effects, there is stimulus specificity. The future behavioral change is seen at maximum value when the stimulus conditions resemble most closely those that existed at the time of reinforcement, punishment, or the extinction operation.

However, there is some generality or, said another way, the specificity is only partial. Some behavioral change can be observed even when the stimulus conditions differ considerably from those of original training. For example, a pigeon reinforced with food for pecking a green disk on the wall of its chamber pecks disks of other colors, but less rapidly than the green disk. A pigeon reinforced for pecking disks of several colors and then extinguished on green will show some resulting decrease in responding with respect to the other colors, but not as much as when the disk is green. The occurrence of a reinforcement or extinction effect under conditions differing from those of original training has usually been referred to as *stimulus generalization*, and has been studied extensively with the principal dimensions of auditory and visual stimuli. The partial stimulus specificity of punishment effects has hardly been studied at all, but seems qualitatively quite similar.

8. *Qualitative relations.* In addition to these essentially qualitative statements about consequences and their effects a good deal is known about various quantitative relations involving consequences. This information is not unexpected in terms of common sense knowledge and will be given only in summary form.

In general, the greater the amount, the better the quality or the higher the frequency or probability of reinforcement, the greater the strengthening effect on behavior. This means that behavior will occur more frequently, with shorter latency (if a stimulus is involved), or that a more effortful behavior can be maintained. Working in the opposite direction, the greater the delay of reinforcement or the more effortful the response, the less the effect of reinforcement on behavior. In the case of punishment, the greater the intensity or frequency of punishment, the greater its suppressive effect; the greater the delay between the response and the subsequent punishment, the less its suppressive effect.

B. *Principles of Effective Usage*

In the previous section, general principles and concepts were presented which referred to the relation between the behavior of an organism and the consequences of this behavior. The management of consequences in applied settings requires this knowledge, but is facilitated by some supplementary practical suggestions which are here called, for want of a better name, principles of effective usage. The first four principles are emphases necessary to correct common errors of application. The next four are specialized derivations from basic principles which are particularly relevant to the educational setting. The last is an attempt to insure the effectiveness of interactions between the person for whom behavioral consequences are being ar-

ranged and the arranger, when the relationship has the form of a contract.² Some additional principles are presented in a later section dealing with behavior problems in the classroom.

Educational settings involve one or more persons who are in the setting to be educated, and one or more persons who are there to do the educating. In what follows, many references to these two roles will be made, and for this purpose the terms "teacher" and "learner" will be used. It is, of course, recognized that the roles are often reversed in the dynamic interplay of the classroom, and also that a good teacher "learns something" every time he interacts with his students. It should also be kept in mind that the "teacher" in a particular situation may be primarily an educational administrator such as a principal; someone involved in pupil personnel services, such as a counselor, or, in the present case, a researcher.

PRINCIPLE NO. 1: *Consequence Identification—Reinforcers and punishers must be identified as such in terms of their effects on the behavior of the learner, not the teacher.* This is an obvious implication of the previous discussion of reinforcers and punishers (Section II, A, 5), but is often neglected, with the result that the learner's behavior is not changed and the teacher experiences extinction in her efforts to manipulate consequences. It is not unreasonable, in the search for effective consequences, to base an initial selection on one's own reaction to some event, or the reaction of someone who resembles the learner in one or more ways. To some extent we are all pretty much alike, and such a basis of selection will often be successful. If the consequence does not seem to have the expected effect on a particular form of behavior a necessary form of troubleshooting is to prove that it is an effective consequence by demonstrating that it can control some other form of behavior. One context in which this problem often arises is the attempt to teach something to a child who is abnormal in some way—retarded, physically disabled, brain injured, psychotic. When such an attempt using reinforcers that are effective for "normal" children fails, it is very common to attribute the failure to the child's defective ability to learn. A good deal of research is available at the present time to show that many such failures are due to defective reinforcers, and when more powerful reinforcers are used, the child learns readily.

PRINCIPLE NO. 2: *Automaticity—Consequences affect behavior in an automatic or mechanistic way: it is not necessary that the learner be able to verbalize about the relation between his behavior and the*

²This entire section is modified from similar material by Homme and Csanyi, 1967, whose willingness to show me their material in an unpublished form is gratefully acknowledged.

MANAGEMENT OF BEHAVIORAL CONSEQUENCES IN EDUCATION

consequence, or even that the consequence has occurred. This must also seem obvious when it is realized that most of the details of our present knowledge of the effects of reinforcers and punishers were discovered in research with sub-human animals. Of course, it is often true that humans are able to talk about, and in a sense "understand" the significance of the consequences of their behavior, but this does not imply that they have lost the more primitive capacity to be altered by such consequences about which they cannot verbalize.

Failure to appreciate this principle has led to two kinds of errors. The first consists of failing to attempt to alter the behavior of a non-verbal human on the grounds that he will not "understand what he is being reinforced or punished for." This kind of error is quite prevalent in work with very young children, and also in some areas of special education. Recent efforts to teach non-ambulatory, severely retarded children to walk have been quite successful using the technique of providing food reinforcement for successive approximations to walking (Meyerson, Michael, and Kerr, 1967). Such efforts are recently largely because of the widely-held belief that such children could not be affected by a reward which they did not understand.

Another kind of error is failing to attempt to alter the behavior of a human who already verbalizes strong motivation toward some goal which is nevertheless not being effectively worked for. Some children claim that they want very much to learn a particular school subject such as mathematics, and that they are trying very hard. It may even be the case that a considerable amount of time is spent with a particular subject, and intensity of desire may be demonstrated by appropriate emotional effects. This does not imply that considerable improvement could not be brought about by an arrangement involving a powerful reinforcer, such as money to be used to obtain some highly desired object, contingent on correct answers to test problems in some form of programmed remedial material.

PRINCIPLE NO. 3: *Relevant criteria—When the main purpose of the use of reinforcement and punishment is educational accomplishment these consequences should be closely linked to the criteria of accomplishment.* It is not uncommon for reinforcement to be related to spending time at a task rather to some criterion of accomplishment of the task, in which case, the only sure outcome is that the time will be spent, but not necessarily productively. This may occur because it is easier to monitor, as when a teacher says, "Work on your arithmetic problems for 20 minutes and then we will have singing and dancing." It would be much better to provide the opportunity for the more preferred activity after a certain number of

arithmetic problems had been *correctly* solved, although the latter contingency is certainly more difficult to administer.

Another common error is to reinforce speed without an accuracy requirement. "As soon as you finish 10 problems you can read." If speed is reinforced fast work will result, but in almost no educational activity, with the possible exception of certain athletic events, is speed alone an adequate criterion of accomplishment. The teacher might modify the requirement to "As soon as you answer ten problems correctly you may read," but even this could be unsatisfactory if it is possible for the learner to select the ten from a larger set and work only those he finds easy. The criterion for reinforcement should conform precisely to the goals of the particular lesson, as perhaps "When you have worked the first ten problems of the lesson and gotten the correct answers you may read." And, of course, it must not be possible to simply copy the correct answers from the work of another child or from some other source, as when the problems in a workbook are accompanied by the answers. Conforming to this principle is always administratively more difficult than ignoring it but if it is kept in mind when lessons and classroom activities are being designed, it is not as difficult as might be thought. Some more concrete suggestions are provided in Part III below.³

At a more general level, failure to conform to this principle underlies the fact that it is possible for children in our culture to participate in public education and still not learn. The differential consequences relevant to participation are often only indirectly related to educational accomplishment. A child is punished in various ways if he is truant or if he creates a disturbance in school, but if he is cooperative, he can avoid most of this punishment, obtain a considerable amount of the social reinforcement associated with interactions with the teacher and the other children, and still learn very little. This problem will be discussed in more detail when we return below to the analysis of the educational process.

PRINCIPLE NO. 4: *Consistency*—The teacher must attend to the consequences of the learner's behavior at all times and in all situations. It is not the case that the principles of behavior are suspended because the teacher is tired, angry, or otherwise involved in his own personal problems. This principle becomes critical in dealing with classroom behavior problems, and will be elaborated in Part IV.

PRINCIPLE NO. 5: *Immediacy*—consequences should be as close in time to the behavior responsible for them as possible. Delayed re-

³All references to "below," "Part IV," "resumption of Part I," and "Part III" will be included in the second half (Part B) of this article which will appear in Volume III, No. 4 (December, 1969) of this journal.

inforcement and punishment are not only weaker in their effects on the behavior which is being dealt with, but are likely to have an effect on some other completely irrelevant behavior which they follow more closely. The weaker effect of delayed reinforcement is illustrated when a child has solved a difficult problem and only the next day does he discover that he solved it correctly. By that time many of the complex intellectual processes which were relevant to the solution are no longer active, or have been interfered with by subsequent processes. Unless the learner can reestablish the conditions that existed during the attempt to solve the problem at the time he receives the knowledge that he was correct, that is, unless he can remember the critical steps in the solution, the effect of the knowledge in strengthening these steps will be slight.

An illustration of a delayed consequence altering some other behavior than that responsible for the consequence is a fairly common form of delayed punishment. A child will sometimes misbehave in such a way that the teacher resolves to chastise him verbally for the misbehavior, but is distracted from the administration of this punishment by some other classroom event. Later when the child approaches the teacher for some reasonable purpose, the teacher is reminded of the misbehavior and at that time delivers the verbal punishment. There may be some effect of the punishment on future misbehavior, since humans can often be affected by consequences which are quite delayed, but approaching the teacher is more immediately punished and will also be weakened, a clearly undesirable outcome. This possibility may occur to the teacher, who then discounts it on the grounds that the child certainly knows what he was punished for, a common example of neglect of the automaticity principle (Principle No. 2).

PRINCIPLE NO. 6: *Frequency—Optimal reinforcement frequency is usually underestimated.* Corresponding to the two different functions that differential consequences play there are two different analyses of reinforcement frequency which must be made. The differential consequences for correct or adequate behavior which are necessary to give it an advantage over incorrect or inadequate behavior must occur often enough to prevent the wastefulness of long periods of incorrect or inadequate activity. If errors occurring early in some sequence of activity can render large amounts of later activity worthless then frequent monitoring is necessary. This is an especially serious problem with the kind of educational material which has built-in consequences of a vague and unspecified nature, such as an ordinary textbook. The role of consequences in the use of such material will be discussed below in the resumption of Part I.

The issue of frequency is sometimes dealt with in terms of the proportion of the learner's efforts that should be followed by differential consequences or corrected. For many kinds of activities it is quite clear that all efforts should be so dealt with. For every arithmetic problem, the learner should compare his answer with the correct answer, and similarly with spelling.

When the function of differential consequences is primarily to maintain participation in educational activity in competition with other available activity the problem of optimum frequency must be interpreted somewhat differently. As a general rule, the more effective the reinforcer and the more frequently it is given, the more effectively the behavior being reinforced will compete with other behavior. In other words, if you want some particular form of behavior to dominate all others give large amounts of reinforcement for this form of behavior and give them as often as possible. On the other hand, there are several factors working in the opposite direction. Some reinforcers are the kinds of things the teacher has a limited supply of. To get the most behavior from their use they should be given out in units that are as small as they can be and still function as reinforcers. When the reinforcers are activities, such as watching TV or playing with clay, the longer the duration of the reinforcing activity, the less time there is available for the educational activity, a factor favoring periods of reinforcement that are as short as they can be without being so short as to lose their reinforcing value.

The goal of getting as much educational activity as possible from as few reinforcers as possible would seem to imply that reinforcers should not only be as small or brief as possible but also as infrequent. Working in the opposite direction, however, is the fact that the longer the period of educational activity without reinforcement, the more likely it is that some competing activity can occur. In the school setting such competing activities consist of daydreaming, talking with one's neighbor, scribbling or drawing, looking ahead to see how much work must still be done, etc. As a complex task becomes more familiar, the completion of its various parts becomes reinforcing in itself (due to the effect described in II, A, 4 above), at which time longer work periods can be tolerated without the danger of competing behaviors interfering. The general significance of the present principle, however, is that the error seems almost always to be made in the direction of a reinforcement frequency which is too low.

There are a few other factors which must be considered in the determination of optimal amounts and frequencies of reinforcement, but their discussion will be postponed until some examples of the deliberate arrangement of educational contingencies are given.

PRINCIPLE NO. 7: *Small steps*—When an educational unit of work is too large to permit an optimally high frequency of reinforcement it should be broken into smaller steps. Most educational activities are composed of units which have a natural beginning and end. Common examples are spelling a word, writing a sentence, reading a chapter of a text, drawing an object, solving a mathematical problem. Those activities which are composed of small units are often grouped together to produce a larger unit, such as answering ten questions at the end of a reading assignment, spelling all the new words introduced in a story, working all the problems at the end of a chapter in an arithmetic book. In order to reinforce with a frequency high enough to prevent the occurrence of competing behavior (according to Principle No. 6 above) it is necessary to break most tasks down into small steps. Just as the usual error with respect to frequency of reinforcement seems to be that of underestimation, the usual error in determining work unit size is overestimation. The two kinds of errors are probably best considered as two aspects of the same general tendency shown by those who already know the topic (the teachers) to underestimate its difficulty for those who are learning it.

PRINCIPLE NO. 8: *Unplanned punishment effects*—The total effect of reinforcement which requires prior worsening includes the punishment effect of the worsening. When there exists between two individuals or two groups of individuals a marked difference in the capacity to worsen or punish, the practice of reinforcing by removing the threat of punishment is often used by the more powerful individual or group to control the behavior of the less powerful one. This form of control is frequently, perhaps usually, the predominant one seen in parent-child relations and is widespread in the field of education. A parent who wants his child to clean up his room can often accomplish this goal by the statement that if the room is not cleaned up by some specified time some form of punishment will occur, usually the removal of a previously established privilege such as watching a favorite TV program or going out with friends. The statement of the relation between the required behavior and the future punishment establishes a condition of threat, the removal of which constitutes the reinforcement for cleaning the room.

One reason for the attractiveness of this approach is the ease with which the threat can be established and removed. The threat and its removal involve verbal effort plus that required to determine whether the task has been performed. If the threat is unsuccessful and the punishment must be administered, this most often consists in taking away something which had already been made available and is not costly in time, effort, or money. (It may even be reinforced

ing to the more powerful individual as when a parent revokes a privilege that had been extended only reluctantly.)

The grading system in public education often functions to provide this kind of reinforcement by threat removal. The punishment that results from receiving bad grades or failing a test or a course is sometimes administered by the school system, and when the child is held back from advancing with the other pupils of his grade and thus is exposed to various forms of social disapproval; but with "middle-class" children the main form of punishment consists in a worsening of the child's relations with his parents, involving an intensified effort on their part to generate more effective schoolwork, usually by the method of threat of further punishment in terms of privilege removal. Of course, in many cases, there is no effective punishment to back up the threat implied by school failure, and as a result the control is ineffective. This is often described as a condition typical for the children of the very poor.

While there is no question as to the effectiveness of this form of reinforcement when properly used, there is a complication which must be taken into consideration. In order for threats to be effective they must at least occasionally be followed by the threatened form of punishment, and thus become forms of punishment in themselves by the principle of conditioned punishment (II, A, 4). The establishment of the threatening condition is not systematically contingent on any form of behavior and does not systematically weaken any form of behavior, with one very important exception: the behavior producing social contact with the person or agency that establishes the threat. When a large proportion of the contacts with parent, teacher, home, school are followed by the threat-of-punishment form of worsening, even though there is usually the subsequent improvement consisting of removal of the threat, contacts with the controlling agency are greatly weakened. The child spends more and more time away from home, or when at home, avoids contact with his parents as much as possible. In many middle-class homes the most severe form of punishment consists in "grounding" or requiring the child to stay in the home during the hours when he would ordinarily be away but not in school.

With respect to teachers and school the relatively severe punishment that results from flagrant truancy usually keep the child in attendance. The weakening effect of the repeated use of threat of punishment is seen, however, on those behaviors which are not controlled as effectively as simple attendance: student-initiated contact with teachers, continuation of an interest in school subjects after school and during vacation, interest in intellectual and educational activities in general. Even in the classroom situation most of the

contact with the educational environment may be so weak as to occur only as a result of pointed inquiry or direct "orders" on the part of the teacher. Ultimately, if the child can hold out long enough he escapes the home and the school as a result of chronological age (actually as a result of the more equal distribution of the power to punish that comes with increasing size and social recognition of ordinary adult responsibility).

It is probably not possible to avoid this kind of reinforcement completely, but the knowledge of its drawbacks motivates a search for reinforcement techniques which do not require prior worsening, or which in some way minimize the punishment effects of prior worsening. Some of these will be discussed in Part III.

PRINCIPLE NO. 9: *Effective contracting*—When consequence arrangement takes the form of a contract between the teacher and the learner, the contract should be (1) clear, (2) fair, and (3) honest. As stated in Principle No. 2, consequences have their effects on behavior even though the learner may not understand the consequences in the sense of being able to describe their relation to his behavior. Any behavior followed by a reinforcer is more likely to recur when the occasion next arises, and any behavior followed by a punisher is less likely to recur. As he grows up in a highly verbal culture, however, a child is subjected to a good deal of language training regarding behavior and its consequences. He is frequently given instructions of the form, "If you do X, then Y will occur." He then does X, either because X is under the control of other momentary variables and he was going to do it anyway, or because the person who stated the relation between X and Y induces him to engage in X as a deliberate form of training. In any case, Y does indeed occur, and either strengthens or weakens X depending on whether Y was a reinforcer or a punisher.

Eventually, statements about behavioral consequences have some of the same effects on the child that a history of experience with such relationships would have. The effects are by no means identical, but the statement has accomplished a part of the training that repeated experience with the relationship would produce. The capacity of a child to be affected by such verbal instructions greatly facilitates further efforts to educate the child about his physical and social environment and, in addition, makes possible a form of control which is best described as behavioral contracting (Homme and Csanyi, 1967). A teacher can describe a fairly complex relation between a behavioral requirement and a reinforcing or punishing consequence with somewhat the same effect that would result from gradual and repeated exposure to the components of this relationship. An ex-

ample is the contract described in II, B, Principle No. 3, "As soon as you have worked the first ten problems of the lesson, you may read."

It is, perhaps, the obvious inefficacy of such statements when made to children who are very young or who have defective language skills that is responsible for the widespread failure to appreciate the automaticity of the effects of consequences. There is no contradiction, however, between the principle of automaticity and the necessity that a child "understand" a contract of the type stated above for such a contract to control his behavior. It is not necessary for a child to understand a contract when he is subjected to gradual and repeated training with respect to its components. The experience with the consequences is quite sufficient for the development of the behavior, as in the case of training severely retarded children to walk. On the other hand, to have told them that as soon as they walked a few steps they could receive their supper would certainly have been ineffective. It is the capacity to be affected by a verbal description of behavior-consequence contingencies as though one had been repeatedly exposed to such contingencies that requires "understanding," not the capacity to be affected by the repeated exposure itself, a capacity which we share with all animals.

Now with respect to behavioral contracts, they all consist of the behavioral requirement and also of the consequences of meeting and failing to meet the requirement. A deliberately vague description of this requirement is sometimes given to facilitate later revision of the requirement in the direction of a more stringent one. Vague descriptions of the consequences are sometimes simply the results of the teacher's failure to have planned that far ahead, but they are sometimes vague for the reason that it may be possible to conserve reinforcers by giving a small reinforcer than the learner would earlier have agreed to work for. Although these short range goals may be reached, the long range effect of either form of vagueness is undesirable. Learners who have experienced such unfavorable revision of terms either make a verbal demand for clarity or, if their verbal skills are not sufficient for this approach, become unwilling to enter such relationships.

Fairness of a contract consists in a consequence being appropriate in amount to the behavioral requirement. Obviously there is no simple numerical way to judge the equivalence of such events, but there is often pretty good agreement on intuitive judgments. The most common form of unfairness is for the teacher to set a behavioral requirement which he knows would seem unfairly large from an adult point of view but which might still be accepted by the less sophisticated learner. Unfairness in the form of disproportionately

MANAGEMENT OF BEHAVIORAL CONSEQUENCES IN EDUCATION

large consequences are not particularly harmful except for the waste of consequences and the unrealistic expectations which such a practice might temporarily engender.

An honest contract is one which is carried out according to the stated terms, which usually include an implied or explicit specification of the time when the consequence will become available.

ABSTRACT

This paper represents a first attempt at an analysis of the educational process in terms of principles of behavior derived from the laboratory. One of the most rapidly developing areas within modern experimental and applied psychology is the science and technology of behavior consequences, and before undertaking a more detailed analysis of the instructional process, it seems appropriate to introduce some of the terminology and principles of the science. This is, in fact, what is done in Part A of this discussion. Part B, due to appear in the coming issue of this Journal (Volume III, No. 4), will deal with the above mentioned detailed analysis and will consider possibilities for improving educational practice.

RESUMEN

Este trabajo representa una primera tentativa de análisis del proceso educativo, visto através de los principios del comportamiento derivados del laboratorio. Una de las áreas de más rápido desenvolvimiento dentro de la moderna psicología experimental y aplicada es la ciencia y la tecnología de las consecuencias del comportamiento, y antes de hacer un análisis más detallado del proceso educativo, conviene introducir la terminología y los principios de la ciencia. La Parte A de esta discusión está dedicada a este fin. La Parte B, que aparecerá en el próximo número de esta Revista (Volumen III—No. 4), tratará del análisis detallado, arriba mencionado, y considerará las posibilidades para mejorar el proceso educativo.

RESUMO

Este trabalho representa uma primeira tentativa de análise do processo educativo visto através dos princípios de comportamento derivados do laboratório. Uma das áreas de mais rápido desenvolvimento na psicologia experimental e aplicada moderna é a ciência e tecnologia de consequências comportamentais, e antes de fazer uma análise mais detalhada do processo educativo, convem introduzir a terminologia e princípios da ciência. A Parte A desta discussão é dedicada a este fim. A Parte B, que aparecerá no próximo número desta Revista (Volume III, No. 4), tratará da análise detalhada, acima mencionada, e possibilidades para o melhoramento do processo educativo serão consideradas.