MANAGEMENT OF BEHAVIORAL CONSEQUENCES IN EDUCATION[4]

JACK MICHAEL
Western Michigan University
U.S.A.

I. AN ANALYSIS OF THE EDUCATIONAL PROCESS (RESUMED)

(At this point the reader may wish to reread the beginning of this discussion, up to Part II.)[5]

A. *One Teacher—One Learner (continued)*

4. *Effectiveness.* This individual tutorial situation is usually a very effective form of instruction. The continuous and close interaction between the teacher and the learner is such that the roles of the teacher are easy to carry out. Inappropriateness of the material being presented (in the present case, the oral questions and the written letters) becomes apparent as the learner either makes too many mistakes or indicates that he has already learned some particular material. Monitoring the learner's developing repertoire and providing differential consequences for correct behavior constitute a large share of the teacher's activity. Ineffectiveness of these differential consequences quickly results in an increase in the learner's mistakes, which may at first be indistinguishable from the result of inappropriately difficult material but can usually be diagnosed by a return to easier material. The delivery of differential consequences is likely to be immediate, frequent, and for small steps, simply because the loss of control that results from failure to respect these characteristics of good *"consequation"* (a useful term coined by Professor Ogden Lindsley of the University of Kansas to refer to the provision of a consequence without specifying whether it is reinforcing or punishing) has an immediate effect on the teacher.

Specifying a situation as individual tutorial instruction says little, however, about the differential consequences for participation. These could be highly effective or not, depending on the specific details. This kind of instruction certainly maximizes the relevance of the teacher's personal qualities and if these are such as to maintain participation the individual tutorial is likely to be quite effective. On the other hand, in this kind of instruction the learner also feels the full effect of a teacher's undesirable personal qualities.

It would appear from the literature of the past that participation

[4]Part B. (Part A appeared in Volume III, No. 3, this Journal.)
[5]Cf. Volume III, No. 3 of this Journal.

has usually been maintained by the same mixture of variables (with a large measure of reinforcement by relief from threat of punishment) that characterizes current education. There is less use of corporal punishment now, but it has been replaced by other forms of worsening.

5. *Some complications.*

a. *Specification of criteria.*

Naming and drawing the letters of the alphabet are skills which are atypical in the degree to which the criteria of effective learning are likely to be well-specified by the teacher. When the goals of instruction cannot be stated in very specific terms, as with some aspects of social studies, the general effectiveness of the individual tutorial is likely to be much lower, as in any instructional situation. Vagueness as to the repertoire which the learner is to acquire makes appropriateness of the material difficult to assess, and renders differential consequation of "correct" or "adequate" behavior equally difficult. The principles involving immediacy, frequency, and small steps are likely to be flagrantly violated, since their violation produces no very clear effects on the learner which can then affect the teacher. The principle involving relevant criteria is also likely to be violated since educational accomplishment cannot be easily assessed, leaving only such criteria as spending time in the situation, appearing interested, being obedient, and the like.

b. *Materials that teach.* For more advanced instruction in writing there must have been many teachers who conceived of some form of the "flash card" technique—a picture of a common object is drawn in one place and the name of this object is written in another. The learner then attempts to write the name of the object without looking at the name, and when he has finished he checks his written word with the correct one. Elementary mathematics lends itself very well to this form of self-instruction once the learner has learned to read numbers. Such materials take over the teacher's functions of presenting stimuli and providing differential consequences for correctness. The adequacy with which these functions are performed is, of course, dependent upon the learner's usage. He may present himself with the stimulus pictures in some other order than that prescribed by the teacher, or he may look at the "answer" before writing his own, which changes the task to an exercise in copying, a skill presumably already mastered. When he has made a mistake he may go on without ever trying the item again. And, of course, he may accept the materials but not use them at all.

What is being described is at a more advanced level referred to as the learner's "study methods." The effectiveness of self-instructional materials clearly depends on the development of this repertoire of

study methodology, and a portion of elementary education is devoted to this task. A good deal of the consequation of this secondary repertoire, however, is supposed to derive from its effect on the development of the primary repertoire being taught by the self-instructional materials. For example, a consequence of using flash cards in the correct order is that the repertoire being developed by the flash cards is developed more easily. There is some reason to believe that this indirect form of consequation is not very effective in modern education.

At any rate, the possibility of ineffectiveness makes is necessary for the teacher to examine the repertoire from time to time, not for the primary purpose of providing differential consequences for correct behavior (that was presumably accomplished as the learner checked his work against the correct answer), but to permit differential consequation for correct usage, or for any usage at all, if he does not observe the learner's work with the self-instructional materials. It is not necessary for the teacher to examine the entire repertoire being acquired, however, but only to sample it in a manner that cannot be predicted by the learner.

This sampling of the repertoire is, of course, the typical educational "test" or "examination." If the behavior being sampled by the test suggests that the entire repertoire is well developed, the learner is permitted to go on to new material, and perhaps reinforced in other ways, such as praise from the teacher. If the test is "failed" the teacher will require remedial work of some sort before attempting new material. This is usually a form of punishment, and may be supplemented by other forms, such as criticism by the teacher and perhaps an unfavorable report to the parents.

In the process of evaluating the adequacy of the behavior sampled by the test, the teacher may provide some differential consequation for correctness. A strategic misunderstanding may be discovered which underlies several errors; an approach to the test which utilizes a technique to be introduced in more advanced material may be noted and reinforced. If the repertoire sampled by the test is only a small part of the repertoire being acquired, then this differential consequation of test behavior is not likely to play a very important role in the development of the total repertoire. In fact, when the self-instructional material contains good built-in consequation, as with the flash cards being described, the principal cause of a poor test performance is simply failure to utilize the self-instructional materials or failure to utilize them correctly. In this case the analysis of the specific errors in the test performance functions primarily to indicate to the teacher the nature of the incorrect usage of the

self-instructional materials and to aid in directing the prescribed remediation.

As the literacy of the learner develops it becomes possible to use that more complex form of self-instruction consisting of a written explanation. In some respects written explanations are superior to spoken ones. Having once written an explanation the teacher can simply hand it to the learner and do something else while the learner reads it. The learner can re-expose himself to the explanation at his convenience and as many times as necessary with no further labor required from the teacher. With the advent of printing such written explanations were made available to many more learners than the teacher could ever contact personally. There are other advantages, too, but there is one important disadvantage: an effective teacher is not likely to give a long spoken explanation to his pupil without monitoring and consequating the repertoire of the pupil which the explanation is supposed to be developing. The principles of immediacy, frequency, and small steps (No. 5, No. 6, and No. 7) are likely to be respected, simply because the failure to do so leads to the teacher having to repeat the explanation, often with the realization that the latter portions have been only a "verbal massage" for the student because of an earlier misunderstanding. When the explanation is written, however, the teacher is protected from the moment by moment consequences of faulty monitoring and consequation, which can then become vague, delayed, and infrequent.

Such material still contains a form of differential consequence for correctness, in that failure to be properly affected by early portions of the text will result in inability to react appropriately to later portions. Many learners, however, seem not to be strongly affected by such a consequence and reading as a form of verbal massage seems widespread, particularly in the areas referred to as the liberal arts.

The writer of explanations is also likely to be a reader of more advanced forms of prose, and cast his own work in a form which is pleasing to him, another factor leading to large step size and a flowing and discursive style. Furthermore, there are usually some learners who are effectively instructed even by poor explanations, which permits the writer to attribute failures to the defective motivational and intellectual qualities of some or most learners.

The factors just described are exaggerated by the decrease in specificity of goals and criteria of instruction that seem always to accompany the increase in complexity of subject matter. The result is that the consequences for correct behavior in ordinary text material are so vague as to be unrecognizable, and the term "self-in-

structional" is now a technical term which rather specifically excludes reference to ordinary text material.

Thus the individual tutorial form of instruction, even though intrinsically well-structured to favor effective contact between teacher and learner, does *not* do so when educational goals become vague and when reliance is placed on written material that is supposed to be "self-instructional" but in fact does not contain a useful form of built-in consequation. The student's failure to be instructed under such conditions, however, is seldom attributed to the ineffectiveness of the instructional system. The more attractive (to the teacher) interpretation in terms of the learner's intellectual ability is by far the more popular one. Further problems arise when the teacher is required to instruct more than one learner at the same time.

B. *One Teacher—Several Learners*

The arithmetic of universal education results in classroom instruction where one teacher is more or less in contact with twenty or more learners for five hours or so each day. There are difficulties with this form of instruction but at the present time it is clearly more effective than if the teacher were to divide up his workday and spend one-twentieth of it with each of the twenty learners. Putting several learners together in the same room with the teacher, however, does not alter the basic requirements for behavioral change or learning. Appropriate material must be selected, correct and incorrect responses to this material must be followed by differential consequences, and consequences must also be at work which maintain participation in educational activity in competition with other forms of behavior. If these requirements are not met, education does not take place although a good deal of teacher and learner behavior may occur in the classroom setting.

1. *Main sources of difficulty.* In addition to the problems resulting from vague educational objectives and the use of written materials that are supposed to teach but do not, there are three new sources of difficulty involved in classroom instruction.

a. *Lack of teaching manpower.* In the discussion of the tutorial instruction, it should have been apparent that an effective teacher would be fully occupied in monitoring the appropriateness of his materials for the particular learner, consequating the learner's reactions to these materials, diagnosing difficulties in the secondary repertoire of study methodology, and contributing to the maintenance of participation. The addition of learners simply means that some of these functions must be performed less often or abandoned.

An additional factor that further reduces the time the teacher

has to work with the learners is the considerable increase in the number of non-educational administrative duties that result when the student-teacher ratio increases. The teacher must spend some time insuring effective use of school facilities and supplies, accounting for and keeping records on the activities of the different students, and controlling student behavior which is unrelated to instructional activity.

b. *Learner heterogeneity.* Even with effective methods for grouping students according to background knowledge, the momentary appropriateness of educational material will differ from student to student. Heterogeneity will also bear on the appropriateness of the differential consequences for correctness, and even more on those for participation.

c. *Learner interactions.* The simultaneous presence of several learners introduces a number of complications arising from the possibility of their interacting with each other. Some of these interactions are thought to contribute to the effectiveness of the classroom situation, but many of the interactions are detrimental to the goals of instruction.

2. *Effectiveness.* The problems created by insufficient teacher manpower, learner heterogeneity, and interactions among learners can best be seen in terms of the basic requirements for an effective educational situation.

a. *Appropriateness of stimulus material.* Because of the manpower problem the presentation of the stimulus material to which the learner reacts generally assumes to form of remarks made by the teacher to a group of students, or written material which is distributed to the students. The extent to which such presentation takes maximum advantage of the existing repertoire of any particular student depends on the homogeneity of the students and the choice of the material. Since the students often differ considerably from one another in adequacy of preparation and since the choice of material must usually be made according to some predetermined plan rather than an assessment of its momentary relevance to any particular student's existing repertoire, the stimulus material is not likely to be very appropriate.

Furthermore, neither the classroom oral presentation nor the use of written material provides the teacher with very effective momentary feedback as to appropriateness. Some children ask questions in class when they do not understand, and some yawn when they are bored but many do nothing noticeable under either condition.

b. *Monitoring and differentially consequating the repertoire.*

During classroom presentation of an explantory nature the teacher may attempt to assess the effect of the explanation on the learners as he goes along by asking questions which individual students answer outloud. The teacher can then provide differential consequences depending on the nature of the answer. Only a few students can participate directly in this consequation, but there is some evidence that a form of vicarious participation is not entirely ineffective. Often several students "think" the same answer that a particular student gives, and they feel some of the effect of the consequation as well as the student who gives the answer. However, the student who is either unable to or for other reasons does not make any well-formed response, either overt or covert, simply hears the answer, but it does not affect him as a consequence.

A major difficulty with this form of group monitoring and consequation concerns the problem of remediation. When a teacher's question is incorrectly answered by one student, and the nature of the error suggests the necessity of review of some earlier material, the appropriateness of this review to the entire class must be considered. No matter what is decided about the review, it is likely to be insufficient for some of the students and excess for others.

The general inability of one teacher to monitor and consequate the developing repertoires of a number of learners has led to extensive reliance on written materials supposedly containing built-in consequation. As mentioned above, some forms of such material are quite effective if used properly, such as flash cards for spelling, vocabulary lists, arithmetic problems with answers, and the like. Until the advent of programmed instruction, however, only a small portion of the ordinary elementary school curriculum could be put in such form, and the most common written material was the ordinary explanatory text, the built-in consequation of which is usually much too vague to be useful. The common use of such text material in education adds to the problems of determining appropriateness since it is very difficult with such material to monitor the effect the text is having on the student.

The widespread use of such text material contributes to a compounding of difficulties. Administrative strategies designed to partially alleviate the manpower problems usually result in a group of students beginning and ending their use of the materials at the same time. Class heterogeneity insures considerable inappropriateness of such material to many of the students' existing repertoires. Differential remediation dependent on the student's need is almost impossible due to the manpower problem and, with such material, would be difficult anyway because of the difficulty of monitoring the effect such material is having on the student's developing repertoire.

In any case it is necessary to sample the repertoire from time to time to monitor effective usage of the materials, but the manpower problem results in the test's sampling only a small part of the total repertoire, and that relatively infrequently. This in turn leads to the inefficiency that consists in spending large amounts of time on material requiring a prerequisite repertoire which is defective. The use of the test results to prescribe remediation is impeded by the necessity of all the students doing the same things at approximately the same time. The tests then begin to function primarily as ways of obtaining a public record of the learner's accomplishment which might, in some long-range sense, have remedial consequences as when a grade must be repeated, but not necessarily in the short-range sense that might actually overcome some inadequacy. It is not uncommon for the teacher to prescribe some remediation to be carried out under the parents' supervision, but the effectiveness of this practice depends on the ability and inclination of the parents over which the teacher has little control.

c. *Maintaining participation in educational activity.* The differential consequences for participation that were discussed at the very beginning[6] in I, A, 3, and again later in I, A, 4 are also relevant to classroom instruction. The presence of several learners in the classroom and in the school situation in general offers some sources of reinforcement and punishment that were not available with the individual tutorial instruction. The reinforcement and punishment associated with competition is one example, as is that related to social games which are used as part of elementary education. With several learners present the teacher can construct a game-like situation which also instructs, for example, playing store and learning to perform the arithmetic operations involved in making change.

In spite of such additional reinforcers a large portion of the reinforcement for participation is still the removal of the threat of punishment for non-participation. Individual teachers may supply other kinds of reinforcers, but the dominant cultural control is of the sort that leads to the expression "mandatory education." Most of it involves prior worsening (the threat) with improvement being then contingent on participation.

Although groups of learners constitute sources of some kinds of reinforcement, the disadvantages of the classroom far more than offset the possible effects of these additional sources of reinforcement In the first place the lack of manpower renders the monitoring of participation quite difficult. This problem is compounded by the fact that the same lack of manpower has led to the extensive

[6]Cf. Part A in Volume III, No. 3 of this Journal.

use of stimulus materials whose effect on the learner's repertoire is difficult to assess—"lecture," and written explanatory material such as the textbook. Thus, it is not easy to detect lack of participation unless it is of an obvious form such as attempting to leave the classroom. Looking at a textbook and turning the pages is not distinguishable from actually studying the text until the next time the repertoire is sampled. Even then a low score may be the result of a defective entering repertoire rather than non-participation. The increasing chance that the material is inappropriate for the individual student leads to a more tolerant attitude on the part of the teacher who is somewhat unwilling to be responsible for seeing that the student is punished in some way for non-participation. Crude forms of non-participation such as leaving the classroom are quickly punished, but thinking of the coming vacation while looking attentively at the teacher as he presents some material is likely to escape immediate consequation. Of course, there will be long-range effects, but the punishment consisting of a bad grade on a test given the next day and handed back the day after it was given has little effect in reducing the non-participation which was responsible for the bad grade.

As mentioned above, the presence of other learners in the learning environment makes possible a few sources of reinforcement for participation that are not available otherwise. The most significant effect of the other learners' presence, however, is to increase greatly the amount and variety of reinforcement which is available for other behavior than participation in educational activity. School is a place where there are other children and where one can obtain the usually powerful forms of reinforcement related to other children, but not necessarily because one participates in educational activity. Interactions with other pupils constitute a potent source of distraction from schoolwork, the control of which requires a good deal of the teacher's time and energies.

The fact that students who are ordinarily well controlled by educational activity can be rather easily distracted by students who are not under such control adds to the difficulty of monitoring and consequating participation, and adds to the teacher's hesitancy to infer non-participation from failure to learn. The system for maintaining participation consisting of punishment and reinforcement by relief from the threat of punishment has some disadvantages in the first place, but if used properly it can be effective even if unpleasant. When the threatened or implied punishment is seldom carried out or is carried out in poor relation to the behavior it is designed to control, all that is left is the unpleasantness.

[Note: The term "punishment" appears throughout this sec-

tion. It should be remembered that what is usually being referred to are rather complex forms of social disapproval, removal of privileges, worsening of parent-child relations, threat of long-range disadvantages, and the like. "Punishment" as used throughout this discussion *never* refers solely or even primarily to corporal punishment, although this usage is sometimes implied in common sense discourse, for example, when parents pride themselves on never "having to punish" their children. Such parents may, indeed, never strike the children, but there is usually an ample amount of punishment of other forms such as restriction of privileges, disapproval, or even expressed disappointment and regret over some act performed by the child. In reading this discussion remember the earlier interpretation of punishment as *any form of worsening*.]

It remains to consider an interesting and very important feature of much current educational practice. It is possible for the learner to obtain most of the reinforcement for participation in educational activity and to avoid most of the punishment for non-participation and still not learn very much. This is because the differential consequences for participation are quite different from and quite indirectly related to those that strengthen correct or adequate behavior over incorrect or inadequate behavior. This, in turn, is the outcome of several inertacting factors whose exact roles were difficult to interpret but which perhaps can at least be identified. The situation is not unique to classroom education but is exaggerated there. It is seen in individual instruction where there are vague educational objectives and extensive reliance on written materials with ineffective built-in consequation. It is also undoubtedly related to the several factors responsible for the existence of "highly-motivated" students who nevertheless fail to acquire the repertoire toward which they are highly-motivated. These are probably the same factors responsible for the increasing emphasis on individual differences in ability and personality as significant factors in education, e.g., inability to monitor the appropriateness of educational materials for the individual student, heterogeneity of pupils' entering repertoires, absence of effective remediation as a result of the manpower problem, inability to monitor participation, and so forth. This feature of educational practice is an example of a clear violation of Principle No. 3: "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."

III. POSSIBILITIES FOR IMPROVING EDUCATIONAL PRACTICE

Dissatisfaction with current education can certainly be justified in one sense: There is a marked discrepancy between what a child

can learn under favorable conditions and what he usually learns in school. This is the case for most children, not just those described as "bright." Consider, for example, the intense, highly-motivated learning of the child hobbyist with respect to his hobby, and contrast this with the learning that the same child shows on somewhat similar material in school. In general, school learning seems quite inefficient in terms of the time spent by the learner in the situation. Of course, it may not be inefficient in terms of other critera, for example, the amount of time each teacher is able to spend attending to each pupil, or in terms of some ratio such as cost in dollars per pupil-fact (a fanciful unit obtained by multiplying the facts by the number of students "possessing" the fact).

Another source of dissatisfaction is the general dislike for school that is shown by many students after having been subjected to it for a number of years. This dislike is not seen in elementary school as much as in the later grades, but the attitudes of the older pupils are presumably due in part to their earlier experiences. Increasing vandalism, hostility toward teachers, flagrant disobedience, and derogatory remarks made by adults about their school experiences are evidence for this dislike.

General satisfaction with education, in any case, is not so high as to render a search for improvements uninteresting. In the present section several suggestions for improvement in educational practice will be made. In general, these suggestions derive from the previous analyses of the role of behavioral consequences in education. Before considering these suggestions, however, it will be useful to consider two approaches to improving educational effectiveness that do not relate directly to educational practice.

A. *Better Selection and More Respect for Individual Differences*

In spite of any difficulties with educational practices, it is apparent that some students thrive in the present system. This has led to an interest in attempting to identify such students when they are quite young, on the assumption that their success in school is related to behaviors which could be observed at early ages. Their "ability" can then be exploited for the common good by seeing that they are given appropriately accelerated programs. The general value of this approach is difficult to assess, but it is essentially irrelevant to the problems of providing effective basic education to everyone. This aproach is sometimes advanced, however, as an alternative to improving the present educational system, which could then be left as it is on the grounds that the average student is not capable of any better learning anyway. Honors programs in colleges sometimes serve this function of justifying tolerance for generally ineffective

instruction by providing what is thought to be a more effective instruction for a few. Unless we believe, however, that the present system cannot be significantly improved without tremendous expense, this approach has little bearing on our present problem.

A related approach is based on the obvious individual differences sometimes seen in the pattern of educational accomplishment. Some children learn mathematics easily and seem to enjoy it but are ineffective in music and art. Others learn to read quite early and read a great deal, but do poorly in mathematics. This has suggested to some critics of public education that it is a mistake to try to make every pupil learn every subject equally well. A popular allegory involves a school for animals where subjects such as flying, swimming, climbing, and so forth, are taught. The folly of requiring all children to learn all subjects is considered analogous to the folly of trying to get all the animals up to the same level in all of the subjects at the animal school. The duck, for example, who was very good at swimming and flying nevertheless had to spend a great deal of time trying to learn climbing. Although this problem may exist at higher levels of education it seems quite irrelevant to most of the subjects of elementary education. The notion that, due to naturally occurring individual differences, some children might be as poor at reading as the duck was at climbing while other children might be as good at this subject as the duck was at swimming seems quite farfetched. It is also inappropriate in that ducks can get along quite well without ever climbing, but in our culture an illiterate child is quite handicapped, as is one who cannot master elementary mathematics.

The observation that some teachers seem to be much more successful at teaching than others has led to another suggestion involving selection. Perhaps it would be possible to determine, prior to providing teacher training, who is going to function as an effective teacher, and select these individuals while rejecting those who are thought not to be good bets for this career. This approach, no matter how successful it might be, is no substitute for an analysis of current educational practices unless, again, one believes that these practices are presently at an upper level of effectiveness, or that once one identifies individuals who are thought to be good bets to become effective teachers, they can simply be turned loose on the potential learners without being given any training.

B. *Spend More Money on Material and Personnel.*

Most current suggestions for improving education amount to making classrooms bigger and better equipped, having more and better paid teachers, providing each with several assistants, and so on.

None of these are unreasonable, but it seems reasonable to suppose that many deficiencies in current practices would survive such improvements in facilities and personnel.

C. *Improvement in Educational Practices.*

The present suggestions start with the existing system. If a system were to be designed from scratch the approach might be somewhat different, but it seems unlikely that this will happen. It also seems most useful to assume no technological developments that are not presently available, nor any which are very expensive, such as computers. Finally, the changes that are suggested are the kinds that could be made by a classroom teacher and do not assume any considerable body of knowledge which teachers do not presently have. Most of the changes do involve manipulation of behavioral consequences and thus require some knowledge in this area, but no more than could be developed by a careful study of the present material.

1. *Reliance on built-in consequation for correctness.* The manpower problems of public education are not likely to be drastically alleviated in the near future. This means that consequation for correctness must, in general, be built into the educational stimulus materials. But in order to be effective, such consequation must be quite frequent and clear. Programmed textbooks, flash cards, workbooks with answers, all contain effective forms of built-in consequation, and this feature should be a strong point in favor of the adoption and use of such materials.

Many aspects of the elementary curriculum are not available in such forms, however, and the teacher, therefore, must rely on ordinary texts. The built-in consequation of this form of material is usually quite vague, but can be improved considerably if the teacher can specify the objectives of the students' contact with the text. Supplementary material can then be prepared which tells the student exactly what he is supposed to be able to do as a function of reading the text. A study methodology akin to that used in work with flash cards will then suffice to provide the consequation for correctness. The supplementary material can be in the form of a set of questions, selections from which will constitute a future test.

Some teachers may object to this use of text material on the grounds that it emphasizes memorization, but the main difference is often between specific instructions as to what to learn versus vague ones. Many textbooks supply such questions, but they are often not an exhaustive coverage of the repertoire but rather a sample, and the student can know the answers to all of the questions and still not be able to answer ones the teacher may ask.

Built-in consequation for material that is presented orally is more difficult to manage due to the heterogeneity of the class. In using a text with a supplementary listing of what is supposed to be learned, the learners can apply themselves to the task in a manner determined by necessity; that is, if one question is easily answered then it need be dealt with only once, but one that is consistently missed can be reviewed several times. Oral presentation does not lend itself to this kind of individualized usage, and probably should not be used if there is any question as to its appropriately affecting every student.

2. *Frequent sampling of the repertoire—testing.* As mentioned above, even excellent materials will have no effect on the learner unless used properly. To insure proper usage the teacher must sample the repertoire, and to avoid cumulative failure this sampling must be often enough to prevent (see next section) proceeding to more complex material before mastering prerequisite material. Frequent sampling, however, runs into the manpower problem. To accomplish the goals mentioned above, tests must usually be given considerably more often than they are at present. How can the teacher evaluate such tests without some form of manpower assistance? Let us assume that he cannot. Manpower assistance is not unavailable, however, and failure to take advantage of it is often due to not realizing exactly how it could be used. Other learners are clearly the most readily available source of help. Teachers often have some of their students help them in various duties. Scoring other students' tests might seem to have some disadvantages, but these can often be overcome. One disadvantage is that the student may not know enough to evaluate the answers. Perhaps this is true for some material, but certainly not for all. Furthermore, the corps of student helpers could be given specific instructions by the teacher regarding scoring. It might not be possible to get the student scorers to spend extra time scoring (but some would probably not mind) but that might not be necessary. Consider the following system. A class of 30 takes a test in arithmetic, except for 6 of the students who confer with the teacher about the answers to the test while the remaining 24 are taking the test. When a student finishes his test he holds up his hand and one of the scorers picks up the test, takes it to his own desk and scores it. He might then return it to the student after recording the grade or hand it in to the teacher. He then picks up another one, and so on. While their tests are being scored the students could be allowed to work at some other task. If the selection of scorers was somewhat at random, or at least could not be predicted by the students ahead of the test, a student could not neglect studying for the test on the grounds that he was going

to be a scorer. On any particular test, six students would not have their repertoires evaluated, but since this would change from test to test, it might not be a serious flaw.

The details of this system are not important. It is only an example of how students could help solve the manpower problem. There are a number of other ways that might be superior for some purposes; for example, using sixth grade students who excelled in arithmetic as assistant teachers in third grade arithmetic instruction. Other solutions will probably occur to any teacher. The important thing is to see the critical necessity of frequent sampling. Its accomplishment can then be worked toward in a number of ways.

3. *Remediation as a consequence.* As was mentioned earlier the function of the test is not to provide consequation for correctness of the repertoire, but rather to permit a remediation consequence. (The test, of course, is also one of the bases of criteria for relief from threat of punishment for non-participation when that is the major form of reinforcement for participation.) The main problem in prescribing remediation for those who need it but not to those who do not is the manpower one of administering different activities for different students at the same time. The problem is not insoluble though and the key to the solution lies in the fact that some aspects of the elementary curriculum are less important than others. When an essential unit is being taught and then a test is given, the test can be scored "pass" or "fail," with a reasonably high standard for passing. The students who pass are then allowed to engage in some less critical activity such as art, free reading, or perhaps some supplementary but non-essential aspect of the unit they were just tested on. Meanwhile, the students who failed the test are directed to some further study after which they are tested again. Those who still fail are likely to be sufficiently few in number that they can be kept in during recess for some further individual work with the teacher.

It might be necessary to utilize one room for the non-essential activity, supervised by one teacher, and another room for the remedial instruction, given by another teacher. Most schools do not have extra rooms available, but there are often at least two teachers at each grade who could use both their rooms for such activity. One teacher could then teach the essential unit to all the students in her room, dismissing to the other room those who pass the test, then conducting the remedial work.

Such a remediation consequence would have an additional advantage in that students who were not well-controlled by the ordinary differential consequences for participation might find the escape from the remediation activity to the non-essential one sufficiently reinforcing to try harder. This is especially likely to be the case if

the objectives are quite specific, the material appropriate for his entering repertoire, and if it contains effective built-in consequation for correctness, in other words, if it is easy to learn the subject matter.

Like the necessity for frequent testing, remediation often requires some improvement in the manpower situation. However, if the necessity of remediation for some critical subjects such as reading and mathematics is appreciated, at least partial solutions to the manpower problem can be found.

The reliance on and the constant search for materials of a written form which provide built-in consequences for correctness plus the use of frequent testing with a remediation consequence for failing the tests are procedures which will partially alleviate the problem of appropriateness of materials to the individual student's existing repertoire. To start with, the same materials are presented to the entire class, and may be too easy for some and too difficult for others. The ones whose repertoire is already developed can soon spend time on some other activity, and the ones who are having difficulty will be given special training.

4. *Improvement in maintenance of participation.*

a. *Improvement in the use of the present form of consequences.* The steps suggested above, or for that matter, any approach that would decrease early failure and remediate ongoing difficulties would result in more favorable maintenance of participation. The threat of punishment which controls much of the current participation is not ineffective if a learner does not fall too far behind. If by moderate extra effort he can avoid the punishment, the effort is often expended. However, if his repertoire is generally defective and he is continually punished for failures of various sorts, the effectiveness of such punishments diminishes, since most of it is based on a somewhat tenuous conditioning history anyway. Furthermore, as a child continues to fail, his parents and others are increasingly unwilling to look upon his failure as one of non-participation and begin to accept an interpretation in terms of ability, for which difficulty punishment does not seem appropriate.

Leaving the basic nature of the present form of consequation for participation unchanged, there are still several improvements that can be made. One is to make the grading system more explicit. If at the beginning of a school term a child can see what he has to do to receive the different grades, and if there are ways to make up for failures of various kinds, the control of such a reinforcement system will be considerably greater. Such an approach usually requires a point system of some sort and is not very effective in the

lower elementary grades. In higher grades, however, it is possible to give points for test scores, remedial exercises, homework, extra credit work, and the like, with the sum of the points determining the grade.

Such a system is clearly grading in terms of accomplishment, not ability, and is sometimes objected to on these grounds. Some students in such a system achieve their grade by learning everything easily and on first exposure. Others receiving the same grade do so by considerably more effort. It is also a system which usually results in more students receiving high grades than might be prescribed by some statistical definition of the different grades. Both of these objections may be valid from a particular point of view, but the system described controls a good deal more educational participation than the usual one. From the point of view that punishment for failure to participate is aimed at inducing more effective participation this approach seems quite reasonable.

Another approach consists in leaving the threat of punishment as an underlying form of consequation, but supplementing it with other forms of reinforcement which do not involve prior worsening. Many teachers do this, but not systematically. Completion of an undesired activity is reinforced by permission to participate in a more desired one. Special privileges are earned by various kinds of accomplishments, as when everyone completing his project on a certain day or to a certain level of quality is permitted to participate in an extracurricular activity planned by the teacher. Favored positions, such as class messenger, are awarded on the basis of some form of accomplishment. The usual use of such favored activities or extra privileges, however, consists in making them available to everyone and only taking them away for some flagrant failure to participate or some other "discipline" problem. Unwillingness to relate such forms of reinforcement to educational accomplishment is based on several forms of objections which will be discussed below.

b. *Attempts to avoid the kind of reinforcement which depends on prior worsening.* An approach which is now being widely used in experimental educational settings is the following: various forms of reinforcing events which are not readily available to the child outside of school are made available for participation, but in such a way that they cannot be obtained without learning. In other words, the consequation for correctness and participation are the same. Two examples are given below.

The reinforcer-event system developed by Lloyd Homme and his colleagues at Westinghouse Electric Corporation Research Laboratories has been utilized for children under three years of age, preschool Indian children, adolescents, retarded children, normal but

"socially disadvantaged" children, and others (Homme, 1967). The basic approach is essentially the same for all of the different kinds of learners but the details given below refer to the system used with very young children.

Homme and his colleagues make extensive use of the Premack Principle mentioned in II, A, 5. The educational area is typically divided into a reinforcing-event area and an educational or training area. The reinforcing-event area contains toys, play equipment, crayons, water faucets and pans (the opportunity to play with water turns out to be a very strong reinforcer for many young children), and so on. A contract is described to the learner of the sort, "Finish a specified amount of work in the educational area and then you may go to the reinforcing-event area and play for ten minutes." At the end of the ten-minute period in the reinforcing-event area, a timing device produces an auditory stimulus and the child is required (gentle persuasion is usually sufficient) to return to the educational area and complete another unit of work. Any behavior on the part of the child which occurs with high frequency, if its access can be limited to the reinforcing-event area, can be used as a reinforcing event. Homme and his colleagues have been quite ingenious in finding activities which appeal to very young children, an ingenuity that derives from a strict and literal interpretation of the Premack Principle. For example, it was discovered that young children show a strong tendency to run and shriek and push chairs, particularly the desk chair with casters on it, if the teacher is sitting in the chair. A bargain was simply made in which they were allowed to do these things only after they had completed a certain amount of educational activity.

Rapid return from the reinforcing-event area to the educational area is controlled by an additional contingency contract: if the child returns within a specific time limit, such as thirty seconds after the bell rings (signifying the end of the play period), a randomizing system such as a roulette wheel would be activated and, once in a while, the child wins an opportunity to return immediately to the play area for another ten-minute play period. If they do not return from the play area quickly enough, they do not have the right to play the game but instead have to start the educational activity immediately. Only a small proportion of bonus returns to the play area are sufficient to maintain rapid response to the bell.

The educational material used is, in general, of a programmed variety sometimes involving a teaching machine-computer combination, but sometimes simply involving ordinary text materials. The importance of this system is that it maintains long periods of educational work under conditions of high motivation in very young

children, as well as all of the other groups mentioned. (Of course, the reinforcing-event area has to be altered according to the age and specific taste of the learners.) It appears that a child under three years can be kept working at educational activity for periods as long as five hours by this approach. It should be noticed that in this case the differential consequences for correct versus incorrect behavior were intrinsically related to the differential consequences that maintained participation in the educational activity. In most cases the children participating were doing so on a voluntary basis. The activities in the reinforcing-event area were of such a nature as to compete favorably with activities and reinforcers available outside of the educational setting.

The educational contract usually consists in specifying not only a certain amount of educational work but also a certain level of accuracy. The contract might be stated "Finish ten addition problems with no mistakes and then you can go to the reinforcing-event area for ten minutes." The child's work is, of course, inspected for accuracy, and errors are corrected and remedial assignments made. The use of programmed material in this context, if the programming is appropriate for the particular learner, increases the likelihood of correct behavior occurring, and the use of computers and teaching machines makes monitoring and detection of incorrect responses very easy. Much of the programmed material, in fact, involves built-in remedial steps for incorrect behavior.

It is important to note the punishing contingencies that are involved and also to note their mildness. It is, of course, a form of punishment to be required to leave the reinforcing-event area and return to the educational area. Refusal to do so is followed by even more serious forms of punishment such as disapproval on the part of the adult, being carried out of the reinforcing-event area to the educational area (in the case of very young children), utimately perhaps expulsion from the educational situation for failure to cooperate. On the other hand, the educational requirement is made very easy to meet in the beginning stages and made to last a very short time, until the children are well-controlled by the system. Limited access to the reinforcing-event area is essential but is not difficult to maintain since the instructional staff or educational manager has far greater resources than the learner in most cases and can easily provide things which are unavailable in other places or at least available under less entertaining circumstances.

A second example illustrates another important principle, the use of tokens. In the summer of 1964, three boys around ten years of age were selected from a summer public school remedial reading class. These three boys were judged by the experimenter and the

teacher to be making the least progress in the class. When the summer remedial session ended, they were told that they could come to another remedial reading course taught by the experimenter. (This work was carried out by Jack Michael and Carl Jensen of Arizona State University but has not been published.) These three boys had all been quite uncooperative in the public school course, engaging in a good deal of unruly behavior and gaining very little in reading skill It was not expected that they would be very interested in continuing this kind of activity for the rest of the summer so they were simply told that they could earn tokens with which they could buy toys, models, equipment for their bicycles, and the like. They were somewhat skeptical of the whole situation but their skepticism was overcome when the experimenter took them to a toy store, purchased about fifteen dollars worth of models and toys which they selected, and then brought them to the experimental psychology laboratory at the University. The toys were placed on a bench in a large room from which three small cubicles opened. Each child was told that if he wished to, he could attempt to read the materials given to him and answer the questions regarding the reading that were a part of the graded reading instructional material (commercially available reading materials for grades 1 through 10). When he finished answering the questions at the end of the reading passage. he was to bring it out of the cubicle to the graduate student sitting in the large room, who scored the material for him. If he received a score of 100 percent on the test, he would be given three tokens (white poker chips). If he received a score above 90 percent, he would receive two tokens; if he received a score above 85 percent, he would receive one token; and if he scored below 85 percent, he received no tokens. All of the toys that the children had selected were given specific token values approximately corresponding to their commercial wholesale value with the token being worth about a fifth of a cent. The three boys were told that they could work as long as they wished, take breaks whenever they wished, and did not have to come at all if they did not want to. The graded reading materials were given to them in such a way that they were able to obtain high scores with the material they were given at first. Only gradually was more difficult material presented to them.

An explanation was given to the parents of the nature of the project and naturally, the parents' permission was obtained for the children's participation. However, the contact with the parents was such as to minimize, if possible, any tendency for them to coerce the boys into participating in the experiment, although undoubtedly some coercion did occur since the experiment could be easily seen to be educational and the parents all valued such activity, as indicated by

their having previously enrolled the children in the public school remedial reading program, which was not free. Nevertheless, the children's attendance in the program was not reported to the parents, nor were the parents told how long the children stayed to work with the reading materials. The general results of this experiment were that the children worked on the average about five hours a day, hardly ever missed sessions, and were extremely well-behaved during the entire procedure. The graduate student's contact with the children was friendly, but no effort was made on his part to encourage them in their activity. They could either work or not, depending upon how much they wished to earn the various objects that they had selected. They were permitted to save the tokens over as long a period as they wished, or to spend them for low value items as soon as they earned the tokens. They were not permitted to play with the toys or utilize them in any way in the experimental room, but had to leave the building to actually use the objects that they had earned.

Unfortunately, at that time programmed reading materials were unavailable, and the reading materials used at a given grade level did not completely prepare the children for the next grade level of materials. These materials were meant to be supplemented by classroom instruction or other training. Because of this, even though the children were highly motivated and worked diligently, the materials became increasingly difficult since no supplementary instruction was given and the later materials actually had vocabulary which had not been introduced in the earlier materials. The experiment was conducted for about four weeks during which time the children worked at what turned out to be a rate of about thirty-five cents an hour, earning a total of about fifty dollars worth of toys, models, and so forth. The experiment was discontinued after each child had advanced about three grade levels in reading material.

The importance of this example is that almost no worsening was necessary to maintain highly-motivated and quite effortful educational activity. These children were by no means thought of as good students, yet there was no reason to suppose from their behavior that they would have been unwilling to continue the experiment for as long as the experimenter wished. They often arrived around nine o'clock in the morning and stayed until five in the afternoon, taking only a half hour or sometimes less for lunch. They showed no hostility toward the experimenter or the graduate student, and in general seemed to regard it as a privilege to participate in this activity. They spoke of their educational activity as "work" and spoke of themselves as "coming to work in the morning and leaving work in the afternoon." During the course of the experiment several trips to the toy store, hardware stores, and bicycle shops were made, in

each case with the children picking out things that they wished to earn later. Some restrictions were made in their choices of objects. For example, they were not permitted to earn pocket knives or other objects that could be used for aggressive activities. They were also required to select some low-value items as well as high-value items. This was because it had previously been the experimenter's experience that children of this age and younger tend to select for themselves highly valuable objects which require the accumulation of several days' earnings, but as the days go on, during which they receive nothing as they work towards this long-range goal, the reinforcing value of the tokens declines. By having available some low-value as well as high-value items, they could always purchase a low-value item when they became discouraged with the long work period required to purchase the high-value item.

Using currently available programmed reading materials, it would seem quite feasible to bring a poor reader up several grades in reading level during a summer of such remedial work and, of course, this would be on a voluntary basis, avoiding all of the unpleasant coercion that is usually involved in such remedial work.

The importance of the token in this setting should not be neglected. Toys, bicycle accessories, an dthe like, do not come in convenient units to be awarded contingent upon completing fifteen minutes' worth of reading. The tokens constituted a reinforcer of constant value sufficiently small to be awarded frequently and for small steps of work yet with a maintained value due to the wide variety of objects which were related to the tokens. It should be added that in addition to the actual material objects, some reinforcing activities were awarded. There was at that time in the Phoenix area an entertainment park somewhat like Disneyland but on a smaller scale. One of the available reinforcers was a ticket permitting a trip to this park and permitting rides on the various activities. When the children wished to buy such tickets with their tokens, the graduate student took them to the entertainment park. Once again, the function of the tokens was to break up these large-value reinforcers into small units which could be administered for small steps of educational activity and which could be administered immediately.

In these examples the reinforcing consequences which maintained participation were the same as the consequences of correct responding. It was thus impossible to participate without learning. Note also that these reinforcing consequences were quite variable; changing interests on the part of the learner did not generally result in a decreased effectiveness of the reinforcers because there was a variety of reinforcers commensurate with the possible changes in interest. For example, in Homme's contingency management system

the reinforcing-event menu contained well over thirty items and was usually more than sufficient to maintain the interest of the children involved. In general, some such variation is essential for the kinds of reinforcers that are available for working with children unless one happens to be in a situation where unconditioned reinforcers such as food are being used. Even here, a variety of food items is generally desirable. [The use of food reinforcement for educational purposes is not so fantastic as it may sound. In work with psychotic children, Ivar Lovaas at UCLA (Lovaas, et al., 1966) has found it impossible to maintain prolonged educational activity with some of the children without the strategy of giving them their meals in small quantities contingent on correct educational activity and also on participation in the educational activity. Such a possibility in the case of special education problems with the severely retarded or the psychotic child should not be overlooked simply because of the unusualness of such an approach in the normal setting.]

The value of tokens is even greater when a number of children have to be dealt with since it is almost always the case that the most favored objects differ from child to child but by simply having a wide variety available and giving tokens contingent on participation and correctness, all of the children can be induced to engage in much the same activity irrespective of what objects maintain the reinforcing value of the tokens.

Note also that in all of these cases ,the punishment contingencies present are very mild and constitute only a minor although perhaps essential feature of the situations.

5. *Criticisms.* In spite of the obvious effectiveness of such systems as the two described above (and many others now in operation), their presentation in educational circles usually generates a good deal of emotion, most of which is not enthusiasm. The criticisms take several forms, the most common of which are presented below.

a. *Bribery, a moral issue.* We all disapprove of the payment of a favor or reward which has as its purpose the perversion of judgment or corruption of conduct. Such is the primary definition of the term "bribery." It is not an unreasonable extension to apply the term to payment for something which we believe should be done without payment, for example, for the common good. Another fairly common verbal practice is to apply the term to any form of reward of which we disapprove. Thus it is a pejorative term for reward.

The two examples described above clearly do not fit the primary definition. Homme's educational tasks and the remedial reading exercises certainly do not qualify as forms of perversion of judgment or corruption of conduct. For that matter, the activities themselves are ordinarily considered praiseworthy. The nature of this particular

application is actually quite complex, but apparently the major factor is usually the belief that such activities should occur without payment, plus the general disapproval of such reward that stems from the next two criticisms to be discussed. The criticism loses its force, however, when an analysis is made of the various sources of reinforcement responsible for maintaining educational activity under other, more common conditions. Recall the intricate mixture of behavioral consequences controlling participation in educational activity and those contingent on correct behavior, and it is quite clear that this activity is not ordinarily performed for no reward. Curiously, the reinforcement consisting of threat removal is widely recognized but is usually thought preferable to the form of reinforcement here defended against the charge of bribery.

b. *Unrealistic and dangerous expectations: "don't rock the boat."* Children who are exposed to such systems of reinforcement will come to expect a reward for everything they do, creating both an unpleasant form of demand on other adults who must deal with them and poorly equipping them for later life when they must do many things for nothing. It is, of course, true that a child who has been handsomely paid for his remedial reading in the summer may suggest a similar arrangement when he starts school in the fall, but such a suggestion will receive extinction or punishment and will not be made too often. Furthermore, whatever the controlling variables were prior to his summer experience, they are still in force and will probably continue to have whatever effect they had before. The interaction between children and adults which begins, "What will you give me if I do?" is quite common, and usually ends with somethink like "You had better worry about what I'll give you if you don't!" without any significant change in the nature of the relationship.

c. *Crass materialism—an undesirable social value.* The work for tokens is sometimes criticized on the grounds that it encourages shallow material values at the expense of deeper and culturally more useful values, such as those for aesthetic, spiritual, or humanisitc activities. The same could be said of a system of employment based on payment in terms of money. Tokens are not, in themselves, materialistic. The critical issue is what they are cashed for. An adult who works for money is not called overly materialistic unless the things he buys for the money fit this definition. Many of the things bought by the children in the remedial reading study would fit this definition, but not all of them. Some of the tokens were spent for books, and some were spent for presents for siblings and parents, and the trip to the amusement park is not too far from aesthetic values for children of that age.

d. *Lack of permanence.* What will happen to the remedial readers once they stop receiving tokens for reading? A reasonable question which might well be asked of ordinary education: what will happen to ordinary readers when they are no longer given grades for reading and threatened with punishment for not reading? In general ,once the controlling variables are removed behavior should cease by the process of extinction unless other variables assume control. But that is the essence of much education. A child learns to perform arithmetic because of the grades, the social approval, and other variables, but this is only preparation for a situation where the consequences of an effective repertoire in this field will be such things as correct income tax forms or correct change. Likewise, with reading, an effective repertoire will be put to many uses of a highly practical nature, e.g., reading street signs, instructions, TV guides, newspapers. If the natural environment supports this kind of behavior by effective consequation then it will continue. If not, it will cease.

Perhaps the issue arises because the ordinary school consequation is so vague and complex that it is difficult to determine when it had been discontinued, whereas the token were clearly given for the last time on the last day of the study.

e. *Cannot be done in the ordinary classroom.* It is certainly true that the purphase of toys and their distribution to the students is beyond the capacity of our present public schools, although it is attractive to consider the possibility of using some particular teachers' salaries for this purpose. The high effectiveness of such an approach, though, recommends its use in the many research and special educational situations where it would be possible. A psychological clinic that specializes in children's learning problems charges the parents a fee, part of which is used to purchase the back-up reinforcers for the token system used with the clients. A firm which prepares programmed instructional material wishes to test its programs with highly-motivated subjects and so pays them money for each correct answer.

The actual feasibility of such reinforcement systems in public education is a matter of cost, administrative strategies, long-range effects, and other such variables. Favorable factors are the long time spent in energetic productive activity, and the generally positive attitude the children have toward such systems.

REFERENCES

Azrin, N. H., and Holz, W. C. "Punishment," in W. K. Honig (ed.), *Operant Behavior*, New York: Appleton-Century-Crofts, 1966, 380-447.

Homme, L. "Contingency Management," *Newsletter* of the Section on Clinical Child Psychology, APA, 1966, V. 4.

Homme, L., and Csanyi, A. P. "Contingency Contracting. A System for Motivation Management in Education," Behavior Systems Department, Westinghouse Learning Corporation, Albuquerque, New Mexico. Prepared for the Southwestern Cooperative Educational Laboratory, Inc., Albuquerque, 1967.

Lovaas, O. I., Berberich, J. P., Perloff, B. F., and Schaeffer, B. "Acquisition of of Imitative Speech by Schizophrenic Children," *Science*, February, 1966.

Meyerson, L., Kerr, N., and Michael, J. L. "Behavior Modification in Rehabilitation," in S. W. Bijou and D. M. Baer (eds.), *Child Development: Readings in Experimental Analysis*, New York: Appleton-Century-Crofts, 1967.

Premack, D. "Toward Empirical Behavior Laws: I. Positive Reinforcement." *Psychological Review*, 1959, 66, 219-233.