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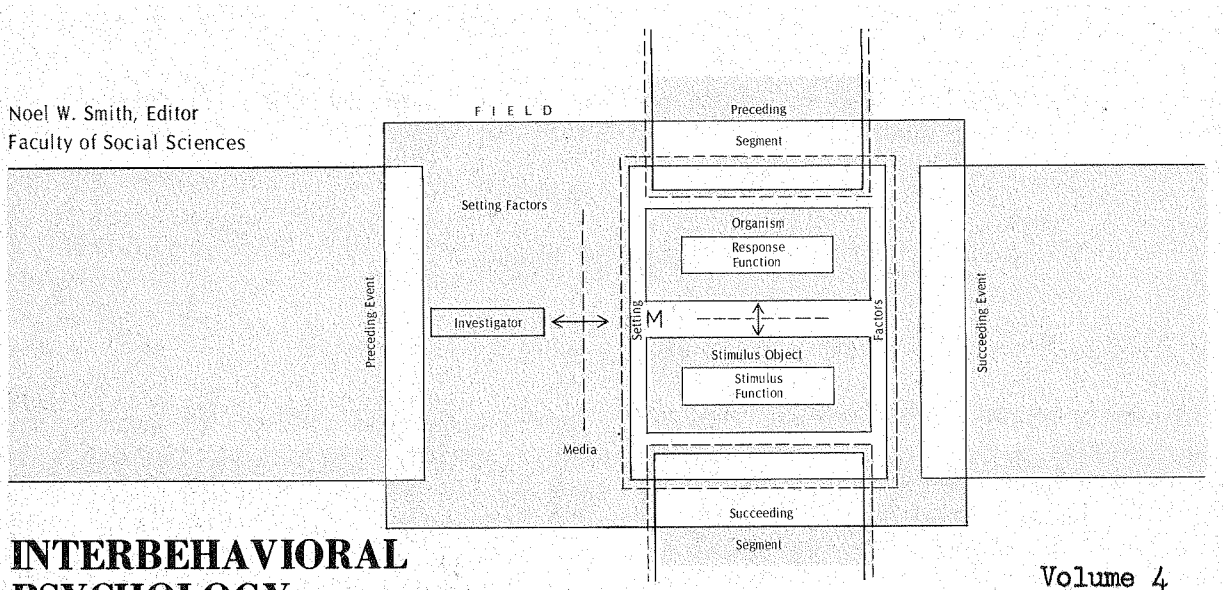


# INTERBEHAVIORAL PSYCHOLOGY NEWSLETTER

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For insight into what human nature is, the Greeks, with Plato first of all, are unsurpassed. They make our best modern psychologists often look very crude.

J. H. Randall: PLATO: THE DRAMATIST OF THE LIFE OF REASON

## THE AGORA

Harry Mahan continues to make progress with his Project Socrates. Some months ago he wrote: "It is arousing nothing less than a phenomenal interest among the community colleges of California. I sent out a mailing the first of the year inviting visits to our campus and I have been swamped with visitors ever since. I made a new set of study tapes just prior to the beginning of the present semester and they contain considerable tutoring material in addition to the content of the two manuals. This makes the taped course virtually completely self-contained, which is what I have been aiming at. The economy aspect is a vehicle which will put our type of psychology into hundreds of introductory psychology classrooms and will convert thousands of people to our way of thinking. The accomplishments of Project Socrates are turning out to be everything which I had hoped they might be. I anticipate at least a couple of pilot programs on other campuses next fall with more the second semester getting the snow ball under way. So far I am not approaching institutions outside of the community colleges of California as they are all I can handle at this time. I want to be in very close contact with any installations at other campuses at first. During the present year I have had a couple of other people teaching the course in addition to myself and am pleased with the results. It is a very easy assignment and works out ideally with the teacher having a couple of other courses which are his and in which he can project his own personality in his relations with his students.... Project Socrates is financed entirely through the sale of study manuals and cassettes which we sell to students through the college bookstore." Inquiries can be addresse to Dr. Mahan at Palomar College, San Marcos, California 92069.

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Correction: the last issue should have been Number 4, Volume 3--not Volume 4. Such errors cause problems with our library subscribers.

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The feature article is by Robert Martin, a doctoral student in psychology with a specialization in higher education. The first two parts (I & II) were abstracted in Research in Education and are available from Educational Resources Information Center.

# Toward Conceptualization of Learning Processes in the College Classroom III: Operant Psychology and Rotter's Social Learning Theory as a Basis for Research

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## Abstract

In this paper the basic processes of learning in the college classroom are conceptualized according to two approaches to learning, operant psychology and Rotter's social learning theory. These orientations are viewed as complementary in characterizing college learning. The theory and relevant research of the operant orientation are reviewed and criticized. Specifically, it is suggested that operant theory, in its application to such complex human concerns as the college classroom is limited in two ways: (a) it is difficult to determine the relevant contingencies of behaviors and reinforcers for individual students, and (b) it is difficult to determine what in fact is a reinforcement for a given student. It is suggested that Rotter's approach may hold potential in meeting these problems. A program of research is suggested to test the utility of such a combined model for the college classroom.

In previous papers, this author (Martin, 1971,1972) has reviewed the literature generally focused on the application of the techniques of operant learning to the college classroom. These applications have been roughly dichotomized as programmed textbooks and related techniques and an overall approach to the classroom, known as contingency management. Although the previous papers have been somewhat critical of this research literature in terms of both the research designs and the limitations of the theoretical framework, the focus of this paper is on the apparent limitations of the operant approach in its application to a highly complex human situation.

In order to focus on limitations of operant theory, a single research effort has been selected. The study reported by Johnston and Pennypacker (1971) was selected because it appears to utilize the bulk of the operant techniques and to answer criticism of research design mentioned above. It also perhaps is more familiar to the general reader than is most of the literature in this area.

After reviewing the general principles of operant theory and the particulars of operant technology in the college classroom, the Johnston and Pennypacker article is used as a vehicle to indicate how in fact the operant techniques have been employed. It is argued, subsequently, that the failings noted in the Johnston and Pennypacker effort (and in similar attempts) are attributable to the weaknesses of the operant approach, as it has been applied to the college classroom. The limitations of operant technology are then further elaborated and alternatives based on Rotter's social learning theory (SLT) are suggested. Finally, suggestions for testing the appropriateness and utility of the contributions of SLT to the use of operant techniques as a model for learning in the college classroom are made.

## The Operant Model

A survey of the indexes for Psychological Abstracts through 1958 yields no references by title to applications of techniques derived from the operant "camp" of behavioristic psychology to the college classroom. The general lack of research on teaching was noted by Beck and Shaw (1960), who have observed:

> The study of the psychology of teaching is apt to involve disappointment. The great number of studies in human learning generate the expectation of a speedy introduction to important principles of practical training. Nevertheless, it is apparent that, although a great deal is known about the many variables and conditions that affect learning, little is known about applying these to promote efficient training. (p. 543)

Beck and Shaw's statement requires some modification because of the work in the decade since it was made. During this period, there has been much effort in attempting to extend the methodology and principles of operant conditioning from animal laboratories to "real, human" problems. This endeavor has been primarily within the "Skinnerian school" and is manifested in education by "programmed instruction" and "teaching machines." The earliest effort in this area was made by Skinner and his colleagues (Skinner, 1958; Holland & Skinner, 1961), but was intimated by Skinner as early as 1948 in his novel, Walden Two.

In spite of the rapid growth in this area since Beck and Shaw's (1960) statement, there remains much reason for such "disappointment." As Lloyd and Knutzen (1969, p. 125) point out, the use of programmed materials has been widespread, but has gone little beyond the use of programmed textbooks (cf., Lumsdaine, 1964; Gagne, 1965). Several volumes have dealt with programmed instruction (cf.,e.g., Lumsdaine & Glaser, 1960; Glaser, 1965; Calvin, 1969), yet applications to the college classroom of operant techniques have been limited almost exclusively to programmed textbooks. This limited use suggests a need to specify the foundations and mechanisms in the application of the operant technology to the college classroom, so that these techniques may be more readily and widely applied.

Theoretical Foundations

The general procedures employed in the conditioning of operant behavior, that is the behavior, that is the behavior by which the organism modifies or manipulates his environment, have been set forth by many authors, but most extensively by the major proponent of this approach, B. F. Skinner (cf., e.g., Skinner, 1953; Skinner, 1963). In this section, the general procedures applied in operant conditioning are presented; also, procedures which are similar and aimed specifically at education and programmed instruction are discussed.

Generally, five steps are delineated in the process of conditioning an operant behavior; (a) the final desired outcome is specified: (b) the pre-conditioning level of this operant is measured; (c) the appropriate reinforcers, discriminative stimuli, and contingencies of reinforcement are specified; (d) a suitable "learning space" is established; and (e) the desired behavior is "shaped up" and brought under the control of the previously specified discriminative stimuli and contingencies of reinforcement. The order of these steps is not necessarily fixed. For instance, step (b) above may be better placed after (c) and (d) in specific situations; steps (c) and (d) might also be reversed where appropriate. In addition, the final behavior is assessed to determine to what extent the "desired outcome" was accomplished.

In specifying the "final desired outcome," the experimenter must define what behavior or specific operant is to be the end-product of this conditioning. In defining the operant, the measures by which the success of the conditioning is determined are also specified. As an example, in a typical conditioning study, an experimenter may have decided to establish a color discrimination in a pigeon. In such a task, the pigeon is to exhibit an operant of pecking a key of only one color and not another. In defining the final outcome, the experimenter also specifies the criteria of learning. That is to say, the measures whereby the operant is said to be conditioned or not are stipulated. In the present example, the experimenter may be satisfied that conditioning has taken place if the pigeon pecks the white key only 90% as often as the red key is pecked in a 60-minute session.

In determining the "pre-conditioning level" of the operant, the experimenter is interested in the probability or, operationally, the frequency, of the response in the organism's existing repertoire of behavior. In so doing, the "base rate" for this particular operant of the specific organism in the given situation is defined, against which the final outcome of conditioning can be compared. In the example of conditioning a pigeon to discriminate between a red and a white key, this step is carried out by observing the frequency of the pigeon's key-pecking behavior prior to any experimental manipulations. In addition to determining the base rate of the operant in question, in this step the experimenter takes note of behaviors which could be components of a more complex operant or a "chain" of responses which the experimenter might wish to establish in the behavior repertoire of the organism and for which the base rate is virtually zero. In the example

of the pigeon color-discriminating, if the desired operant were a circle turned in the clockwise direction before pecking the red key, the experimenter would note in the base rate determination those behaviors which were emitted frequently and could be components of the turning behavior, such as tilting the head in the clockwise direction.

The third step noted above is most complex and deals with "motivational" variables of learning, as well as the physical limits of the organism. In specifying the appropriate reinforcers, the experimenter must be aware of or control the physiological state of the organism. Motivation for learning, necessarily observed as the performance of an operant, is typically operationalized by depriving the organism of some necessity of life such as food or water, but not to such an extent as to impair the organism. Yet choosing, as a reinforcement of the food-deprived pigeon in the previous example, a pellet of dried meat would be inappropriate. In addition to reinforcement delivered appropriately to meet deprivation, other types of reinforcers may be useful. Secondary reinforcers, when they can be observed or established for the organism, may be more appropriate in certain conditioning situations. (This is apparent in considering the complex behavior of students controlled by grades or "being right"; a point considered in greater detail below.) In the example of the color-discriminating, clockwise-turning pigeon, many circles may be turned just to be able to peck the red key, which becomes red only after n circles are turned by the pigeon.

In specifying the discriminative stimuli, under the control of which the experimenter wishes to bring the operant, again the physiological limits of the organism must be recognized. To require the pigeon in the, by now well-used, example to discriminate between two shades of red, closely spaced on the spectrum, would be nearly an impossible task to learn. In addition, the discriminative stimulus may vary in its appropriateness to the task. (This point can be better exemplified in considering educational uses of operant techniques discussed below.)

The specification of the contingencies of reinforcement includes two primary considerations: (a) the interval between operant termination and the presentation of reinforcement, termed "delay of reinforcement" and (b) the number of operants required prior to reinforcement or "schedules of reinforcement". In this regard, the physical limits must be considered: a delay of reinforcement of five minutes is likely to have little effect on the color-discrimination operant of the pigeon, yet a grade of 129/150 may have powerful effects for a student several weeks after the behavior has been emitted. Likewise, expecting a pigeon to emit ten circle-turnings for the first reinforcement is unreasonable. Both the delay and schedules of reinforcement have been extensively researched in the laboratory (cf., Ferster & Skinner, 1957), and hence, the experimenter in the laboratory can readily find guide lines for this step. This procedure when applied in the educational or therapeutic setting has been termed "contingency management," by some authors and is discussed below. Guide lines for the classroom, however, appear not to be so readily available.

In establishing a "suitable learning space," the experimenter attempts to control as many as possible of the variables which may impinge on the organism and interfere with conditioning. In addition, the environment most conducive to learning is sought. This includes making the methods of response and reinforcement convenient to the organism. In the example of the discrimination pigeon, this is generally accomplished by utilization of an operant conditioning apparatus, the so called, "Skinner Box."

Finally, the experimenter shapes up the specified operant by reinforcing successive approximations of the behavior. In addition, the behavior is brought under the control of the specified discriminative (eliciting) stimulus and contingency of reinforcement. Shaping is accomplished through the utilization of small increments in moving from more simple to more complex behavior, in that the organism is first reinforced for gross approximations of the desired operant and then only for finer and finer approximations. Responses which were initially sufficient for reinforcement are subsequently not reinforced. By requiring one simple behavior to follow another, prior to reinforcement, complex behavior patterns (the whole of which may be termed an operant) are established, through chaining. In bringing behavior under the control of specific stimuli or sets of stimuli and in establishing schedules of intermittent reinforcement, the organism is reinforced only under certain conditions and only after a certain number of operants have been emitted. More operationally, the response probability for the specified operant comes to approach 1.0 under certain states, and 0.0 under others. Measures like rates of responding are influenced by the schedule of intermittent reinforcement, that is, the number of operants required before reinforcement.

Operant Foundations in Education

Several authors have delineated approaches to applying, in the educational situation, operant techniques similar to those discussed in the preceeding section. Reviews by Barlow (1962) and Gagne (1965) represent and summarize such work.

Barlow has maintained much of the language of "Skinner's 'operant' psychology," yet taken it from the laboratory setting, as is exemplified in the preceeding section, and placed the emphasis on the classroom. Barlow states,

> The task of the teacher is to (1) determine the current discriminative repertoire and effective reinforcers for the potential students: (2) carefully specify the desired terminal behavior and conditions under which this behavior is appropriate; (3) evoke and reinforce typical current behavior that is relevant in order to "dipper" or "magazine" train the student; (4) carefully sequence SDs (discriminative stimuli) and reinforcement in order to shape the behavior of the student until the desired behavior is emitted in the presence of SDs typical of the natural practical environment in which the behavior is appropriate; (5) complete the sequence in such a manner that the new behavior will be intrinsically reinforced and maintained after the sequence is completed (p. 403).

It should be noted that, in addition to some differences in the order of the steps outlined in the description of the operant procedures presented initially above and Barlow's there are some differences in emphasis, if not content. It should be helpful to indicate just how Barlow's scheme relates to the more general one outlined previously. Barlow's first point corresponds roughly to the third point in the general scheme outlined above, that is specifying the appropriate reinforcers, SDs, and contingencies. In addition, this step of Barlow's scheme implies the determination of base rates which is the second point in the general operant procedure. Barlow's second step also implies (c) of the general scheme, as well as the specification of the desired final outcome, (a) of the general scheme. The "general conditions under which this behavior is appropriate" can be taken as the relevant discriminative stimuli and contingencies of reinforcement. Barlow's third and fourth points may be seen to correspond with the fifth point of the general procedure, shaping and establishing contingencies. The fifth point of Barlow's scheme is implied in (e) of the outline of the general procedure; "intrinsically reinforced and maintained" may be taken to correspond to "brought under the control of the previously specified discriminative stimuli and contingencies of reinforcement." Barlow's scheme apparently does not specifically consider step (d) of the general procedures for operant conditioning, the establishment of a suitable learning space. It is, however, implicit in Barlow's whole description and most clearly implied in (c).

Gagne (1965) has emphasized the importance of specifying the outcomes of conditioning and the conditions for the behavior to be emitted (Barlow's second step). In addition, to the necessity of this step apparent in the statement of the operant approach in the laboratory, that is step (a) of the general scheme, he has indicated some other and perhaps more practical considerations. To Gagne, the specification of terminal behavior desired by the teacher is essential so that the "instructional designer" may know the nature of what is to be learned. That is to say, the "instructional designer" must know the nature of the terminal behavior so that he can correctly design the terminal stages of his program. This depends on the specification by the user of a program, the teacher, of "what the learner is expected to be able to do" having gone through instruction. It is only with such a criterion that the success of the program can be measured. Clearly, this terminal behavior must be specified as an overt performance in order to provide a suitable criterion. In addition to determining the terminal sequences of the program, Gagne points out that the specification of outcomes in overt behavior allows the programmer to make inferences about behavior modifications to be made through the program (pp. 23-24)

Gagne notes two more reasons for specifying the desired outcomes of conditioning in terms of overt behavior. One such specification allows the evaluation of the effectiveness of the program in comparisons of the effectiveness between programs. This is so because the specification of overt terminal behaviors meets the requirements of reliability and measurement. Finally, Gagne suggests that the most important function of specifying outcomes of conditioning is the provision of a basis for the shaping of behavior (cf.,

steps (c) and (e) of the general scheme). Distinctions among the class of behavior to be established may serve as a basis for modifying previous patterns of behavior. Different classes of behavior require the application of different conditions for learning (p. 25). For example, the learning of a class of behaviors such as ethical behavior can be expected to take place under different conditions (e.g., different contingencies and reinforcers) than the learning of a class of behaviors such as basket making. In Gagne's preceding treatment "user" and "educational designer" are distinguished. Often, however, it is the case that in the ad hoc use of operant techniques in the classroom these two "technicians" are the same. Nevertheless, it should be emphasized that the specification of clearly defined end-products of the conditioning remains essential.

Gagne emphasizes one more role for the specification of outcomes or "defining of objectives"; this has to do with the role of reinforcement in applying operant techniques to human behavior. The matching of behavior to specified outcomes or "being correct" appears to be a powerful reinforcer of human behavior (Gagne, 1965, p.26). However, Gagne adds that "reinforcement" has not been practically defined, beyond the concentual definition that a set of conditions coincident or closely subsequent to a behavior which appears to increase the probability of that behavior is termed reinforcement. Reinforcement is then taken to mean in programmed instruction the learner's matching of his own response production to a response which is indicated as correct (p. 27).

For the most part, to this point, the elaboration of Barlow's scheme has been limited to his second point and to the additions to it suggested by Gagne. Skinner (1965) has written an article which suggests some further clarification of Barlow's outline and provides some additional translation from the statement of operant procedure in the laboratory to the application of these procedures in the classroom. Skinner offers the following elaboration:

> An important contribution of operant research has been the so-called "programming" of knowledge and skills--the construction of carefully arranged sequences of contingencies leading to the terminal performances which are the object of education. The teacher begins with whatever behavior the student brings to the instructional situation; by selective reinforcement he changes that behavior so that a given terminal performance is more and more closely approximated. Even with lower organisms quite complex behaviors can be "shaped" in this way with surprising speed; the human organism is presumably far more sensitive (pp. 6-7).

The notion, contingency, implies both reinforcement schedules and sequences of discriminative stimuli; behavior is brought under the control of both. As Barlow suggests, "Weaning" from the program is essential also, so that the behavior is maintained by the appropriate schedules and reinforcers and discriminative stimuli in the "real world".

Reflecting the emphasis on specification of overt behaviors as the terminal outcomes of conditioning made by both Barlow and Gagne, Skinner (1965) also emphasizes the equally straightforward, overt function of the program or instructor: "The task of the teacher is to bring about changes in the student's behavior. His methods are equally conspicuous: He makes changes in the environment. A teaching method is simply a way of arranging an environment which expedites learning" (p. 13). This is the implication of the third and fourth point in the discussion of operant techniques in the laboratory, that is the establishment of a suitable "learning space." In addition to manipulation of contingencies of reinforcement and discriminative stimuli, an environment "conducive to learning" is needed.

Skinner also suggests a dichotomy of the role which operant procedures play in the educational setting: producing new behavior or controls and maintaining behavior strength. As he views this role of "programming," the arranging of contingencies of reinforcement by the teacher to establish new forms of response, such as a handwriting and verbal and nonverbal behaviors as in sports, arts and crafts, is fairly straightforward. However, the manipulation of contingencies to bring existing behaviors under new stimulus controls, such as with intellectual and ethical self-control has not been so widely attempted, but requires the application of the same principles (1965, p. 13). This discussion corresponds roughly to Barlow's fourth point, but also incorporates part of Barlow's final point.

The sceond half of Skinner's dichotomy of the role of operant procedures in education completes the fifth step of Barlow's scheme and reflects the "motivational" aspects in the preceding treatment of laboratory operant techniques. Skinner has emphasized the role of schedules of reinforcement in suggesting that "a second kind of programming" results in the maintenance of the strength or probability of a student's behavior. The form of the response and stimulus control are not altered but the likelihood of response is increased. The introduction of new reinforcers or increasing the effectiveness of old ones can strengthen behavior, as in Skinner's example of providing a student better reasons for getting an education. He adds that another possibility is suggested by the experimental analysis of behavior: available reinforcers may be scheduled more effectively. Appropriate terminal schedules will yield a "motivated" student, or one who is "interested," "perservering," "curious," and "industrious"; but less stringent schedules are required first, in order to maintain the desired behavior at every stage. Skinner stresses that, "The programming of schedules or reinforcement is a promising alternative to the aversive control which, in spite of repeated reforms, still prevails in educational practice" (1965, pp. 13-14).

At this point, the juxtaposition of the laboratory techniques of operant conditioning with the description of these techniques in the classroom is completed. With the theoretical foundations of operant conditioning in educat on having been delineated, it is now in order to consider an example of the application of operant techniques in the college classroom.

Operant Techniques in the College Classroom:

In this section of the paper, the effort to use operant principles and techniques, or contingency management, in the college classroom reported by Johnston and Pennypacker (1971) is used as an example. The principles of operant conditioning, as outlined above, are elaborated and exemplified using the Johnston and Pennypacker study.

The general scheme developed by Barlow (1962) and delineated above is used as the criterion against which the example is compared. The criterion is one of completeness and although the Johnston-penneypacker paper is criticized below, their caveat is well-noted:

> The studies discussed here are a part of a long-term research program which seeks definition and analysis of relevant variables affecting student performance in undergraduate college courses and the development of feasible methods of most efficiently and reliably producing optimal student performance in a manner that is preferred by both student and teacher to other methods of instruction. It should be noted that the efforts to be reported here are only the beginning of such a program and have thus been confined to certain facets of the entire program (p. 220).

Before considering the specific operant principles, the general procedures and characteristics of the course are noted. The course was an advanced course, focusing on principles of behavior. The majority of the students were junior and senior psychology majors, but other students ranged from sophomore to graduate levels and majors represented all the colleges of the University. Enrollment was from 60 to 70 students each quarter and classwork consisted of reading a textbook, lectures three days a week, and ap lied laboratory sections usually on the remaining two days.

In Johnston and Pennypacker's operationalization of operant principles, students performed verbally in answering questions for each study unit to criterion. Reinforcement (i.e., being correct) was administered immediately by a more advanced student "manager," who also displayed the student's cumulative record. The course grade was determined by the final correct and incorrect response rates. Replications with variations such as silent written performance and in various course content areas were also reported by Johnston and Pennypacker. The specific points of their approach are now compared with the schemata developed by Barolw (1962), which has been presented above.

The first step of Barlow's scheme, the determination of the discriminative repertoires of students and the reinforcers effective in controlling their behavior, is apparently not measured but only assumed. In this approach rather than the determinat on of such variables for each student, the following type of assumptions are made:

> It has been suggested that instructions presumably substitute for drive and that knowledge of results presumably substitutes for reinforcement in the case of the human subject. Generally speaking, it appears that knowledge of results comes ordinarily to act as a secondary reinforcer; and, as is true of secondary reinforcers at the infrahuman level, it is also true with human subjects that knowledge of results come simultaneously to attain cue or $S^D$ properties (Notterman, 1970, pp. 194-195).

This approach is evident in the Johnston-pennypacker program (pp. 221-2; 238). From the standpoint of assessing individual students prior to teaching, these assumptions appear to be a major difficulty of the operant approach. This criticism is elaborated and alternative approaches are suggested in later sections of this paper.

Although the evaluation of "entering behavior", as the information required in the previous paragraph is sometimes referred to (cf., e.g., Taber, Glaser, & Schaefer, 1965, p. 147), is not evident in Johnston and Pennypacker's program, the specification of the desired terminal behavior, the second step of Barlow's scheme is evident.

> [T]he written and oral course-relevant verbal behavior of the student was the primary response of interest in these experiments, although other behaviors (such as attendance) were also considered (Johnston & Pennypacker, 1971, p. 220).

In addition to this description, the particular response criteria were carefully specified (pp. 222-3; 232-7; 238). Criteria for performances on the weekly quizes were stated in terms of both correct and incorrect response rates so that "a quality and quantity of verbal behavior with respect to the subject matter that would be comparable to the verbal behavior that characterizes an 'expert' in the area" would be produced. These criteria are equivalent to 90% correct and 10% incorrect. The cumulative performance criteria, over quizes, were also stated. This was done to raise the probability of consistent quiz taking behavior.

Barlow's third step, the evocation and reinforcement of behavior, currently in a student' repertoire and useful in shaping, is not readily apparent in the Johnston-Pennypacker program. This operation is related to the assessment of entering behavior and is subject to the criticism noted above in that regard. The use of instructions and the description of the course provided to students (p. 223-4) appears to be an attempt to evoke the appropriate behaviors from the class. The measurement of success of this manipulation for individual students is subject to the previous criticism. In addition, Johnston and Pennypacker's attempt to balance "student-paced" with "instructor-paced" demands (p. 223) may be an implicit recognition of the differences in the success of this attempt to shape existing behaviors.

The first part of Barlow's step (4), the sequencing of SDs and reinforcements is evident on the level both of individual quizes and from unit to unit. The student is provided cues and reinforcement from the display of his behavior, cumulated by the manager after each performance. In addition, an adequate performance on each unit is required prior to moving to the next (p. 222; 237-8). The second part of Barlow's fourth step, that is bringing the behavior under the control of the SDs in the individual's "natural, practical" ecology, is apparently not considered by Johnston and Pennypacker.

Likewise, Barlow's fifth step does not appear to have been taken into consideration in the work reviewed. The intrinsic reinforcement and maintenance of the newly acquired operant is essentially the notion that the skills acquired in the particular course will be maintained in strength in other courses and outside the classroom. Skinner has suggested that this process may also be a function of the scheduling of reinforcement (cf., p. 13, above).

As was noted in the introductory remarks, the intent of the author is not to criticize the research effort reported by Johnston and Pennypacker (1971). On the contrary, their approach has been viewed as comprehansive in its use of operant techniques. It is argued that failings, if there are any, of such programs are not the fault of researchers, educato , or programers who are as careful as Johnston and Pennypacker evidently are, but are intrinsic to the use of the operant orientation.

The utility for higher education of the operant approach has been summarized by Martin (1971, pp. 24-34), if the goals stated for it can in fact be accomplished. As Johnston and Pennypacker (1971) see it, the goals of the use of operant techniques is the individualization of instruction in higher education (pp. 241-2). They summarize this goal and the attendant operations with the following:

> The ideal guiding these efforts developing teaching procedures which would allow each student to serve as his own control for the academic purpose of evaluating the effects of individual procedural changes and for the research purpose of evaluating independent variable manipulations was in great part attained. The individual cumulative records served as a highly sensitive representation of current individual activity. Such attempts will accrue even greater success if material difficulty and other similar variables can be held relatively constant to allow stable reflections in individual student performance of manipulations of variables of primary interest. There would seem to be considerable advantages to such a research tactic (Sidman, 1960; p. 243).

Although this author has been critical of the operant approach on various grounds (Martin, 1972, pp. 39-44), it is exactly the limitations of the operant approach in meeting such goals, which are now of focus. Although Johnston and Pennypacker (1971) report high levels of achievement, with over 90% of the class receiving A's (p. 226), and high student satisfaction (p. 224), some important considerations remain from the standpoint of individualizing instruction.

First, there is apparently some variability in the number of students reaching criteria in programs of apparently equal comprehensiveness (cf., e.g., Malott and Svinicki, 1969, p. 550; Ferster, 1968, p. 523). In addition, the research literature may be selectively distorted by failing to include studies reporting lower success rates. In the author's own experience, the A-achievement is closer to 65%. Although this may be a function of less precise use of the techniques or of higher criteria for behavior, it is argued below that this variability is a function of the inability to assess individual variation prior to the course of instruction with operant methods.

Secondly, the reportedly high student satisfaction may be an artifact of high drop-out rates from the class. Johnston and Pennypacker do not report relevant data, but Ferster (1968, p. 523) has reported a dropout rate near 12% of the initial enrollment. In the author's classes a rate from 40-60% has been evident and similar to that noted in the personal experience of others (Todd, Anderson, Hodson, & Gregerson, 1972). Such variability may be a function of program differences or characteristics of student populations. Again, it is argued in the next section, however, that the dropout rate is in part a function of the inability of the operant approach to assess the individual prior to the course of instruction.

Apparent Limitations:

Having considered the application of the principles of operant conditioning to college learning as delineated in the previous section, one may conclude that there are serious limitations to this orientation. For instance, if a college instructor wishes to manipulate the appropriate contingencies of reinforcement in the classroom, he needs to know what constitutes reinforcement for a given student; such knowledge requires information about his individual history of reinforcement. This is the assessment required by the first step of Barlow's approach described above. The failure of the operant approach to provide a means for such an evaluation for complex human behavior, on an individual basis, is the major criticism of this approach to this writer. It appears that events such as being correct, receiving praise from the instructor, and receiving a high grade are not reinforcing events and effective for all students. Likewise, discriminative stimuli, those stimuli to which some behaviors are emitted and others withheld, are assumed to be the same for individual students. Such stimuli as an open book, a study table, or a teaching machine may or may not exist as SDs in individual student repertoires. Whether these reinforcers and SDs exist for every student in a given class and in equal strength is an empirical

question, the potential evaluation of which is elaborated in the concluding section of the paper.

Secondly, to apply the principles of operant conditioning, it is essential to establish the "base line" of behavior, or more technically, the probability of occurrence of the behavior; that is to assess the student's entering behavior. The same assessment is required for classes of behavior in the repertoire of the student. This corresponds roughly to the third step of Barlow's scheme, as noted previously. The operant approach appears not to suggest methods for determining what is the current repertoire, including the relevant contingencies, for an individual in complex, human situations. In the laboratory or for simple behavior (including humans in some institutional situations, e.g., profound retardation), one need only to observe the organism to determine the base rate of the desired operant and any behaviors existent in the organism's repertoire which might be useful in later shaping.

To summarize, it has been argued that in the case of complex human behavior, occuring in a very complicated ecology, the operant approach does not provide the tools for the assessment of individual behavior, antecedant to the goal of individualizing instruction. Such limitations, it may be suggested, present serious difficulties for the practical use of the principles of operant conditioning in the college classroom. The assessment of each student, even if it were possible using operant techniques, would require large expenditures of personnel time, money, and equipment. In the present educational system, it would appear unlikely that such assessment is foreseeable. After reviewing social learning theory (SLT) in the next section, specific suggestions taken from SLT for increasing the utility of the operant model in individualizing the instruction in the college classroom are discussed.

## The Social Learning Model

Variables like "history of reinforcement" and individual reinforcement contingencies, as well as response hierarchies, can be considered as lying in the domain of the "personality" sub-area of psychology (Jesser, Graves, Hanson, & Jessor, 1968, pp. 85-89). Rotter's (1954, 1955, 1960, 1966) social learning theory (SLT) perhaps provides a basis for meeting the limitations of applications of operant principles to the college classroom, in that the primary concepts of SLT are intended to evaluate what constitutes reinforcement for the individual. SLT is directed as the complex or personality level, rather than derived from principles developed in simple situations. In this section of the paper, then, the basic formulations of Rotter's theory are presented and suggestions for application of this conceptual framework to the college classroom are discussed.

### Rotter's Orientation

Rotter, at the Nebraska Symposium on motivation (1955), addressed the problem that learning theorists generally do not treat the issues raised above, that is, the measurement of what constitutes reinforcement or what contingencies are operating for the individual. It is argued that knowing the external environment is not sufficient for prediction of individual behavior; the "psychological situation" must also be considered. Rotter states that, "any attempt to predict precisely or specifically what the human organism will do, requires a knowledge of the cues present, internal or external, and the acquired meaning or learned values that these cues have for the organism" (1955, p. 245).

Rotter goes on (1955, pp. 245-254) to review theoretical positions which have treated the "psychological climate" and concludes that this consideration is never more than implicit. In this regard, Brunswik's approach is noted as an exception. In other specific research areas the "psychological situation" has been considered somewhat more explicitly. The role of anxiety in student performance (1955, pp. 251-252) and the role of experimenter, examiner, or teacher bias (1955, pp. 249; 251-252; cf., Rosenthal, 1966, E-effect) are noted by Rotter as such research areas. He, however, concludes that the consideration of the "psychological situation" generally has been limited to personality theorists and social psychologists; the importance of the psychological situation in learning theory is stressed by Rotter:

> There are two basic aspects to the prediction of learned behavior. One deals with the individual's past experience, from which we must abstract constructs or variables of different levels of generality for different purposes and we attribute these to the individual or consider that he carries these around with him. The other is the present, meaningful environment, psychological situation or what Lewin (1951) has called the "life space." From this latter variable the psychologist must also abstract constructs at different levels of generality for different purposes in order to predict behavior (1955, p. 249).

Although Rotter's explanation is couched in terms of "behavior prediction," the same considerations hold for "behavior control."

Specification of Rotter's Theory

Rotter has specified the role of the psychological situation in the prediction of human behavior with the formal statement of functional relationships. However, before considering these, some basic definitions are treated.

Internal and external cues. In the discussion above of this general orientation, it was noted that knowing both internal and external cues is considered essential in order to predict behavior. The definition of these variables has implications beyond the common-sense meaning:

> By internal cues I mean that the individual is responding to stimuli conditions, arising in the body, with learned associative meanings, such as to a parched throat, or a pain in the region of the stomach. By external cues I refer to any aspect of the individual's environment, outside of the body, to which he is responding at any given time, and which for him has acquired meanings as a result of previous experience. A cue then is a psychological stimulus (Rotter, 1955, p. 251).

It would appear that in this use "cue" is a somewhat broader concept than the "stimulus" of operant theory (although, c.f., Staats and Staats, 1963).

The definition of the other basic concepts of SLT are most efficiently treated as they appear in the statement of the functional relationships of the theory. SLT first was stated comprehensively in the context of clinical psychology (Rotter, 1954);

Social learning theory has been characterized in the following way:

> The fundamental concepts in Rotter's social learning theory are the following: (1) Expectation (E), which refers to the subjective probability held by an individual that a specific behavior will lead to the occurrence of certain events or reinforcements; (2) reinforcement value (RV), which refers to the degree of preference for the events or reinforcements which are contingently related to behavior; (3) behavior potential (BP), which refers to the likelihood of occurrence of a behavior, or the relative strength of the tendency to respond in a certain way; and (4) the psychological situation (S), which refers to the immediate context of action described in psychologically relevant terms, that is, in terms reflecting the actor's potential perception or interpretation of his confronting situation.
>
> These basic terms generate the following descriptive formula, which constitutes the foundation for prediction or explanation at the personality level: BP = f(E and RV). The formula reads: The potentiality of any behavior occurring in a given situation is some function (probably multiplicative) of (1) the expection that it will, in that situation, lead to a particular goal and (2) the value of that goal in that situation. Note that the "S" term is implicit in that each of the other terms in the formula is variable or dependent upon the specific properties perceived in the psychological situation. Action, or actual behavior, then, always involves a process of selection or choice, from a repertoire of behaviors, of that behavior with the highest potential for leading to gratification in a given context (Jessor, et al., 1968, pp. 85-86).

The four terms of this general expression require elaboration and lead to some other functional relationships.

Expectation. What Jessor et al. have termed "expectation" was in Rotter's original formulation "expectancy" (E). "Expectancy may be defined as the probability held by the individual that a particular reinforcement will occur as a function of a specific behavior on his part in a specific situation or situations" (Rotter, 1954, p. 107; 1955, p. 256). Additionally, it is pointed out that expectancy is theorized to be independent of the reinforcement's value or importance to the individual. The concept of expectancy is important also in moving from prediction of specific events to prediction or explanation of classes of behavior, as is elaborated below.

Reinforcement value. Originally this concept was defined "ideally," limited to external reinforcement (Rotter, 1954, p. 107). In subsequent presentations of the theory this qualification was dropped and reinforcement value (RV) defined "as the degree of preference for any reinforcements are equal" (Rotter, 1955, p. 255). It is clear that the referent of this concept is the individual and not experimenter-defined events in the ecology, the nature of the reinvorcement concept in operant theory.

Behavior potential. The third concept of SLT and the one which provides the basis for the prediction of behavior is behavior potential (BP). This is defined "as the potentialit of any behavior's occurring in any given situation or situations as calculated in relation to any single reinforcement or set of reinforcements" (Rotter, 1954, p. 105; cf., 1955, p. 255). It is noted that ultimately the evaluation of the potentiality for the occurrence of any specified behavior may be based on its actual occurrence in a given situation where alternative behaviors are possible. BP thus is a relative measure, being described only as weaker or stronger than other potential behaviors present in that situation. This relativity would hold also if the potential for the same behavior were determined in severe different situations (Rotter, 1954, p. 105). That is to say that the obtained BP's would be ordered relative to each other for each different situation.

Psychological situation. One concept is implicit in all the functional relationships presented below, the importance of which has been stressed by Rotter. "Perhaps one of the greatest weaknesses of current psychological theorizing and practice has been its failure to deal analytically with the situations or contexts in which humans behave" (Rotter 1954, pp. 110-111). The psychological situation (S) functions to provide cues by which the individual may determine which reinforcements he may expect to follow which behaviors (Rotter, 1955, p. 256). More specifically,

> We mean by s a psychological situation or any part of it to which the individual is responding. Like Lewin (1951) and Kantor (1924), we define a situation as that which is experienced by the subject with the meanings the subject gives to it. The situation must also be describable in objective terms for scientific purposes. We do not let the matter rest with the statement that for each person the situation may have different meanings, since it is necessary to describe in some communicable way what it is that has different meanings for various persons (Rotter, 1954, p.111).

The three variables defined above are viewed as functionally related in the context of s. Hence, they provide a basis for predicting human behavior at the most simple level and, with reformulation, at the complex level, classes of behavior.

Predicting behavior. At the most simple level (i.e., a single behavior), expectancy and reinforcement value are combined, in the context of the psychological situation, to yield behavior potential. Formally, this relationship is stated:

$$B.P._{x,\ s_1,\ R_a} = f(E_{x,\ R_a,\ s_1} \ \&\ R.V._{a_1,\ s_1}).$$

Verbally, this relationship is: the potential for the occurrence of a given behavior (x) in a specific situation (1) in relation to a given reinforcement (a) in a function (probably multiplicative) of the value of that reinforcement in that situation and of the expectancy for the occurrence of the reinforcement a following the given behavior in that specific situation (Rotter, 1955, p. 255; 1954, p. 107; 1960, p. 302).

This initial formulation is of limited usefulness, however, in the prediction of behavior because it takes into account only a specified reinforcement and no other possibilities. In order to predict the potential of all the possible behaviors occurring in situation 1, a set of BP's must be obtained, each limited to a specified reinforcement. This logic generates the following formulation: $B.P._{x, S1, R(a-n)} = f(E_{x, S1, Ra-n} \& R.V._{a-n}$ which can be described verbally as the potential of the occurrence of a given behavior (x) in a specified situation (1), considering all the potential reinforcements relevant to the individual, is a function of the expectation that these reinforcements (a to n) will occur in the given situation and the values of these reinforcements (Rotter, 1954, p. 109).

In order to predict behavior at a more general level in a variety or group of situations, the formula for behavior potential is generalized:

$$B.P._{(x-n)\, S_{(1-n)}\, R_{(a-n)}} = f(E_{(x-n)\, S_{(1-n)} R_{(a-n)}} \& R.V._{(a-n)} \quad S_{(1-n)}.$$

This is described by Rotter:

> The potentiality of the functionally related Behaviors x to n to occur in the specified Situations 1 to n in relation to the potential Reinforcements a to n is a function of the expectancies of these behaviors leading to these reinforcements in these situations and the values of these reinforcements in these situations (Rotter, 1950, p. 302; cf., 1954, pp 109-110).

This formula is simplified in the following expression: NP=f(FM & NV) (Rotter, 1960, p 303). This introduces three simplifying and more general variables than used in the preceding formula. Need potential (NP), freedom of movement (FM), and need value (NV) are defined in the following description of this functional relationship: "The potentiality of occurrence of a set of behaviors that lead to the satisfaction of some need (need potential) is a function of the expectancies that these behaviors will lead to these reinforcements (freedom of movement) and the strength or value of these reinforcements (need value)" (Rotter, 1954, p. 110). Rotter has emphasized that the psychological situation is implicit in this formula (1960, p. 303).

Rotter has further elaborated the theory and further specified the concepts of SLT (1954). In addition, he has indicated how SLT can be brought to bear in particular applied areas (clinical, 1954; personality testing, 1960). However, since these do not appear to bear directly in this effort to conceptualize college learning, only one additional concept is considered.

Internal-external control. In later development of SLT and in Rotter's research, the concept of internal versus external control of reinforcement (I-E) has received emphasis. This concept has been most fully developed and a relevant program of research reported in a monograph (1966). I-E is in a sense a further generalization of the predictive function of the theory as can be seen in definition provided by Jessor et al. (1968). I-E is the "generalized orientation or expectation that the outcomes of one's behavior are contingent upon what one does (internal control) as opposed to being determined by outside forces such as powerful others, or impersonal random forces such as luck, fate, or chance (external control)" (italics in the original, p. 104).

Having completed the description of social learning theory, it is at this point appropriate to note some of the apparent limitations to its intended use, vis a vis operant techniques in the college classroom. The orientation of SLT has been highly theoretical in the preceeding description; this is of necessity in that it has not been applied to the processes of learning in the college classroom or to behavior and ecologies of similar complexity. In addition, the appropriate measures appear not to have been fully formulated. There is, however, sufficient evidence on both counts to suggest the hueristic value of the concepts of SLT in the present context; a suggested research program is developed in the concluding section of the paper.

With the basic conceptualizations of Rotter's SLT and the relevant limitations in hand, a consideration of its potential role in research on college learning processes can

be undertaken. In what follows some suggestions as to the potential use of SLT in characterizing and researching learning in the college classroom are described.

SLT and Learning in College

The potential contribution of SLT to research on conceptualization of college classroom learning processes is in its specification of individual differences inherent in the concept of psychological situations. The most effecient application of any reinforcement paradigm to such complex human learning would appear to require elaboration as to how the variables of stimuli and reinforcements affect individuals differently. This can be elaborated in considering the potential role of each of the variables of SLT in conceptualizing the learning processes of the college classroom.

The concept of reward value provides perhaps different potential information for predicting human behavior than the experimentally controlled reinforcement. Recalling that RV is the extent to which an individual prefers reinforcements contingent on his behavior, it can be suggested that experimenter- (teacher-) defined reinforcements will differ in their effect in controlling students' behavior. As an example, some students will "work" best for grades, others for praise, and still others for freetime. For the teacher to manipulate only grades, for instance, (i.e., to "contract" for the amount of work to be completed by the student) would appear a less efficient way to handle a class of students. The RV concept of course broadens to need value in considering classes of functionally related reinforcements (goals).

It would appear that determining the RV or NV for an individual student perhaps provides the same functional information as is essential in specifying or controlling the history of reinforcement of the individual student as is noted above (p. 25). The difference between these two approaches would appear to be in the method of measurement (or manipulation) by the teacher.

As with RV and history of reinforcement, a parallel between expectation and the contingencies of reinforcement can be drawn. E, the individual's subjectively held probability that a particular behavior will be followed by the occurrence of a specified event or class of events (reinforcements), can be viewed as the individual's appraisal of the contingencies of reinforcement in his ecology. Whether such contingencies are chance-controlled or they are personally controlled indicates the role of the I-E variable of SLT. The E variable is generalized to sets of behaviors and goals as the mean expectancy or freedom of movement.

An example of a classroom situation may help clarify the relationship suggested between E and contingency of reinforcement. The I-E concept is also suggested in this example. If a student perceives that the grade he will receive for a research report is a function of how well he approximates writing a paper acceptable for publication, it can be predicted that he will respond differently than if he perceives that his grade is determined only by the instructor's whim. It is suggested that this is so, irrelevant of the actual contingencies of reinforcement. To specify this point: it is being suggested here that for mature human subjects (hopefully students) in complex situations of learning, the individual's expectations of reinforcement will be a better predictor of behavior than the actual contingencies of reinforcement. This is an empirical question and through learning it can be suggested that expectations and contingencies of reinforcement may, in general, become very similar, if not identical.

The probability of the occurrence of a given behavior, that is the relative response tendency (BP) strength, appears conceptually similar to the notion of response hierarchy (cf., Staats and Staats, 1963, pp. 101-107). The concept of response hierarchy is an extension of basic operant principles. It can be taken to suggest that for classes of functionally related behaviors, one behavior has a greater likelihood of occurrence in a given situation than another behavior in the same class. This parallel is more explicit in considering that the relativity of the strength of the tendency to respond in a certain way is with other behaviors. When BP is broadened as need potential, the probability of occurrence of a set of functionally similar behaviors, the two concepts would appear to be identical. The determination of response hierarchies or of NP would appear to yield the same information, at least conceptually.

A summary comment is in order for this section: In this treatment of Rotter's social learning theory, the approach has differed somewhat from the previous approach to operant conditioning. In the operant conditioning section, relevant research was reviewed; none was available for applying SLT to the classroom. However, to the author, these two theories do not appear to be antagonistic. On the contrary, they appear to be complementary, as has been stressed above. SLT would appear to have potential contribution to reinforcement paradigms in general, and, in particular, for conceptualizing learning processes in the college classroom, if in no other way than notational. However, a broader contribution has been suggested above.

## Summary and Conclusions

Based on the thrust of the existing literature, the paradigm initially followed in this paper to characterize learning in the college classroom is that of operant conditioning. The intent in this paper is to increase the effectiveness of learning in the college classroom through the more efficient use of operant techniques. Some apparent difficulties, impairing the efficiency of the application of this paradigm in a complex situation, have been alluded to above. In addition, it has been suggested that social learning theory may hold some potential solutions for these problems in specifying reinforcers and contingencies. In this concluding section these matters are more concisely formulated and the nature of research relevant to these issues is indicated.

The two major difficulties in applying the operant approach in the college classroom would appear to be in assessing, prerequisite to controlling, the contingencies of behavior and reinforcement and in manipulating the relevant reinforcers (steps 3 and 5 in the general operant procedure outlined above). In complex human behavior, it is difficult (i.e., e.g., "unethical") to control the organism's history of reinforcement, or even the most recent history, such as depriving a rat of water. In addition, recording such history would appear to present insurmountable (at present) problems when the time period is around 20 years. The difficulty in manipulating relevant reinforcers is similar to the preceeding one for complex, human behavior: in order to manipulate the reinforcers, one must determine what constitutes a relevant reinforcer. The E knows the relevant reinforcer of the bar press operant, if the rat has been food deprived for 36 hours, and thus can manipulate this reinforcer. Can a teacher, however, be so confident that the promise of an "A" -grade is the relevant reinforcer for the operant of writing a research paper, if the student has been "A" -deprived for two semesters?

As noted previously, the experimenter or teacher manipulation of relevant reinforcers is dependent upon their specification. In the rat (or in simple behavior) the relevant reinforcers are operationally "defined" when the experimenter deprives the organism, a situation unlikely to be duplicated in complex, human behavior. Two basic concepts of social learning theory may provide a basis for assessing the relevant reinforcers for individual students in complex learning situations. Expectancy is the individual's (subjective) probability that a given reinforcement will occur as a function of his emitting aparticular behavior in a particular situation. This concept also provides a basis for assessing what are the individual's perceptions of the contingencies of reinforcement. Reward value, on the other hand is the concept which provides the basis for determining the relative strength of reinforcers for the individual. Thus, it may be an indication of what reinforcer should be manipulated by the teacher in order to control the student's behavior.

Two ideas have been raised here which should be further stressed. The notion is implicit that what the student reports as the contingencies of reinforcement (his expectancy) may be more useful in the control of behavior (learning) than the "actual" or teacher-defined and -manipulated contingencies. Such an orientation is consonant with the approach of social learning theory. However, operant theory might be taken to suggest the contrary orientation to the question of the individual's awareness of the contingencies operating in his learning (cf., e.g., Greenspoon, 1955), that reinforcers may operate outside of awareness. Research is required to resolve this apparent difference in the two theories, although recent research (Page, 1972) favors an "awareness" interpretation. The question is whether or not the individual's perception of the contingencies of

behaviors and reinforcements, or at least his report of these is relevant to the effectiveness of learning. In fact, if student-reported and teacher-defined contingencies differ at all is an empirical question. The second notion is that what events a student perceives as reinforcing may not correspond in "value" (i.e., their effectiveness for the control of behavior) to the teacher-defined and -manipulated events. In fact, the student may not perceive as reinforcing at all what the teacher manipulates. The question is again which set of events or reported perceptions leads to better control, if they are different at all.

Specification of Research Questions and Suggested Methods

In specifying what appears to be the critical research questions, the orientation taken below is to focus on the apparent deficits in the operant paradigm and to suggest how the concepts and methods of SLT may be utilized in providing the information necessary for effective application of operant techniques in the college classroom. The most important question for college teaching raised above would appear to be that of the perception of reinforcers in the teaching process. That is to say, do students perceive the same events as reinforcing as do teachers in the teachers' effort to control the classroom and academic behavior of college students?

At the outset it should again be noted that, in the terms of Rotter's theory, this question involves the assessment of student's psychological situation. In the methods typically used in SLT, a questionnaire for the expected outcomes or consequences of a set of behaviors is developed. Adams and Ulehla (1969) have used a method for assessing social learning variables in the framework of the theory of signal detectability (TSD). This measurement model can be combined with an orientation toward social perception (such as Gibson's, 1966 and Brunswik's 1955), which focuses on the individual's subjective perceptual parallels to the events of the ecology. Through Brunswik's notion of representative design, the complexity and real nature of the ecology is stressed. That is to say that stimulus situations are used as they exist in the natural ecology, rather than as they are delimited and simplified typically in the laboratory.

The TSD approach to the measurement of social perception yields unitless, ratio-scaled measures from rating scale data, similar to Thurstone's (1927) approach. In the intended application of this approach to social perception measurement, "stimulus sources" may be read as the events in the ecology of students and teachers which are "considered to be reinforcers" in the college classroom (Ulehla and Martin, 1971). The method of development of expected consequences questionnaires is suggested by several authors (cf., e.g., Jessor, et al, 1968).

A second major question is implied in the preceeding paragraphs. This question too, involves differing perceptions of the ecology but is centered around the problem of specifying the contingencies of reinforcement and behavior, or expectancies in social learning terms. That is to say, are the contingencies perceived by the teacher the same as those perceived by the students? As an example, does the student perceive his grade to be contingent upon the "knowledge of the literature" demonstrated in his writing of a paper or contingent upon the teacher's whim? For the teacher, is the grade given contingent upon the "knowledge" demonstrated or on the "clarity or expression," the "style," the "form," for some combination of these or upon something else? Clearly, the control of paper writing behavior is in part a function of such perceptions of the relevant contingencies, perhaps more so than the "actual" contingencies. This latter is again an empirical question, but is not the current focus. A methodological approach similar to that outlined for the first basic question would appear productive. That is to say, a questionnaire focusing on the expected consequences of various academic activities, the contingencies of reinforcements on the student behavior, would be used. Items again would be developed according to the principles of the ecological, functional approach to perceptual measurement. Sampling academic behaviors and their expected consequences from the ecology or what students and teachers perceive of the ecology is required.

These two basic questions suggest supplemental research questions. Having discovered to what extent teachers' and students' perception of the reinforcers relevant to the classroom and academic behavior of college students differ, for example the next question might

be to discover which events in the ecology of the college classroom are most useful in controlling the target behavior. In social learning terms, the question is which events of potential use, have the greater reward value for students, within practical and ethical limits. Another supplemental question with a closer anchor in the ecology of the college classroom is to determine if the reinforcers and contingencies actually manipulated by the teacher are the same ones the teacher perceives himself to be manipulating. These are only two of many possible questions which would be of experimental potential. The elaboration of these questions and the appropriate experimental methods should be determined by the answers to the more basic questions raised above.

Having raised the two basic research questions for assessing the utility of social learning concepts in refining the application of operant procedures to the classroom, several other questions of research interest may be generated, some of which have been noted. The basic issue remains: Can the concepts of social learning theory be utilized in complementing the basic operant paradigm for use by college teachers in controlling the academic behavior of their students? Research directed at answering these basic questions should clarify the utility of social learning concepts and methods in the effort to improve the effectiveness of teaching in the college classroom through the use of the operant paradigm. This goal is in harmony with those working to apply operant principles to the college classroom. The goal is clear; Johnston and Pennypacker (1971, p. 243) observe:

> The key to the success of any applications to other academic situations is in the adherence to techniques that will give to all concerned precise and continuous feedback on the individual effects of any or all procedures. Only by having evidence as to what is happening and to what variables these effects are related can reasonable development progress. The lack of such evidence would seem to promote capricious variations more related to the personal whims of the teacher than to the lawful relationships between the academic environment and student performance.

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