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WHAT PSYCHOLOGY HAS TO OFFER EDUCATION—NOW[1,2]

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Some day, the question, "What does psychology have to offer education—now?" will be answered by psychologists with some measure of agreement. But at present the answer to this question depends almost entirely on the particular orientation of the individual to whom the question is put, for psychologists differ enormously in their conception of the subject matter and objectives of their discipline. Some say its subject matter is the domain of the mind, others, that it is the observable interaction of an individual's behavior with environmental events. When the question of the objectives of psychology arises, some claim them to be the understanding and explanation of psychological phenomena, others, the prediction and control of behavior. Psychologists also differ markedly in their choice of research methodology, with one segment stressing statistical designs that compare achievement of groups, and others emphasizing changes in the behavior of an individual organism. In addition, psychologists vary greatly in their approach to theory construction, with some favoring the hypothetico-deductive method, and others, the empirico-inductive procedure.

In spite of these great individual variations, there would probably be three basic approaches to the question of what psychology has to offer education: that which would be taken by the *great majority,* that of the *large minority,* and that of the *small minority.* The great majority would probably say that psychology presently offers education something like this: "We can offer an impressive collection of facts about the abilities of the child and his growth and development; we can offer an extensive literature on the analysis of stimuli, on the psychology of simple and complex learning, and on perception; we can offer a considerable body of knowledge on measurement, test construction, and statistical procedures for the experimental study of groups; and we can offer some promising theories of intelligence, socialization, personality, development, and psychopathology."

The concepts and principles of this large majority have accrued not only from psychology, but from sociology, anthropology, and physiology as well. They have evolved from many theories, mostly from psychoanalytic, cognitive, and learning theory. They have been established on findings from many research methods, experimental, correlational, clinical, and field observational or ecological. Consequently, many of the concepts and principles are not rooted in objectively defined raw data, nor are they systematically related to each other. Those with this orientation are eclectic with respect to a research methodology. In general, group experimental designs serve to test theories and hypotheses while correlational methods serve to assess traits and abilities. Since these psychologists, for the most part, view teaching as an intuitive art, their predominant view is that psychology can offer educators the kind of information and ideas that will help them evaluate their philosophy of education, and can acquaint teachers with recent research findings and their possible implications for instruction.

If, on the other hand, another group of psychologists, whom we shall call the large minority, were asked what psychology can offer education, the reply might be: "We can offer some tentative ideas about the nature of the child; we can present firm convictions about

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[2]Dedicated to Professor B. F. Skinner in his sixty-fifth year.

the stages of cognitive and intellectual development; and we can offer theoretical formulations about perception, learning, the will to learn, and the general mechanisms of coping and defending. We can also offer a philosophy of science which postulates that behavior is determined both by observable and by hypothetical internal variables."

Subgroups in this large minority attempt to relate their concepts and principles in a systematic manner. However, the concepts and principles developed by one group do not synchronize with those developed by the others, mainly because these systematists do not anchor all of their terms to objectively verifiable data. Research, as with the first group, is designed mainly to test a theory or an hypothesis and consists for the most part of comparing the achievements of groups. Practical application often involves terms and processes that are not related to the principles applied. That is to say, attempts to apply research findings to classroom practices are all too often bolstered by hypothetical variables or precepts. Because hypothetical variables and processes are central to the theories in this group, educators who subscribe to this approach are prone to attribute school failures to such presumed internal conditions as lack of drive, perceptual disability, or clinically inferred brain damage.

Still another group of psychologists, which at present is only a small minority, responding to the question of what psychology can contribute to education now would say: "We can offer a set of concepts and principles derived exclusively from experimental research; we can offer a methodology for applying these concepts and principles directly to teaching practices; we can offer a research design which deals with changes in the individual child (rather than inferring them from group averages); and we can offer a philosophy of science which insists on observable accounts of the relationships between individual behavior and its determining conditions."

Faced with this complex state of affairs—a house of psychology divided on what it has to offer education—I should like to elaborate on the offer of the last-mentioned group of psychologists, the behavioral analysis group. I shall discuss what I believe to be the promise of this approach, its influence on the role of the school psychologist, and what educators can do if they choose to pursue the leads offered by this group.

THE OFFER OF THE SMALL MINORITY

The offer of the behavioral analysis will be presented in terms of its philosophy of science, concepts and principles, core research method, and procedure for the application of concepts and principles to teaching.

The Philosophy of Science

The philosophy of science (assumptions) of any approach merits close scrutiny because it influences the kinds of problems selected for study, the basic method of gathering data, the forms in which the data are presented, and the interpretation of the findings. For the purpose of this paper, I shall limit my discussion to only five of the basic assumptions of a behavioral analysis. More comprehensive accounts may be found in Kantor (1959) and Skinner (1947, 1953, and 1963).

1. The subject matter of psychology is the interaction between the behavior of an integral organism and environmental events. These interactions are analyzed in *observable, measurable,* and *reproducible* terms and therefore are amenable to scientific investigation.

2. The interactions between the behavior of an individual and environmental events are lawful. Given an individual with his unique biological endowment, changes in his psychological behavior are a function of his interactional history and the current situation in which he is behaving.

3. As in all of the sciences, the subject matter of psychology exists in *continuities.* Continuities are assumed to exist in the stages of development, in the rates of development (normal, retarded, and accelerated), in the relationships between normal and pathological development, in the problems and procedures of basic and applied research, and in the analysis of psychological phenomena from raw data to theoretical formulation.

4. Complex interactions evolve from simple interactions and begin with the infant's initial relationships with people and objects. This does not mean that com-

plex behaviors are assumed to be sums of simple behaviors. How a specific form of complex behavior, such as mathematical problem solving, is established is a problem for experimental study. The final analysis of any class of complex behavior would probably involve many concepts and principles such as minute stimulus control, subtle variations in setting conditions, and intricate schedules of reinforcement.

5. A psychological theory and its technology are open and flexible systems. That is, a new concept, a new principle, or a new technique may at any time be added to the existing list, provided that it can display the proper credentials: it must be tied unequivocally to observable events; it must be functional; and it must not overlap with the concepts, principles, or techniques already catalogued.

The Concepts and Principles

The concepts of behavioral analysis refer only to observable behavioral events and environmental conditions, and to the relationships between them. Furthermore, these concepts, derived entirely from experimental investigations, are functional in character; that is to say, behavioral events are defined by their effects on the environment, such as producing or removing a stimulus, and environmental events are defined by their effects on the behavior, such as providing an occasion for a class of operant behavior.

The behavioral concepts of this approach are, for the most part, divided on the basis of whether they are sensitive to antecedent or consequent stimulus events; the former are referred to as respondent behavior, and the latter as operant behavior. There is, among adherents to this approach, an acknowledged penchant for measuring respondent behavior in terms of its latency or magnitude and operant behavior in terms of its rate or frequency of occurrence (Skinner, 1966*a*).

The environmental concepts also fall into two categories: stimuli with functional properties, and setting factors. A conditioned stimulus in a respondent interaction and a discriminative stimulus in an operant interaction are examples of stimulus functions. Satiation and deprivation of reinforcing stimuli, disruption of sleep cycles, and drug intervention are examples of setting factors.

The principles of the behavioral approach are statements describing demonstrated relationships among behavioral and environmental variables. These statements, which have been accumulating steadily over the past sixty years, are the *facts* of the science of psychology as generated by an experimental analysis of behavior. They have been organized variously, but with slight differences among them (*e.g.*, Ferster and Perrott, 1968; Millenson, 1967; Reynolds, 1968; and Skinner, 1953). Reynolds (1968), for example, groups the principles as follows: acquisition and extinction of operant behavior, stimulus control of operant behavior, conditioned reinforcers, schedules of reinforcement, respondent behavior and respondent conditioning, aversive control, and emotion and motivation.

Research

Experimental analysis of the interactions between changes in individual behavior and environmental events is the core strategy in research (Sidman, 1960). Here, research is not planned to test a theory or an hypothesis but to demonstrate functional relationships (Skinner, 1966*b*), or to evaluate a practical application of the concepts and principles (Baer, Wolf, and Risley, 1968).

The strategy of teaching-oriented applied research does not consist of designing a study to determine whether Method A is better than Method B for the teaching of subject-matter X. It is, instead, a search for ways to engineer an educational environment so that each child can learn specified tasks, and then, after that goal is attained, to compare achievement in that engineered situation with achievement in some other school situation.

Application to Education

The concepts and principles of behavioral analysis are applied directly to the classroom teaching situation: to the observable behavior of the pupil in relation to the teacher's techniques of instruction, the instructional materials, the contingencies of reinforcement, and the setting conditions. The analysis of teaching and the methodology of application are clearly set forth by Skinner in *The Technology of Teaching* (1968).

Teaching, according to Skinner, is a situation in which the teacher arranges the contingencies of reinforcement to expedite learning by the child. The teacher is the arranger, and since she generally works in the classroom by herself, we may think of her as the "Lone Arranger". The teacher arranges the contingencies to develop appropriate study behavior, for example, attending to the materials to be learned, and hopefully she arranges the contingencies so that this behavior becomes part of a child's way of dealing with future study tasks. She also arranges contingencies by scheduling the formal academic subjects (the visible programs), and manners and moral behavior (the invisible programs) in such a way that each child makes progress at approximately his own pace and with minimum frustration or aversive consequences. She finds it necessary, at some times, also to arrange contingencies to reduce or eliminate behaviors that compete with acquiring the desired academic and social behaviors.

Two comments about arranging the educational environment are appropriate at this point; one pertains to scheduling the contingencies of reinforcement; the other, to scheduling the stimulus material. The fact that academic and social behaviors are operants, and hence sensitive to consequent stimulation, has led many teachers and researchers to use, indiscriminately, contrived contingencies such as tokens, candies, points, stars, *etc.* Such artificial reinforcers are not always necessary, and in many instances in which they have been used, they have not been functional. In other words, a child's rate of learning has not increased through the use of candies, or by whatever else he receives in exchange for a collection of tokens or a sum of points. Contrived reinforcers are appropriate only when the usual reinforcers applied in the classroom (confirmation, indications of progress, privileges, preferred work, approval, and the like) are not meaningful to a child. If, at times, contrived reinforcers are considered necessary in order to initiate learning, they can be scheduled so that they are gradually replaced by the reinforcers indigenous to the situation and the activity being learned. These are called by Ferster (1967) "natural", "intrinsic", or "automatic" reinforcers. As Skinner (1968) pointed out, the critical task in most teaching is not the incorporation of more and more new reinforcers but the effective utilization of those currently available to the teacher.

Let us turn to the scheduling of stimulus materials. The fact that a school task can be learned with a minimum of frustration and on the basis of positive reinforcement via a program of differential reinforcement of successive approximations to the ultimate form of a response (skill), or the desired response in the proper situation (knowledge), has led to an over-emphasis on the role of teaching machines, and to a misconception about the school subjects that can be properly programmed. Teaching machines, from the most primitive to the most elaborate, are of value in teaching only insofar as they assist the teacher in arranging the contingencies that expedite learning, *i.e.,* aid the teacher in presenting the material properly, in providing for explicit responses, and in arranging for optimum timing of effective contingencies of reinforcement. The programming of any academic subject for a child is straightforward: (1) state in objective terms the desired terminal or goal behavior, (2) assess the child's behavioral repertory relevant to the task, (3) arrange in sequence the stimulus material or behavioral criteria for reinforcement, (4) start the child on that unit in the sequence to which he can respond correctly about 90% of the time, (5) manage the contingencies of reinforcement with the aid of teaching machines and other devices to strengthen successive approximations to the terminal behavior and to build conditioned reinforcers that are intrinsic to the task, and (6) keep records of the child's responses as a basis for modifying the materials and teaching procedures.

The research to date suggests that behavioral principles can be applied to the teaching situation with gratifying results. Further advances in basic and technological knowledge should, of course, lead to even more effective application.

IMPLICATIONS FOR THE SCHOOL PSYCHOLOGIST

Now let us look briefly at the offer from the mini-minority of psychologists as it relates to the school psychologist. Let us suppose that we have a school in which the teachers are happily applying behavioral principles to all aspects of education. In such a situation, the

school psychologist would perform at least four functions.

First, he would work in close cooperation with kindergarten and first-grade teachers to help newly admitted children make a smooth transition from their homes to the classroom, with the objective of preventing school retardation and behavior problems. Specifically, the school psychologist would help these teachers to assess the repertories of their children and would help them to arrange suitable individual pupil programs. He would also help these teachers and their assistants to modify the programs when the child encounters difficulties and to assess their reinforcement contingency practices.

Second, he would work with counselors, teachers, school social workers, and parents on mitigating or eliminating problem behavior, setting up remedial programs that would be based on the same set of concepts and principles that are applied to teaching. In other words, the school psychologist would be engaging in behavior modification or *action counseling* as described and practiced by Krumboltz and his colleagues (1966).

Third, the school psychologist would assist teachers in dealing with problems of classroom management and subject-matter programming. His efforts with respect to classroom management would be comparable to the work of Thomas, Becker, and Armstrong (1968). On request from the teacher, he would observe the behavior of a problem child or group of children in the classroom, and on the basis of data collected he would analyze the contingencies that are operating in the situation, work out a course of action with the teacher, and evaluate it in terms of data from observational procedures. Data indicating that the new procedure was ineffective would lead to reassessment and alteration of the plan until a satisfactory solution is found. In helping the teacher to program instructional material, the school psychologist's task would consist of analyzing each child's daily academic records and modifying teaching procedures, contingency arrangements, and sequences of materials. With respect to assisting the teacher to develop and maintain other essential school behavior, such as paying attention, his procedures would be similar to those described by Hall, Lund, and Jackson (1968).

Fourth, and finally, the school psychologist would conduct in-service training for the teacher's assistants. In many instances these people would be clerks, like the instructional material clerks in the University of Pittsburgh type of programming; or they might be aides who would conduct individual and small group tutorials. The school psychologist would also be responsible for keeping the teachers and others informed of advances in technology of teaching and the specific ways of incorporating them into the school system.

It is obvious that the school psychologist described here would not be simulating the role of a child psychiatrist, would not be performing as a part-time clinical psychologist, would not be a full-time psychometrician; rather, he would be a person informed and skilled in the application of behavioral principles to all aspects of teaching both normal and handicapped children.

REQUIREMENTS FOR THOSE IN EDUCATION WHO WISH TO ACCEPT THE OFFER

Now I should like to suggest what educators might do if they wish to accept the offer of psychologists with a behavioral analysis orientation.

First, they should learn with precision the more specific aspects of this approach. A thorough grounding is necessary because behavioral analysis does not offer a touchstone. It is necessary because the approach has an apparent simplicity that can be deceptive, and many alluring features that can be misleading. Lastly, it is necessary because effective application requires a minute analysis of the teaching situation, and ingenuity in rearranging contingencies in order to eliminate difficulties and to expedite the establishment and maintenance of the desired behavior. It is therefore essential that the practitioner learn from *first sources:* (1) the nature of the concepts and principles and referential supporting data, (2) the methodology of practical application and the basic literature on the behavioral technology of teaching, (3) the individual research methodology, and (4) the assumptions of behavioral analysis and their implications for educational practices.

Second, the practitioners should obtain experience in applying these principles. Those who would use this approach should arrange to

observe demonstrations in actual educational settings and should seek out opportunities to practice the techniques under supervision. Such first-hand experience provides occasions in which one must face and deal with the problems of contingency management and subject-matter programming; it also provides opportunities to be reinforced by the visible changes that result from one's efforts. If there are no preschool or elementary school demonstration classes within easy reach, educators who teach in colleges and universities might apply these principles to their classes (Ferster, 1968; and Keller, 1968). They might do this even if there are opportunities to observe the application of behavioral principles to the education of young children. Not only will it give them a new source of satisfaction but their students would probably appreciate a learner-centered approach to instruction.

SUMMARY AND CONCLUSIONS

A small but rapidly growing group of psychologists can now offer educators (1) a set of concepts and principles derived entirely from the experimental analysis of behavior, (2) a methodology for the practical application of these concepts and principles, (3) a research method that deals with changes in individual behavior, and (4) a philosophy of science that says: "Look carefully to the relationships between observable environmental and behavioral events and their changes."

Application of behavioral principles to education would revise the role of the teacher; she would become a facile manager of the contingencies of reinforcement and an effective instructional programmer. Application would also change the style of educational research from comparing the achievement of groups of children to analyzing the specific conditions and processes in the teaching of a particular subject as they relate to the behavior of an individual pupil, and application of these principles would change the role of the school psychologist. He would be an expert in the behavioral technology of teaching. As such, he would collaborate with kindergarten and first-grade teachers to prevent school problems by arranging remedial procedures for individual children. He would also serve as a consultant to all teachers on problems of classroom management and programming, and through in-service classes would train teacher's aides to assist the teacher in reaching her goals.

To act on this offer from the small minority of psychologists, educators are advised to learn the details of this approach from primary sources. In addition, they should seek first-hand experiences in applying the techniques so they can understand the problems involved and the approaches to their solutions.

What sorts of changes would be expected to result from an acceptance to this offer? It is difficult to foresee all the details of the changes but certain broad indications are clear. First, the teacher would probably derive new satisfaction from teaching because she would be in a situation that allows her to see concretely the progress of each child in her class, and she would know what to do when a child is not making reasonable progress. She could not help but gain new confidence in herself as a teacher because she would know *what* she is doing and *why* she is doing it. She would in addition be more secure in the knowledge that her teaching practices are based on demonstrated principles, and that with the help of the school psychologist she can refine and extend her methods in accordance with new research findings. Finally, she would have opportunities to try new ways of teaching standard subjects, and to explore ways of teaching subjects not now programmed.

Second, putting this offer into operation would probably provide a common basis for the discussion of problems among those working with the teacher—the principal, the psychologist, the counselor, and the school social worker. It would make no difference whether the problem were the persistent deviant behavior of a child, curriculum difficulties, an unruly classroom, an uncooperative parent, or the behavior of groups of children in the cafeteria or on the playground. A common approach to all aspects of education, especially one based on experimental concepts and principles, would certainly advance teaching as a profession.

Third, systematic application of behavior principles would be expected to reduce dramatically the number of children who reach the fourth grade without learning to read at a socially functional level. Present estimates of this group range from 20% to 40% of the

school population. In terms of numbers, this is a staggering figure. With its emphasis on the prevention of academic and behavioral retardation, it is not unrealistic to think that the behavioral analysis approach could reduce that percentage to almost zero. And for the same reason, it would be expected to reverse the trend of spiralling increases in budgets for remedial services.

Fourth, the ultimate result, of course, would be a better educated community—the first requisite in equipping an industrial society to manage the advances of science and technology to achieve *humanitarian goals* (MacLeish, 1968).

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