

## ON CERTAIN ASSUMPTIONS UNDERLYING CONTEMPORARY EDUCATIONAL PRACTICES

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**ABSTRACT:** Education is one of the most important services a culture can provide for its citizens, yet certain of the educational practices in our contemporary culture are predicated on mentalistic and ultimately counterproductive assumptions about (a) the nature of students' intellectual skills and (b) the process called learning as it applies to the classroom. Behavior analysis has its own set of assumptions about educational matters based on its view of verbal behavior, particularly concerning equivalence relations.

*Key words:* education, culture, contingencies, dispositional attributions

Just how well the members of our culture are being educated and integrated into the culture is a matter of considerable controversy. For example, on one side of the controversy are such critical treatments as Bennett (1992), Bloom (1985), Kozol (1991), and the National Commission on Excellence in Education (1983). These treatments argue that contemporary educational practices are simply not having an acceptably positive impact on the development of students' intellectual abilities and the maintenance of important cultural values. Sykes (1988) is sympathetic and blames university faculty for shirking their pedagogical responsibilities. Perhaps because of these kinds of concerns, presidential candidates have campaigned on platforms of holding faculty and school systems "accountable." Indeed, at least one candidate advocated using a comprehensive testing program so that "no child is left behind," although "leaving no child untested" is probably a more accurate summary of the proposed programs.

On the other side of the controversy, Berliner and Biddle (1995) debunk a whole series of familiar criticisms of public education using data-based arguments. In contrast to treatments that criticize faculty, Sacks (1996) paints a less than enthusiastic portrait of the entering intellectual repertoires of many college-age students on the basis of his college teaching experiences. Readers of the behavior-

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<sup>1</sup> This article is based on presentations at the conventions of the Behavior Analysis Association of Michigan, Mar, 1999, in Ypsilanti, MI, and the Association for Behavior Analysis, May, 1999, in Chicago, IL. I thank Drs. Jim Todd and Roger Bass for their kind invitations, and Drs. Jack Michael and Dick Malott for their helpful comments on many of the issues addressed here. Correspondence concerning this article may be addressed to J. Moore, Ph.D., Dept of Psychology; University of Wisconsin-Milwaukee; Milwaukee, WI 53201; (414) 229-4746; email: jcm@uwm.edu.

analytic literature may also be familiar with Fraley (1998), who calls on some poignant personal experiences at West Virginia University to argue that if today's universities are sacrificing their commitment to high educational standards, it is because economically driven policies are forcing them to do so, rather than because of any personal failings of the faculty.

Regardless of which of these particular messages one embraces, few would dispute that our culture will be better off if its members are more effectively integrated into the culture, that education plays a key role in the integration, and that in many instances members of the culture are just not being effectively integrated into it. The question to be explored in the present article is whether traditional, mentalistic assumptions about (a) the nature of students' intellectual skills and (b) the process called learning as it is applied to the classroom are actually interfering with educating and integrating the members of the culture. If so, then behavior analysis can offer its own set of nonmentalistic and ultimately more productive assumptions about these matters that could improve things.

To be sure, the present article is not a formal analysis of the obvious merits of precision teaching or direct instruction. Rather, it is an essay that draws on the personal experiences of the author over the course of 25 years in professional education. It reflects those experiences in the same way that the ancient fable of 5 blind men describing an elephant reflects their experiences. Whether individual readers agree with the present article will presumably depend on their experiences.

## **THE TRADITIONAL VIEW OF THE EDUCATIONAL PROCESS**

### ***Certain Traditional Assumptions About Students***

On a traditional view, students are said to possess "native intelligence." In its raw state, this form of intelligence is presumed to be innate and genetically determined. In some older versions, it is more generalized, a sort of "cognitive common denominator" (Spearman, 1904; see also Herrnstein & Murray, 1994, for a modern endorsement). In other more recent versions, it is said to have several "modular" components, representing different kinds of mental or cognitive processes (Sternberg, 1985). Gardner (1993) has even proposed several different kinds of intelligence. Regardless of the version, a common assumption is that intelligence is a "mental" characteristic that is distributed among the population of students according to a normal curve, much like such other characteristics as height or weight. This intelligence is responsible for basic intellectual abilities from which overt behavior flows, although many theorists assume the underlying intelligence can be influenced to some extent by practice or experience. The exact extent of the influence, and the specific kinds of practice or experience that might enhance intelligence, are of considerable debate (e.g., Herrnstein & Murray, 1994).

In addition, a common feature of the traditional view in professional education is that students develop according to a maturational unfolding of their abilities (e.g., Piaget, 1969). The unfolding follows a "stage" system, according to which they are said to possess a set of "cognitive structures" during each stage.

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The set of cognitive structures possessed at each stage defines what they can and cannot do. They progress to the next stage when they have achieved a state of maturational “readiness.” If one tries to accelerate their readiness, the effects can be counterproductive for both student and instructor. The instructor is obliged to wait until the student is ready and not intervene except in ways that will draw on the cognitive structures that are presumed to exist at that point in time.

### ***Certain Traditional Assumptions About the Educational Process and the Role of the Instructor***

On a traditional view, education is in large measure a screening and selection process, and the instructor is essentially a gatekeeper. In the selection process, the instructor poses various demands that ask students to do more than they would otherwise. The instructor then selects those students who have best shown their readiness to meet the demands (i.e., those from the top of the distribution). Because the students’ underlying abilities are assumed to be distributed according to a normal curve, grades should similarly be assigned to students according to that normal curve. Given such a system, the instructor acts as a gatekeeper by allowing only the best and the brightest to enter, where best and brightest are defined as the individuals who receive grades in the top range of distribution. If the students’ abilities are such that they cannot or the students will not meet the demands posed by the instructional program, the students receive grades in the lower portion of the distribution. These students are not selected, and they do not get to pass through the gate. In keeping with the selectionist metaphor, they do not survive as students in a Darwinian sense. They fall by the wayside, dropping out of the educational system and perhaps even the culture.

### ***Traditional Concerns***

On a traditional view, evaluation of educational practices is largely concerned with determining whether instructors are making type I or type II errors. Instructors make type I errors when they let someone through the gate who should not have been let through. The instructor mistakenly infers they have the right underlying cognitive abilities, when they really don’t. Instructors make type II errors when they do not let someone through the gate who should in fact have been let through. The instructor mistakenly infers they do not have the right underlying cognitive abilities, when they really do. Debates focus on the validity of the evidence for making the correct inferences about students. Accordingly, there is great concern in traditional education with population statistics, individual differences, probability sampling, etc., to be sure one has not made a type I or type II error in recognizing a student’s underlying abilities and inferring something about those abilities. As the probability of type I errors is reduced, the probability of type II errors increases, and vice versa. A casual review of recent social history suggests that societal emphasis shifted during the social and cultural upheaval of the 1970s from minimizing type I errors to minimizing type II errors.

In retrospect, the various assumptions and resulting practices are largely based on assumptions that the causes of students' academic and intellectual activities are "inside" them, and that education needs to take these inner causes into account as it carries out its mission. In short, the assumptions and practices are largely mentalistic. To cite Skinner (1974), albeit in a different context: "This kind of thing has been going on for centuries. It is surprising that so many intelligent people refuse to ask what is wrong" (p. 170).

## **A BEHAVIOR-ANALYTIC VIEW OF THE EDUCATIONAL PROCESS**

### ***Assumptions About Students***

On a behavior-analytic view, there are no dispositional attributions about students comparable to those of the traditional view. Indeed, behavior analysts regard traditional assumptions, such as those about intelligence from which instructional practices follow, as tragically mentalistic and counterproductive. Of course, behavior analysts sometimes do say that "the rat is always right," in the sense that the rat is always responding on the basis of one contingency or another, rather than on the basis of some supposed mental or cognitive process that is faulty. Similarly, behavior analysts might also say that "the student is always right," in the sense that the student is always responding because of one contingency or another, rather than because of some supposed mental or cognitive process that is faulty. These are not dispositional attributions about the organism in either case.

### ***Assumptions About the Educational Process and the Role of the Instructor***

On a behavior-analytic view, teaching is the arrangement of contingencies of reinforcement that expedite learning (Skinner, 1968, p. 5; 1969, p. 15). In this regard, "The first step in designing instruction is to define the terminal behavior. What is the student to do as the result of having been taught?" (Skinner, 1968, pp. 199-200). Often this is a question of determining whether the terminal repertoire is verbal or nonverbal, and if it is verbal, determining whether response products of the verbal repertoire are to become discriminative for nonverbal behavior. Once the terminal repertoire has been specified, the repertoire of the representative beginning student is assessed, and the difference between the beginning and terminal repertoires is divided into small units. The student is then exposed to the instructional sequence.

An analysis of educational practices may therefore be seen to be an analysis of contingencies that are used to expedite learning along a path in the educational setting: discriminative stimuli, responses, reinforcers. Common examples of discriminative stimuli in educational practices are textbooks, workbooks, outlines, notes, study guides or objectives that ultimately lead to test questions. The responses range from the so called recognition or recall questions, such as picking the correct alternative in a multiple choice or matching format, to production questions, such as filling in blank, writing a correct answer to an essay question. Reinforcing consequences are then provided for mastering each unit along the way.

Michael (1991) identifies some possible motivational influences for students in college settings: (a) increasing their knowledge of subjects that are “intrinsically interesting,” (b) approval from others, (c) short-term advantages, (d) long-term payoffs, and (e) a higher course grade. Of these several possibilities the contrived reinforcer of the course grade, systematically and conspicuously linked to the intermediate steps of the instructional program, seems particularly relevant (see also Skinner, 1968, chapter 7 on “The motivation of the student”).

## **CONTINGENCIES AND THE MATTER OF CONTROL**

### ***Four Important Elements of the Terminal Repertoire***

The concern with the terminal repertoire is a concern with at least four elements of repertoires having to do with contingencies (Skinner, 1968, pp. 65 ff.). The first element is the topography of the response. The response needs to be topographically correct and others need to be able to identify it as such when it occurs. A second is the nature of the stimulus control over the final repertoire. This is a matter of having the response occur on the appropriate occasion, and frequently of having the response generalize to similar occasions. A third concerns the temporal or intensive properties of the response. Often it is necessary for a response to be properly timed, as in a sense of rhythm. A fourth element concerns the maintenance of the behavior under infrequent reinforcement. Here, the response must persist when naturally occurring reinforcing consequences are intermittent. Contingencies generate all of these elements, and the educational process needs to take these goals into account to be effective.

To be sure, these four elements apply in different ways in different levels of teaching. Perhaps with certain populations of developmentally delayed individuals, things like temporal and intensive properties of the response are critical. Topography might be important in training the vocal skills of a second language or the motor skills of a repair technician who needs to use a torque wrench. Writing a well-organized paragraph is presumably not a simple matter of tempo or response topography. In addition, most people in an educational setting presumably provide reinforcement for every correct response, rather than intermittently, even though intermittent reinforcement increases resistance to extinction. Notwithstanding these obvious concerns, the important issue to be emphasized here is the extent to which behavior analysts take known educational principles into account as they develop our own courses of instruction.

### ***Verbal Knowledge***

Suppose we say that a student “knows something” or “has learned something” in a course. What exactly does such a statement mean? On a behavior-analytic view, such a statement is usually concerned with the first two elements generated by a contingency: (a) the topography of the response and (b) the stimulus control over the responses said to “show knowledge.” Consider the case of a student who provides the correct answer to a test question, but who has simply copied from a

cheat sheet that has been brought into the classroom. Ordinarily, such a student is not said to “know the answer” in a useful sense. This is simply a case of transcription, where the stimulus control over a response is written verbal material present at the time the response is emitted. Similarly, consider a student who provides the correct answer to a test question, but who has simply asked an adjacent student what the answer is. Again, this student is ordinarily not said to “know the answer.” This is simply a case of taking dictation, where the stimulus control over a response is spoken verbal material present at the time the response is emitted. In both cases, we would probably say the student cheated and give the student a failing grade, and the decision is based on the assessment of the stimulus control over the response. What kinds of stimulus control then are relevant to verbal knowledge?

### ***Intraverbal Control***

In many cases in education, the response that is said to “show knowledge” is an intraverbal (e.g., Michael, 1991, p. 230; see also Skinner, 1957, pp. 71-78; Skinner, 1953, pp. 408-410). An intraverbal is defined as a verbal response that is under the functional control of another verbal stimulus, where the relation between stimulus and response is an arbitrary one established by the verbal community (Catania, 1998, p. 395). In many cases, intraverbals consist in just saying the next word in a previously acquired chain of responses. Perhaps the common example is saying a “memorized” sequence of words, as in the pledge of allegiance, a song, a poem, lines in a play, or even writing out previously memorized material on essay tests. Other examples include some scientific formulas and conventional sayings common in culture. In the case of intraverbal responses to test questions, presumably the intraverbal was originally generated as another form of verbal behavior. It may have been generated as an echoic, by hearing someone else say it, or as a textual, by reading it. One popular instructional technique to “fluency training” is called SAFMEDS (“Say it All Fast in a Minute Every Day Shuffled”), and this technique is explicitly concerned with establishing intraverbal control.

In behavior analysis a common distinction is between contingency-shaped behavior and rule-governed behavior. Contingency-shaped behavior is standard operant behavior in which discriminative control does not come from verbal antecedents. Rule-governed behavior is operant behavior in which discriminative control or other behavioral influence does come from verbal antecedents. Often the verbal antecedent specifies the contingent relation among a setting, a response, and a consequence. The verbal antecedent is typically an intraverbal. Of course, rule-governed behavior is fine. Many scientific laws are encountered as intraverbals. As Skinner (1969) noted,

A scientific law does not enjoin anyone to behave in a given way; it simply describes the contingencies under which certain kinds of behavior will have certain kinds of consequences.... The point of science ... is to analyze the contingencies of reinforcement found in nature and to formulate rules or laws

which make it unnecessary to be exposed to them in order to behave appropriately. (p. 158, 166)

However, possible limitations of programs of instruction that teach rules as intraverbals also need to be recognized. Skinner (1969) noted that “Rules are often followed for reasons which are unrelated to the reinforcers in the contingencies from which they are derived” (p. 169). Rule-governed behavior can be rigid. It does not always promote generalization from basic principles and concepts, or collateral behavior in different situations. These differences may be troublesome, in that students may not always be able to perform as expected simply because they can state a rule.

## *Tacts*

In other cases, a response may be a tact. A tact is defined as a verbal response that is under the functional control of an object, event, or situation, or some property of an object, event, or situation.

Educational systems are also concerned with establishing concepts. A concept may be understood as a special kind of tact. A concept may be defined as a class of stimuli such that an organism generalizes among all stimuli within the class but discriminates them from those in other classes (Catania, 1998, p. 381). At issue, of course, is the feature or property or set of features or properties that defines the stimulus class, such that all instances possessing that feature or property are treated as equals, and distinguished from other instances that do not possess the feature or property. The stimulus class may be defined with reference to structural or physical features, to functional features, without regard to age, and so on: chairs are things we sit on or in, regardless of their size, whether they have cushions, whether they have 4 legs or 3, or whether they are of a style called Queen Anne or Eames. In this regard, we can note that a special kind of concept is called an abstraction. In an abstraction, only a single feature of an event or object or property of an event or object defines the stimulus class, independent of other variables that are present (Catania, 1998, p. 378).

In any event, the point is that concepts are not easily developed because of the difficulty in overcoming control exerted by other stimuli that are always present. For example, in behavior analysis, the terms respondent and operant are concepts, in that each is controlled by the special features of an environmental relation. In the case of respondents, the relations are those of the CS-US correlation that is responsible for the behavior. In the case of operants, the relations are those of the response-reinforcer contingency that is responsible for the behavior. We identify a response as a respondent because of the relevant principle, even though the response may be (a) the salivation of Pavlov’s dog to a tone in the presence of which food powder has previously been delivered or (b) the blinking of an eye to a light in the presence of which an air puff has previously been delivered. We identify a response as an operant because of the relevant principle, even though the response may be (a) the lever pressing of a rat to a tone in the presence of which previous responses have produced a sucrose solution or (b) the keypecking of a

pigeon to a keylight in the presence of which previous responses have produced 3 seconds access to mixed grain. Beginning students often have difficulty with these concepts and identify an operant under discriminative stimulus control as a respondent, simply because an antecedent stimulus is present and evokes the response. One of Skinner's early papers (Skinner, 1935) directly addressed these important relations as he sought to distinguish between the two types of conditioning. Interestingly, Hull (1943) never caught on, perhaps because of his concern with the properties of an inner "conceptual nervous system" in terms of which he sought an explanation of behavior.

Specific training, typically involving the presentation of multiple examples that illustrate the same principle or feature but with other differences, is typically necessary to establish a concept (Skinner, 1953, pp. 134-136). The degree to which a response illustrates conceptual stimulus control is usually assessed by testing with a novel stimulus from class in question. That is, one tests for a concept by presenting a novel question with the same general feature or principle. If the correct answer is given to a novel question, then presumably the response is under the appropriate stimulus control. In sum, an important component of educational programs is the degree to which they seek to promote the development of concepts, particularly as opposed to simple intraverbals.

### ***Concepts, Collateral Responses and Equivalence Classes***

To be sure, in education we want the student to also be able to engage in collateral responses. The importance of collateral responses in determining what is called "knowledge" and "meaning" cannot be underestimated ("A similar issue concerns meaning. A machine may behave like a man but its behavior may still be called meaningless.... What is resented is the lack of collateral behavior," Skinner, 1969, p. 291). Although written from a traditional mentalistic rather than a behavior-analytic perspective, the venerable taxonomy of educational objectives in Bloom et al. (1956) nevertheless provides a kind of analysis of the terminal repertoires that a program of instruction might seek to instill, and the relations among those repertoires that is relevant to the question of collateral responses.

In 1956, Benjamin Bloom headed a group of traditional educational psychologists who developed a classification of levels of intellectual behavior important in learning. This classification system became a widely recognized taxonomy including three overlapping domains (see <http://www.dlrn.org/library/dl/guide4.html> for the basis of what follows).

The first domain is so-called "cognitive learning." This sort of learning is demonstrated by recall and associated intellectual skills: comprehending information, organizing ideas, analyzing and synthesizing data, applying knowledge, choosing among alternatives in problem-solving, and evaluating ideas or actions. This domain of the acquisition and use of knowledge is predominant in the majority of academic courses. Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts, at the lowest level, through increasingly more complex and abstract activities, at the highest level. Examples of



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verbs that represent the intellectual activity nominally associated each level are also listed.

1. Knowledge: Stating specific facts, ways and means of dealing with specifics (conventions, trends and sequences, classifications and categories, criteria, methodology), universals and abstractions in a field (principles and generalizations, theories and structures). Representative verbs are arrange, define, duplicate, label, list, memorize, name, order, recognize, relate, recall, repeat, reproduce, state.
2. Comprehension: Grasping the significance of instructional materials. Representative verbs are classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate.
3. Application: Using previously learned information in new and concrete situations to solve problems that have single or best answers. Representative verbs are apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, write.
4. Analysis: Breaking down informational materials into their component parts, examining (and trying to understand the organizational structure of) such information to develop divergent conclusions by identifying motives or causes, making inferences, and/or finding evidence to support generalizations. Representative verbs are analyze, appraise, calculate, categorize, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, test.
5. Synthesis: Creatively or divergently applying prior knowledge and skills to produce a new or original whole. Representative verbs are arrange, assemble, collect, compose, construct, create, design, develop, formulate, manage, organize, plan, prepare, propose, set up, write.
6. Evaluation: Judging the value of material based on personal values/opinions, resulting in an end product, with a given purpose, without real right or wrong answers. Representative verbs are appraise, argue, assess, attach, choose, compare, defend, estimate, judge, predict, rate, core, select, support, value, evaluate.

The second domain is so-called “affective learning.” This sort of learning is demonstrated by behaviors indicating attitudes of awareness, interest, attention, concern, and responsibility, the ability to listen and respond in interactions with others, and the ability to demonstrate those attitudinal characteristics or values which are appropriate to the test situation and the field of study. This domain relates to emotions, attitudes, appreciations, and values, such as enjoying, conserving, respecting, and supporting. Verbs applicable to the affective domain include accept, attempt, challenge, defend, dispute, join, judge, praise, question, share, support, and volunteer.

The third domain is “psychomotor learning.” This sort of learning is demonstrated by physical skills; coordination, dexterity, manipulation, grace, strength, speed; actions which demonstrate the fine motor skills such as use of precision instruments or tools, or actions which evidence gross motor skills such as the use of the body in dance or athletic performance. Verbs applicable to the

psychomotor domain include bend, grasp, handle, operate, reach, relax, shorten, stretch, write, differentiate (by touch), express (facially), and perform (skillfully).

Let us now consider the application of the classification Bloom calls “cognitive learning” to the issue of what it means to say an individual knows something, such as the meaning of a term. Readers may also refer to Vargas (1972, pp. 105 ff.) for an explicit rendering of objectives from Bloom’s taxonomy in behavioral terms, although that source was composed before the behavior-analytic concepts to be deployed below were developed. For example, at the end of an instructional program designed to teach a student the “meaning” of a term, the student should presumably be able to:

1. Select a definition that fits the term
2. Select a term that fits the definition
3. State a synonym of the term
4. State an antonym of the term
5. Match the term with an appropriate synonym
6. Match the term with an appropriate antonym
7. Choose a picture that represents the term
8. State the principle that fits the term
9. State the similarities between the term in question and a second term
10. State the differences between the term in question and a second term
11. Choose the best meaning of the term when it is used in a sentence

These objectives identify a whole range of activities from the “cognitive” domain, although as evidenced by the frequency of the verbs “state” and “select,” the objectives focus more on the lower level skills, such as knowledge, comprehension, and application, than on the higher level skills, such as analysis, synthesis, and evaluation. In any case, the important point is that understanding the meaning of a term is cast in more than just the recitation of a definition. Those who are said to know the meaning of a term can engage in variety of collateral responses.

How would a behavior analyst specify the nature of these collateral responses in terms of contingencies? At issue here is the establishment of equivalence classes, often supplemented by conceptual stimulus control. The term “equivalence classes” refers to stimulus control that emerges as a result of certain experiences, not involving specific discrimination training and differential reinforcement (Sidman, 2000; cf. Hayes, 1994). For example, suppose an individual is presented with stimulus A1 (a picture of a dog). Then, in the presence of A1, the individual is trained to pick stimulus B1 (the word “dog” played on a tape recorder) rather than B2 (the word “cat” played on a tape recorder). Suppose that the individual is next presented with stimulus B1 and trained to pick stimulus C1 (the letters D-O-G on a card) rather than C2 (the letters C-A-T on a card). A wide variety of recent research has shown that if the individual is presented with stimulus C1 (the letters D-O-G on a card), it will reliably pick stimulus A1 (a picture of a dog) rather than A2 (a picture of a cat), even though there is no history of differential reinforcement involving this third relation. The collateral responses in question may be understood in some instances as responses that develop through equivalence

relations, or in other instances as responses that are under conceptual stimulus control such that they are evoked by novel stimuli.

Equivalence relations are important because as with concepts, an instructional process must provide the appropriate kinds of experiences that promote them. That is, the instructional process must presumably provide the “given A1 pick B1 rather than B2,” “given B1 pick C1 rather than C2,” and then the “given C1 which to pick from A1 and A2?” experiences. Consider instruction designed to teach students the aforementioned distinction between operants and respondents. Suppose an instructor poses 2 or 3 examples during class discussions and asks students to identify by a show of hands whether the example is of operant or respondent behavior. Suppose the instructor then asks students on a quiz question to provide an example of one or the other. Students might well provide a “correct” example, but only because they memorized and recited back one of the examples the instructor used. Many instructors would be satisfied that their students had learned the difference, but the students might not have: The answer might be based on simple intraverbals, rather than on “understanding the concept” (see also Skinner, 1968, pp. 202 ff.; Skinner, 1953, pp. 408-410; Vargas, 1972, p. 107).

Now consider 2 alternative teaching strategies. In the first, suppose that the students were asked on the quiz to identify whether a description of a novel behavioral event (i.e., one that the instructor did not discuss in class) was an instance of operant or respondent behavior. In the second, suppose that students were asked to describe an instance of their own operant or respondent behavior, and as part of their answer, to identify the discriminative stimulus if they were describing operant behavior or the conditioned stimulus if they were describing respondent behavior. In such alternative situations, the students whose earlier answers were intraverbals might not give a correct answer on their one and only try on the quiz question, because there is no intraverbal basis for the answer. The correct answer depends on complex conceptual stimulus control and consists of collateral responses. Presumably, the worthwhile and enduring educational practices are those that implement the necessary kinds of instructional experiences to establish complex conceptual stimulus control beyond intraverbal control.

### ***Concerns About the Provenance of the Response***

Most often, determining whether students “know the material” means determining the extent to which students can produce responses which are of a certain topography, which are under a certain kind of stimulus control, which persist in the face of infrequent reinforcement, and which have any necessary temporal or intensive properties. Society hires instructors to certify that after students have completed a course, they can do the appropriate things. Generally, this kind of knowing is assessed verbally, by determining the extent to which students are able to state answers to test questions. The “stating” here usually consists of intraverbal control, where the source of the intraverbals is conceptual stimulus control, rather than transcription or dictation.

On the one hand, a conventional expectation of society is that students have learned in a representative way, such as by sitting and listening in a lecture course (see also a related discussion in Michael, 1991, pp. 229-230). Society may expect that students have not been spoon fed in individual tutorials, such that they do not always need to be taught that way in order to learn anything, for example, in training provided by their future employer. On the other hand, students pay money in the form of tuition and taxes to have their behavior changed. Students whose behavior is not changed in a course of instruction for which they are paying are being cheated, and educational programs that take money from students may be engaging in fraud. Do students have the “right” to be taught in way that best suits them? One suspects that given a choice, most students would prefer to be spoon fed in an individual tutorial, unlimited opportunity to do assignments, with unlimited opportunity for evaluation. Would instructors really be prepared to spoon feed students in individual tutorials? Again, a reasonable guess is that some instructors might be prepared to teach some students this way. But, if one, why not all? PSI (Personalized System of Instruction) was supposed to do just that. A reasonable guess is that most educational practices are tempered by the fiscal realities of the economic system that supports teaching (see also Fraley, 1998). Would society be prepared to countenance the economic implications of a form of instruction wherein instructors spoon feed a relatively small number of students in individual tutorials? This is not a question of whether this kind of instruction is technically possible or effective. Rather, the question is one of societal expectation: Instructors can make allowances for some students, but society expects that a large segment of students has learned when taught by conventional methods. For that matter, society does not pay instructors to provide individualized tutorials for only a small number of students. At some point, an educational program may need to provide information to those potential employers about both how much of the terminal repertoire the graduates acquired and how long the graduates took to do so, and the graduates would need to know that this kind of information is being provided to potential employers.

### **BEHAVIOR-ANALYTIC EVALUATION**

As noted above, the four goals of instruction are to facilitate establishing the (a) appropriate topography of the response, (b) appropriate stimulus control over the response, (c) appropriate temporal or intensity characteristics of the response, and (d) maintenance of the response when the rate of reinforcement is low. Of particular concern for present purposes is the nature of stimulus control over the response. In most instances, this concern reduces to (a) the extent to which thematically related collateral verbal behavior, which goes beyond intraverbals, is part of a student’s repertoire; and (b) the extent to which verbal behavior is discriminative for subsequent nonverbal behavior. Reviews of instructional programs should presumably take these goals into account.

The first concern can be assessed by determining generalization, or perhaps the establishment of equivalence classes. Often it is a simple matter of asking a

given question in two or three different ways. Perhaps a student could be taught to identify instances of a concept on the basis of auditory, visual, and written stimuli. The relevant question is whether there are procedures in effect in instructional programs that seek to determine whether the response is based on conceptual stimulus control, such that it reflects generalization of an abstract principle.

The second concern can be assessed by setting up situations in which a student's nonverbal behavior is discriminative for verbal, and vice versa. Consider the issue of shaping via differential reinforcement of successive approximations. The following cases are probably familiar to many instructors. Suppose a student can state the principles of shaping quite well but cannot actually shape the lever press. Suppose a student cannot state the principles but nevertheless can shape the lever press quite well. Suppose a student can correctly state the distinction between operant and respondent behavior but cannot shape the lever press. Suppose a student cannot correctly state the distinction between operant and respondent behavior but can shape the lever press.

The student might first receive instruction on how to state what is involved in shaping a rat's lever press, and as part of this instruction, compose some verbal material indicating what will be done. Video tapes of other cases of shaping might also be employed. The student would then have to actually shape the lever press. Finally, the student would have to describe how the process of shaping was actually carried out, and the student would compare the first description with the second. The literature regarding correspondence between "saying" and "doing" is voluminous, but presumably discriminative control by self-descriptive verbal behavior is an important part of the educational process, for self-knowledge as well as intellectual self-management (Skinner, 1957, pp. 438 ff.).

### ***Practicalities of Instruction***

In a common cultural arrangement, some entity, either public (city, state, national) or private, pays a fee to teachers to change the behavior of students in their charge. For various reasons, teachers have a lot of flexibility in seeking to bring about these changes. The flexibility is called "academic freedom." The teachers are also given job security. The security is called "tenure." Such practices are presumably meant to protect the educational process and those who work in education from the interference of those with ulterior and selfish political agendas. Overall, one can say that a form of "social contract" exists between the culture and teachers.

Instructors must obviously start with the entering repertoires of students (Fraley, 1998; Michael, 1991). The problem is that there is wide variation in entering repertoires. Moreover, the path from entering to terminal repertoire will presumably be spotty, as students may have already acquired partial skills along the path. We know from the basic experimental literature that some prior training can actually interfere with current training by blocking responses from developing that would otherwise develop (Kamin, 1969). Highly variable entering repertoires

challenge the behavior of the teacher, if only because dealing with variable entering repertoires requires more time and individual attention.

A behavior-analytic interpretation of evaluation by third parties, such as accrediting agencies or certification boards, is that such evaluation is usually concerned with determining the topography of a student's response and the nature of the stimulus control over it. The third parties typically do not frame the matter in such terms, of course. In any case, a particular concern for behavior analysts is whether the stimulus control over the student's response is sufficiently generalized. This concern may be contrasted with that of accrediting agencies, who typically want to see how instructional programs guard against (a) accepting what they should reject (i.e., committing a type I error); or (b) rejecting what they should accept (i.e., committing a type II error). Of course, the validity of anyone's judgment is an issue, including the validity of accreditors or certifiers. The validity is important because those doing the judging are under the control of extraneous and competing contingencies, not because of the difficulty of inferring something about purported underlying mental abilities on the basis of behavioral evidence. There are no underlying mental abilities of this sort to judge, despite our mentalistic culture's fondness for inventing them and then proposing to use their manifestations as a basis for judgments.

As noted earlier, a common practice is to establish "objectives" for a program of instruction. If the objectives take the form of a progressive sequence, the last set of objectives specifies the terminal repertoire the program is designed to achieve. Grades are conventional measures used to indicate what percentage of the required terminal repertoire has been achieved by the end of the instructional period. By giving a student a failing grade, the teacher is certifying that the student does not have some minimal percentage of the terminal repertoire. By giving a student a passing grade, the teacher is certifying that the student does have some minimal percentage of the terminal repertoire. By giving a high grade, presumably the teacher is certifying for the public that the student has a large percentage of the terminal repertoire. By giving a lower grade, presumably the teacher is certifying for the public that the student has a lower percentage of the terminal repertoire.

However, a variety of practical matters need to be recognized in the grading process. For example, does a student need to acquire all aspects of the terminal repertoire? What if the student is absent for a certain portion of the academic calendar, and is not exposed to all parts of the instructional program? What if the student is observing a religious holiday that extends over some period of time? What if the course is required in some curriculum, but the student has "deeply held" personal beliefs that conflict with the subject matter of the course? The legal system gives the students "civil rights," and specifies that the student cannot be penalized. The point is that all these practical matters require the instructor to spend more time, which is generally unrecognized by society. If a teacher waives the missed material by not allowing make-up work, or if a teacher substitutes an average of other work for the missing work, the teacher has not established the full repertoire in the student, and the grade does not necessarily reflect the student's actual repertoire. If the teacher does deal with the special cases, the teacher is

doing much more work than the job description calls for, and the extra work is typically not reimbursed. Often the teachers do it anyway, of course, but the problem contributes to teacher burn-out. The important issue is whether students who complete a course with a given grade actually have a terminal repertoire that is commensurate with that grade. Whether the culture is prepared to deal with this issue, given its commitment to mentalistic assumptions about students and learning, is debatable.

## SUMMARY AND CONCLUSIONS

In conclusion, we can see that many traditional educational practices are based on mentalistic assumptions about students and the learning process in the classroom. Although there may be ways in which these assumptions can promote certain reasonably effective practices, on balance they are not as effective as they need to be. In contrast, behavior-analytic educational practices are based on contingencies arranged by the instructor to expedite the acquisition of new elements in a student's repertoire. Of particular concern are new topographies and new stimulus control, especially of the sort identified as verbal equivalence relations. Overall, by taking verbal contingencies into account, instructors will be better able to educate the members of our culture and integrate them into the culture.

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