The Development and Empirical Validation of a Concept Analysis Program to Teach the Concepts in B. F. Skinner's Verbal Behavior

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THE DEVELOPMENT
AND EMPIRICAL VALIDATION OF A
CONCEPT ANALYSIS PROGRAM TO TEACH THE
CONCEPTS IN B. F. SKINNER'S
VERBAL BEHAVIOR

by
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Norman McLeod Peterson
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"They teach concepts, don't they?"
-Markle 1975

Behavioral approaches, such as behavioral objectives and programmed instruction, have been criticized for dealing only with the lowest level of learning. This level has been referred to as the knowledge level (Bloom, 1956) or rote memorization (Gagné, 1965). Gagné has described a hierarchy of learning, and central to this hierarchy is concept learning. Concept learning forms the basis for virtually all forms of higher learning, including problem solving and creative behavior.

The empirical investigation of concept learning (also called concept formation or attainment or acquisition) began with Hull (1920). Since that time several hundred studies have been published on the topic (see Clark, 1971, for a review of over 250 of these studies). Much of this research has been done within the framework of a cognitive or mentalistic point-of-view. Formal logic has played a major role in the work of some researchers (Engelmann, 1969; Haygood and Bourne, 1965). An operant analysis has been offered by a few writers (Buss, 1950; Lawson, 1962), but extensive operant research into the area of concept learning has not been conducted. Operant research in the area of stimulus control is relevant however.

Within the last seven years, important advances have been made in bringing together elements of formal and empirical investigations of
concept learning, with some principles from programmed instruction and behavior analysis (Becker, Engelmann & Thomas, 1971, 1975; Engelmann, 1969; Markle & Tiemann, 1969). This blending together of knowledge has produced at least the beginnings of a powerful technology capable of really teaching concepts. The purpose of this paper is to review the relevant findings from the experimental literature, the writings from a formal analysis, and the recent integrative work pioneered by Markle and Tiemann (1969) to develop a set of teaching prescriptions which will have the potential to result in optimal conceptual learning by students. This set of teaching prescriptions will then be used to develop a concept analysis program. The program will then be subject to an empirical validation.

The concepts will be taken from B. F. Skinner's *Verbal Behavior*. This particular text was chosen because it has been difficult to teach from, yet there is a growing number of instructors who would like to teach Skinner's analysis. It is therefore hoped that a concept analysis program over this text will not only provide a model for writing such programs, but will also fill a current need for a more tractable text presenting Skinner's analysis.

The format for the introduction is as follows. First, I will present some definitions of concepts or conceptual behavior, the component features that are necessary to understand the area of concept learning research. Then I will review the experimental literature focusing on the subjects used, the various types of stimuli and the major dependent and independent variables. Thirdly, I will present a
synthesis of teaching prescriptions based upon those presented in the literature. Finally, I will present a behavioral analysis of conceptual behavior and the prescriptions for teaching it. Section II, The Development on Empirical Validation Of The Program, presents a description of the steps involved in the development of the program and will briefly present test data obtained as part of the validation procedure. Section III consists of the actual concept analysis program incorporating all revisions based upon the validation procedure.

Definition and Analysis

What is a concept? This is another term which has come into psychology from popular speech, carrying with it many different connotations. We shall have to be careful in using it, remembering that it is only a name for a kind of behavior. Strictly speaking, one does not have a concept, just as one does not have extinction, rather, one demonstrates conceptual behavior by acting in a certain way. Our analysis should really start with a different question: what type of behavior is it that we call conceptual?

Keller & Schoenfeld, 1950

Definitions

In attempting to deal with the question of how to best teach concepts, or how to teach those behaviors that we call conceptual, the first problem is one of definition. Virtually everyone who has investigated any aspect of conceptual learning has proposed a definition. The following represent some of the definitions that have been offered.
...concepts are properties of organismic experience—more particularly they are the abstracted and often cognitively structured classes of "mental" experience learned by organisms in the course of their life histories. (Martorella, 1972, p. 2)

...concept attainment refers to the process of finding predictive defining attributes that distinguish exemplars from non-exemplars of the class one seeks to discriminate. (Bruner, Goodnow & Austin, 1956, p. 22)

A concept is a kind of capability that enables an individual to identify, by class name or otherwise, a specific member of a class of objects, object properties, actions of events, where that specific member is new to him. (Gagné, 1970, p. 117)

Other writers have preferred to define concepts in terms of stimuli or stimulus characteristics.

A concept is a class of stimuli which have common characteristics. (DeCecco, 1968, p. 228)

A concept is a set of characteristics that is shared by all instances in a particular set and only by those instances. (Engelmann, 1969, p. 9)

The response that the organism makes has been seen as the defining characteristic by other writers, in addition to the nature of the stimuli that control that response.

When an organism gives the same response to a set of stimuli varying on a particular dimension, but not to other stimuli that lack that dimension, that behavior is said to be an example of concept formation. (Lubow, 1974)

Conceptual behavior involves generalizing within classes and discriminating between classes. (Mechner, 1971)

Finally, some writers emphasize contingencies of reinforcement.

A single response, verbal or non-verbal, under the discriminative control of a group of stimuli whose
parameters are defined by the differential reinforcement of the environment. (Brigham, 1972)

A concept is simply a feature of a set of contingencies which exist in the world, and it is discovered simply in the sense that the contingencies bring behavior under its control. (Skinner, 1974, p. 95)

These latter two sets of definitions are essentially consistent with an operant analysis of conceptual behavior.

**Concept analysis**

Before examining the experimental findings relevant to teaching concepts, it is first necessary to further investigate the components involved in concepts and concept teaching. Concepts have attributes or stimulus features that may be either relevant or irrelevant, may vary intradimensionally, may vary in number or may vary in salience. Furthermore, concepts may be defined by the relationship between or among attributes.

Bruner et al. (1956) has defined an attribute as "any discriminable feature of an event that is susceptible of some discriminable variation from event to event." This notion of variation of an attribute from instance to instance is important. If all instances of a concept are the same, then we have a case of what Markle & Tiemann (1969) have labelled "identity," and not a concept at all. In the case of identity, all examples are exactly alike. Markle and Tiemann cite as an example: "In geography or urban studies, for instance, the city of Chicago, Illinois, is an identity - there is only one such place." DeCecco (1968) stated that "concept attributes are distinctive
features . . . that have values." Furthermore, he indicates that concepts may have different numbers of attributes, and that the dominance of the attributes may vary.

Attributes that are essential to an instance of the concept are called either relevant (Engelmann, 1969) or critical (Markle & Tiemann, 1969) or exemplar (Bruner et al., 1956). The absence of any or all of the relevant attributes defines a non-instance, non-example or non-exemplar. Engelmann (Becker et al., 1975) has defined a special set of relevant attributes that he calls "shared characteristics." These are features that are relevant to several concepts, but are not the essential defining characteristics, but rather are also features of related concepts. These form the basis of critical attributes for higher level concepts. For example, an attribute of horse is being warm-blooded; being warm-blooded is also an attribute of dogs, and therefore warm-bloodedness is an example of shared characteristics. Warm-bloodedness is, however, a defining relevant attribute of mammals.

Swanson (1972) has made a distinction between critical and relevant attributes. Relevant attributes, of course, must be present for the instance to be positive, but the attribute(s) that distinguish(es) the concept from related concepts is called critical or defining. For example, the critical attribute of Skinner's "tact" (1957) is that the response form is controlled by a non-verbal stimulus.

Relevant attributes include the fact that the response is verbal, but so is the response for "mands" and "intraverbals" (Skinner, 1957). Sets of concepts that differ on the basis of only one critical
attribute have a specific function in relation to one another (Engelmann, 1969). Groups that differ on the basis of several attributes have a "general function." But instances of concepts have other attributes than those that we call relevant.

Properties of concept instances and non-instances which are unrelated to their status as concept instances or non-instances may be called "irrelevant characteristics" (Becker, et al., 1975; Markle & Tiemann, 1969). Size may be considered to be an irrelevant attribute of examples and non-examples of the concept, "square." Whether the side of a square is an inch long or a mile long, makes no difference as long as all the relevant attributes of squareness are present. Other irrelevant attributes that are relevant neither to instances nor non-instances of squares include movement, location, position, color, and others.

Attributes have several other relationships to concepts other than their relevance or irrelevance (DeCecco, 1968). The number of attributes may vary from concept to concept. Generally speaking, the fewer relevant attributes a concept has, the more likely we are to call it "abstract" (Skinner, 1957). Attributes of concepts have a range of values. Having a back is an attribute of "chair," but the back of a chair may range from low to high, or from straight to curved. Finally, the dominance or salience of an attribute may vary depending upon the number and nature of the other attributes present in the concept instance. For example, bright coloration is often a more salient attribute than dull coloration. Whether or not an attribute is salient
or not is not dependent upon its being relevant or irrelevant. An irrelevant attribute may be the most salient in an instance of a concept, a factor that has the potential to cause problems in concept learning.

Additionally, the relationship between or among attributes has been the basis for one method of classifying concepts (Bruner et al., 1956; DeCecco, 1968). This classification derives from a logical analysis of the different relationships that two attributes may have with each other and has been presented in detail by Haygood and Bourne (1965). Engelmann (Becker et al., 1975) has proposed a different classification, which he calls concept domains.

The most commonly used type of concept in the experimental literature is the conjunctive concept (Bruner et al., 1956). This classification presumably resulted from the fact that most laboratory concept learning studies have employed geometrical figures as stimuli, and the concept being investigated was arbitrarily defined by the relationship between two of the attributes. In a conjunctive concept, the relationship is the combined presence of two or more attributes. In a simple example, the concept, for which the subject has to discover the attributes and the rule which relates them, is defined as "yellow and bordered" Gagne, 1970). Martorella (1972) used rectangle as an example of a conjunctive concept.

Learning conjunctive concepts is often contrasted with learning disjunctive concepts (e.g., Eifermann & Steinitz, 1971; Fraunfelker, 1971; Conant and Trabasso, 1964). Using the same attributes as he
did in exemplifying conjunction, Gagne gave the disjunctive example "either yellow or bordered." Actual examples of disjunctive concepts may include "citizen" (Martorella, 1972), a person who either was born in a country or moved to the country and was granted citizenship. Another example, given by Bruner et al. (1956) is a "strike" in baseball. A strike is either a pitched ball that is swung at and missed, hit into foul territory, or not swung at, but in the "strike zone."

Other writers have tended to exclude the notion of disjunction with respect to concepts. Anisfeld (1968) has argued that the notion of disjunctive concepts is primarily an artifact of the psychological laboratory and that naturally occurring human categories are not typically disjunctive. Markle and Tiemann (1969) preferred to call this relationship "multiple situations with convergent responses" and consider it a non-example of "concept." They based this upon the notion that examples of concepts must have attributes in common with each other, and the "or" relationship permits two examples to have no attributes in common. Since conceptual behavior is based, in part, upon generalization within classes, they exclude disjunction because it excludes generalization.

A third category of concepts is relational. Bruner et al. (1956) define relational concepts as those that are based upon a relation between attributes. They give the example of "effective stimulus." Martorella (1972) uses the example "waste." Gagné (1965) preferred to call this a defined concept.

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Other potential relationships have been identified by Haygood and Bourne (1965). These are based upon the logical possibilities with respect to two attributes. In the table that follows, R will stand for the attribute, red, and S will stand for square. The logical symbols \(\land\) (and), \(\lor\) (or), \(\neg\) (negation), \(\rightarrow\) (if...then...), and \(\leftrightarrow\) (if and only if) are used to denote the relationships.

Table I

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<td>(R \rightarrow S)</td>
<td>Exclusion</td>
<td>(\neg R \land \neg S)</td>
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<td>Bi-conditional</td>
<td>(R \leftrightarrow S)</td>
<td>Exclusive Disjunction</td>
<td>((R \land S) \lor (\neg R \land \neg S))</td>
</tr>
<tr>
<td>Negation</td>
<td>(\neg R)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative denial</td>
<td>(\neg R \lor \neg S)</td>
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Engelmann (Becker et al., 1975) has proposed a somewhat different classification of concepts that appears to be derived from real life concepts as opposed to those used in the psychological laboratory. He proposes five categories or "domains." The lowest level concerns objects. This is followed by object properties. Then come object relationships in space such as order, location, relative position. The next category is events in time and space and the example given is the conservation of mass. The final category concerns the relationship among events in time and space, e.g., reinforcement as an example of cause and effect.
Just as attributes enter into important relationships with one another, so do concepts. Feldman (1972) in analyzing mathematical concepts, identified supar-, co-, and sub-ordinate concepts in relation to the ones she was analyzing. Supra-ordinate concepts are those that are more general than the concept that is being analyzed. Mammal is a supra-ordinate with respect to "horse." Co-ordinate concepts are on the same level as the concept being analyzed. Cow would be a co-ordinate concept in relation to horse. Sub-ordinate concepts are more specific than the concept being analyzed. Thoroughbred would be an example of a sub-ordinate concept with respect to horse.

Summary of definitions and analysis

Rather than try to synthesize a definition of concept, I will instead indicate the features that a good definition should contain. First of all it should be phrased in terms of a response emitted by the organism. This response should be under the discriminative control of a specified set of stimulus features. The parameters of this set are determined by the contingencies of reinforcement, generally established by the verbal community.

An analysis of concepts reveals that they have attributes which may be relevant or irrelevant to a concept instance. Furthermore, the number of both relevant and irrelevant attributes may vary from concept to concept. Attributes have values that vary along a continuum and various attributes have different degrees of salience, depending upon both the nature of the attribute and the context in which it is found.
Concepts may be classified by the relationships between or among their attributes, the simplest form is the one-dimensional attribute, or affirmation, such as color. Other categories, derived from a logical analysis of the stimuli used in the psychological laboratory include conjunctive, disjunctive and relational concepts. Additional categories are possible, but have seldom been the object of research. Engelmann has described five concept domains including objects, properties of objects, object relationships, events in time and space and relationships between events in time and space. Concepts may also be classified in terms of their relationship to one another on the basis of their shared attributes. Concepts that share certain attributes are called co-ordinate concepts. Concepts that have shared characteristics of co-ordinate concepts as their critical attributes are supra-ordinate relative to the concept being analyzed. Concepts whose shared characteristics are critical to the one being analyzed are sub-ordinate to it.

Types of Subjects and the Range of Concepts

Much of the research done between 1920 and 1970 has been done in the psychological laboratory using "artificial concepts" based upon various arrangements of attributes making up stimulus cards with geometric figures on them. A typical set (Bourne, 1966) of cards includes three dimensions of variation: color, form, and size. Each dimension has three values: for color - red, green and blue; for form - square, triangle and circle; and for size - large, medium.
and small. Concepts are then selected by defining a relationship between two of the attributes. An extensive review of this literature has been done (Clark, 1971) and tentative teaching prescriptions, for teaching real concepts to real students, were suggested. Since the time of Clark's review, important research has been carried out using real concepts and more definitive teaching prescriptions can be formulated from that research. The purpose of this section of this paper is to re-analyze the relevant literature from the laboratory, and integrate it with the literature from the classroom in order to derive from it teaching prescriptions that can result in adequate concept teaching.

The format of this section will include a review of the types of subjects and range of concepts used. Then a summary of the various dependent and independent variables that have been employed will be presented. Finally, some criticisms of the applicability of the laboratory finding to the classroom will be summarized.

A typical subject for the traditional concept learning study, using geometrical figures, has been the college sophomore (Clark, 1971). More recent studies performed in the classroom have also used the college student (Markle and Tiemann, 1974). Other studies, however, have employed elementary school students as subjects. Sixth graders were used by Swanson (1972), and Feldman and Klausmeier (1974) investigated differences in concept attainment between fourth graders and eighth graders.
Although the geometrical figure on a card, arbitrarily defined by the experimenter and sometimes given some nonsense name, e.g., "DAX" (Carroll, 1964) is most commonly used, other concepts have also been employed, and, indeed, the current trend is to use actually occurring concepts. It should be noted that a major difference between artificial concepts used in the laboratory and concepts that are naturally occurring concerns a number of irrelevant attributes and the number of dimensions that the relevant and irrelevant attributes may possess. In the laboratory, these are, in both cases, finite; whereas, in the actual world, concepts have virtually an infinite number of values along irrelevant dimensions. "Concept acquisition deals with infinite concept classes as contrasted with finite classes as used in concept attainment research (Tennyson, Wooley and Merrill, 1972)." Examples of concept research using geometrical figures on cards may be found in Bourne (1957), Brown and Archer (1956), Callentine and Warren (1955), Conant and Trabasso (1964), Denny (1969), Fryatt and Tulving (1963), and Hunt and Hovland (1960).

Concepts used in human research, other than geometric figures, include Chinese ideographs (Hull, 1920), correlation (Asbury, 1971), equilateral triangle (Feldman and Klausmeier, 1974), sets of letters typed on cards, (Haygood, Harbert and Omlor, 1970), individualized instruction, (Harris, 1971), dependent (Hoehn, 1974), sentence, noun, pronoun, verb, adjective, adverb (Moore, Jones and Goldschmidt, 1971), island (Martorella and Wood, 1971), trapezoid (Smuckler, 1967),
communativity and associativity (Shumway, 1974), environmental concepts, such as biodegradable (Swanson, 1972), distributivity and homomorphism (Shumway, 1973), adverb (Tennyson, 1971), trochaic meter (Tennyson, et al., 1972) and atavistic (Anderson and Kulhavy, 1973).

Although most of the research done on concept learning has involved human subjects, a number of studies have been performed to investigate concept attainment in infra-human subjects. Several writers have questioned whether lower organisms can form true concepts (Osgood, 1954; Hunt, 1962). Smoke (1935) in commenting upon a study by Field (1932) which involved a jumping response by a white rat argued that the response was qualitatively different from the "symbolic" responses typified by human verbal behavior.

Skinner's (1957) treatment of verbal behavior, especially the section on abstraction in the chapter on "The Tact," provides a rather compelling argument for the lack of a qualitative difference between behaviors emitted by lower organisms and verbal behavior. He goes on to question the whole notion of a word as a "symbolic" response standing for something. Whether or not some arbitrary response by a rat such as jumping is equivelant to the vocal verbal response, "triangle" cannot be judged by the form of the response, but rather by the nature of the reinforcing contingencies.

Several studies have demonstrated compelling evidence for conceptual behavior on the part of lower organisms. The general procedure in most of these studies for establishing the conceptual
behavior is based upon the principals of stimulus generalization
discrimination, and differential reinforcement. The results of these
studies certainly throw doubt on some interpretations of human con­
cept behavior, which require the formation of hypotheses that are
tested by the organism with each presentation of a concept instance or
non-instance. This is not to imply that some form of "hypothesis
testing" does not occur in studies with human subjects. What actually
may be occurring is a form of behavior that Skinner (1968) has called
"rule-governed." I shall return to this notion of rule-governed
behavior when I suggest further research that needs to be done in
teaching concepts in higher education.

Perhaps the earliest investigation of concept formation with lower
animals was the work of Field (1932) who tried to bring a rat under
the discriminative control of the concept "triangularity." Field
was convinced that he had trained a form of conceptual behavior.
"When white rats are given a training period especially designed to
provide a large number of different "triangle experiences," the rats
able to perfect a type of behavior which is fully described by the
implications inherent in our use of the term concept."

Since that time, many other experiments in concept learning have
been performed with a wide variety of animals and with a wide variety
of concepts. In addition to the rat, species that appear to have
demonstarted conceptual behavior include old and new world monkeys
(Bromer, 1939), squirrel monkeys (Wells and Diffenbacher, 1966) and
pigeons (Herrnstein and Loveland, 1964; Lubow, 1974; Malott and Siddal,
The range of concepts used in these experiments included (other than triangularity) "threeness (Hicks, 1956)," oddity (Bromer, 1939), matching (Malott and Malott, 1970), man-made objects (Lubow, 1974), humanness (Malott and Siddal, 1972).

Two of these studies dealt with extremely complex concepts: human (Malott and Siddal) and man-made objects (Lubow). It would be very difficult to specify all the relevant attributes for these concepts. These two studies perform the very useful function of demonstrating the fact that the teacher does not have to be able to identify all the relevant attributes in order to adequately teach the concept to another organism (Michael, 1973).

Summary of subjects and concepts used

Much of the early work in concept learning was done with college students as subjects and geometrical figures on cards with experimenter determined relationships between two or more attributes defining the concept to be investigated. More recently, younger human subjects have been used with concepts from the real world, the concepts that are typically taught daily in the schools. Concurrent with research with human subjects, a number of studies have been reported which employed a variety of animal subjects, including the white rat, pigeions, and several types of monkeys.
Probably the most common measures of performance in concept research are number of trails, number of incorrect (or correct) responses and time to solution (Bourne, 1966, p. 46). These measures are essentially equivalent indices of performance, with correlations ranging around .90 (Bourne, 1957). Furthermore, the responses required of the subjects, from which these measures are derived, fall into two general paradigms.

The most common response requirement is the reception paradigm. The general task here is to categorize stimuli, either by indicating whether they are positive instances of the concept or negative instances. Alternatively, the subject may have to learn a non-sense name, such as DAX or VEC (Bourne, 1966, p. 6). Bourne provides a detailed description of the entire procedure and variations in his 1966 book.

The selection paradigm is more recent and is typified in the work of Bruner et al. (1956). Bourne (1966) described the procedure as follows:

The problem begins when the experimenter designates one member of the stimulus population as a positive instance of the concept which must be discovered. On the basis of this information, the subject guesses what the concept is; that is, he states some hypothesis about the solution. If the guess is wrong the subject is allowed to select an instance from the population, and to ask whether it is positive or negative. Once this question has been answered by the experimenter, the subject states his new or revised hypothesis. This procedure continues - another instance is selected by the subject and categorized by the experimenter - until the subject states the correct hypothesis; that is, the solution.
The major purpose of this strategy is to provide information about the learning process and whether or not the subject is using some systematic selection strategy. The reception approach supplies no data concerning how the subject acquires the concept; it merely provides information about how long it took, or how many errors were made. Perhaps the major advantage of the selection procedure is that it supplies approximately the same information as the reception approach, plus information about "hypothesis formation."

Studies that have used naturally occurring concepts have typically employed some type of generalization and discrimination test. In this procedure, after training is completed, novel examples and non-examples are presented to the subject and the subject is expected to categorize them (Markle and Tiemann, 1974; Tennyson et al., 1972). This, of course, is very much like the typical examination procedure used in the schools to test whether or not a student has mastered the concept in question. Markle and Tiemann (1969) would quickly point out, however, that the test items selected for classroom use are not as carefully selected as those employed in experimental designs.

Markle and Tiemann (1969) have suggested that responses of this nature, in addition to being correct, can represent three distinctly different kinds of errors, depending upon the nature of the stimulus features present during training. All of these errors represent forms of stimulus generalization similar to that described by Skinner (1957) in his discussion of "tact extension." Correct answers involve generalization along the dimensions of the relevant or critical
attributes. This is essentially what Skinner (1957) has labelled "generic tact extension." The stimulus controlling the form of the response must have all of the defining attributes present. If the student emits the concept label in the presence of stimuli that either do not include all of the defining attributes or none of the defining attributes, then a different type of extension has occurred. The other general type of error occurs when the student fails to respond appropriately with the concept label in the presence of a positive instance of the concept.

Overgeneralization is the label applied by Markle and Tiemann (1969) to mistakes that involve responding with the concept name in the presence of non-examples of the concept, but non-examples that share some of the relevant attributes of the concept. This is what Skinner (1957) has called "metaphorical tact extension." In this case, the stimulus control is by relevant, but not defining stimuli. An example of overgeneralization occurs when a child sees a bear cub for the first time and calls it a dog.

Another kind of mistake has been labelled "undergeneralization" by Markle and Tiemann. Undergeneralization represents a failure to generalize adequately along the dimensions of the relevant attributes. More likely this is an instance where the stimulus control involved in controlling the response "non-example" is by some irrelevant attribute and that control is stronger than the control exhibited by the relevant attributes over the correct response. For example, if a child has only learned to say "cat" in the presence of small
household pets, and to make some other response in the presence of larger animals, then the first time he sees a lion, he may have a tendency to emit some response other than "cat."

The most serious kind of error discussed by Markle and Tiemann is called "misconception." Essentially a misconception represents control by some irrelevant variable, or control by an attribute relevant to a non-example of the concept. Skinner calls a related form of tact extension "metonymical." The chances of this happening are very high if some irrelevant, and highly salient feature appears in all positive instances of the concept. Markle and Tiemann present an example involving the concept "fallacy." They indicate that their students were able to identify fallacies from the examples given in a textbook, but virtually all of them missed one they prepared - which they thought would be a very simple one. Given the following example: "All horses have wings. Man O' War is a horse. Therefore, Man O' War has wings." most of the students indicated that this was a fallacy. A quick examination of the textbook revealed that all examples of fallacy used conclusions that were obviously false, and all examples of sound logic reached conclusions that were true. Therefore, even though the logic was sound in this example, the students, apparently more under the control of the truth of the conclusion, identified this example as a fallacy. The only systematic investigation of this classification of errors has been done by Tennyson (1971) and Tennyson et al. (1972).
Summary of dependent variables

The most common dependent variables in the type of research done in the psychological laboratory, using "artificial" concepts, are time to solution, number of trials and number of incorrect responses. These types of measurements are collected in both reception and selection paradigms. Selection paradigms also permit a performance measure of strategies or processes used by the subject in attaining the concept. Markle and Tiemann have classified responses given in a type of generalization and discrimination test of conceptual understanding into the following categories: correct, overgeneralization, undergeneralization, and misconception.

Major Independent Variables Used in Conceptual Learning Research

Virtually all aspects of concept learning have been investigated. Bourne (1966) has made a distinction between "task" variables and "subject" variables. Task variables are those that the experimenter can directly manipulate; whereas, subject variables are those aspects of subjects that can be selected, such as I.Q., sex, and age. In this paper I plan to restrict my review to task variables, since those are the primary variables that can be manipulated in the classroom.

Major areas of comparison have centered around the effectiveness of positive as compared to negative instances in learning concepts. In the original study on this question, Smoke (1932) concluded that "some subjects appear to learn little if anything from negative
instances, and may even find them hinderances to concept learning."

In a subsequent study, Smoke (1933) modified this position, saying,

"Thus, although negative instances may not make for rapidity in learning, they tend to make for accuracy, especially in the case of difficult concepts. It appears that in so far as negative instances assist concept learning they do so largely because of the way in which they prevent the learner from coming to one or more erroneous conclusions while he is still in the midst of the learning process."

Almost all studies that have reported little utility from using negative instances have employed conjunctive concepts (e.g., Braley, 1963; Nahinsky and Slaymaker, 1970). Hovland (1952) suggested that Smoke's findings do not permit a distinction to be made between two potential sources of difficulty: the low efficiency of negative instances as a carrier of logical information or the subject's ability to assimilate information presented in this form. Hovland and Weiss (1953) devised a procedure in which the amount of information transmitted by positive and negative instances was logically equated. Their results indicate that correct concept identification is attained by a higher percent of subjects when transmitted by all positive instances than when transmitted by all negative instances. Their results did, however, disprove the notion that concepts can't be learned from negative instances, since as many as 50% of the subjects, under certain conditions, arrived at the correct concept exclusively on the basis of negative instances. It is important to remember, when interpreting these results to remember that the type of concepts used in this study has a finite range of attributes. Whether negative
instances would be at all useful in identifying a concept is highly questionable.

Davidson (1969), however, argued that the solutions required by Hovland that were based upon negative information were more complex than those that were based upon positive information. He experimentally equated the difficulty of the solutions and his results showed that the general detrimental effect of negative instances was either weak or absent. Freibergs and Tulving (1961) suggested that Hovland's findings may be the result of pre-experimental experiences of the subjects. They argue that most natural situations have primarily positive information and that it is very rare in everyday circumstances to learn concepts using only negative instances. They hypothesized that experience in learning to use negative instances would result in performance approximately equal to that obtained when only positive instances are used. This hypothesis was supported by their results.

The findings that positive instances result in better performance than negative instances are almost exclusively based upon studies involving conjunctive concepts. When disjunctive concepts are used, the findings have been reversed (Fraunfelker, 1971; Krebs and Lovelace, 1970; Scroth and Tamayo, 1973). Recent studies by Moore (1971) and Hoehn (1973) involving elementary school children and mathematical concepts reported no significant differences when comparisons were made between procedures using only positive and only negative instances. Finally, Hovland (1952) argued that the effectiveness of negative instances may vary considerably as a function of several variables.
including the total number of dimensions involved, the number of these
which are relevant to the concept, the total number of values for each
dimension, and the number of correct values for the relevant dimension.
Hovland concludes by saying, "it is clear that questions asked in earlier
concept formation studies about relative effectiveness of positive and
negative instances cannot be given a generalized categorical answer..."

When the task shifted from the laboratory to the classroom and the
concepts from arbitrary relationships between attributes to naturally
occurring relationships, the precise role of negative instances became
more clear. First of all, none of this latter research has investi-
gated concept learning from negative instances only. The typical
approach has been to compare positive with positive plus negative.
Several studies have indicated that negative instances enhance concept

Markle and Tiemann (1974) argued that non-examples enable the
student to discriminate fine differences necessary to exclude similar
specimens from membership in the class. Swanson (1972) reported that
the removal of non-examples from teaching sets resulted in significant
overgeneralization. Harris (1971) has also reported results that
confirm the hypothesis that negative examples are necessary to
facilitate discrimination, while positive examples facilitate general-
ization.

Variety of examples

The question of what variety of examples and non-examples to
use in training has not been thoroughly or conclusively investigated.
Some studies (Adams, 1954; Amster and Marascuilo, 1965; Callentine and Warren, 1955) have indicated that a small variety improved generalization. On the other hand, Morisset and Hovland (1959) reported that a wide variety produces better transfer. Markle and Tiemann (1969) suggested that it is not the number of variations that is important, but rather the nature of those variations. They proposed that a couple of widely varying examples are more useful than a larger number of examples that only vary slightly from example to example. To teach "dog" using a wide variety of medium sized dogs may not be as efficient as using a small dog, a medium sized dog, and a large dog. On the other hand, when selecting non-examples, they indicate that a wide variety of non-examples each lacking several relevant attributes would be much less effective than a set of non-examples that each lacked one and only one of the relevant attributes. These statements are in need of experimental support.

Number of attributes

Several investigators have researched the factors involved in concept difficulty. Increasing the number of irrelevant attributes decreased the performance of the subjects; that is, they make more errors or require more trials to solution or more total time to solution (Archer, Bourne and Brown, 1955; Bourne, 1957; Bulgarella and Archer, 1962; Clark, 1971; Haygood and Bourne, 1964; Haygood and Stevenson, 1967; Kerpros and Bourne, 1966; Walker and Bourne, 1961). In most studies the functional relationship between the number of irrelevant attributes and performance decrement was linear. Only Archer et al. (1955) reported an exponential relationship.
Similar findings have been reported when the number of relevant attributes was experimentally manipulated (Archer, 1954; Fredrich and Klausmeier, 1968; Kerpros and Bourne, 1966; Schvaneveldt, 1966; Walker and Bourne, 1961). Again, the relationship has been found to be linear, except for Walker and Bourne's suggestion of an exponential relationship. Moore, Berzonsky and Jones (1974) reported that concept difficulty was not a function of the number of relevant attributes, but rather a function of the interaction between the number of defining attributes and the mean level of conceptualization of the concept's attributes.

Other factors related to concept difficulty include findings by Nelson, Wolf and Royer (1973) that concept attainment is facilitated by a similarity (e.g., that of width and height, both aspects of size) between irrelevant dimensions and retarded by a similarity between relevant and irrelevant dimensions. Battig and Bourne (1961) found that there was a significant decline in performance for increases in either intra- or inter-dimensional variability.

Related findings, dealing with the difficulty of specific instances reveal that "instance difficulty is the major cause of concept learning errors (Tennyson, et al., 1972)." Tennyson and Boutwell (1974a, 1974b) proposed that training should proceed from less difficult instances to more difficult instances and have developed a system for obtaining a measure of instance difficulty. They outlined a two-step procedure that they called on "instance probability analysis." The first part is a subjective rating according to the difficulty of
the attributes. This involves identifying relevant attributes, identifying more common irrelevant attributes, and constructing an attribute matrix to assign scale values to each instance. The second step involves an empirical analysis based upon the ability of a sample of students, from the target population, to correctly identify examples and non-examples.

**Redundancy of information**

Another stimulus factor that has been investigated is "redundancy." Haygood and Bourne (1964) have identified two forms of redundancy. Form "A" exists when the levels of two stimulus dimensions are perfectly correlated. Form "B" exists when the levels of one dimension are contingent upon a combination of levels within two or more other dimensions, but there is no correlation between pairs of dimensions. The results of their experiments indicated that redundancy of both forms within relevant stimulus dimensions facilitated performance; however, increasing amounts of irrelevant redundancy degraded performance. Bourne and Haygood (1959, 1961) investigated the effects of amount of redundancy and found that increases in the amount of redundant relevant information improved performance, and that the facilitative effect becomes more pronounced as the amount of irrelevant information increases. Redundant irrelevant information interfered with performance at two different levels of relevant information; however, it has less effect than comparable degrees of non-redundant irrelevant information.
Salience

Another stimulus factor, on which only preliminary data have been collected is salience or "discriminability." In the discussion section of their 1955 study, Archer, Bourne and Brown suggested that a critical determinant of ease of concept attainment is the discriminability of the levels of dimensions involved. In a subsequent study (Archer 1962) concluded that performance was facilitated if relevant information was obvious and that performance was impeded if relevant information was less obvious than irrelevant information. Shore and Sechrest (1961) concluded that repetition may be necessary if the concept is based upon less obvious characteristics. Feldman (1972) investigated whether or not emphasizing relevant attributes would facilitate concept learning, but found no significant differences when compared to training that did not include the emphasis.

Presentation of stimuli

Cahill and Hovland (1960) showed that incorrect hypotheses stated by a subject were more likely to be incompatible with remote stimuli than with more recently presented stimuli. To test the effects of "memory factors" they compared subjects on acquisition of concepts under successive or simultaneous conditions. In the case of successive presentation, each stimulus is presented for a brief time and then removed; whereas, in the simultaneous presentation format, a stimulus, once exposed, remains in view for the rest of the session. Overall performance was much better in the simultaneous condition.
Bourne, Goldstein and Link (1964) extended these findings by investigating the range of number of stimuli left available - a range that extended from none to all. In a study involving attribute identification, Fraunfelker (1971) reported that subjects needed more time in a simultaneous condition compared to a successive condition. Smuckler (1967) in an experiment involving elementary school children and the concept "trapezoid" reported that more correct responses were given by students with successive presentation than by students with simultaneous presentation. She reported no significant differences between the two presentation modes on either transfer or retention tests.

Several other variables concerning mode of presentation have been investigated. Haygood, et al. (1969) concluded that contiguity of instances of a given type (e.g., one type of positive instance is presented for several positive instances and then a change is made to another type of several instances) leads to a marked improvement in disjunctive concept learning. This finding may, however, be an artifact of nature of disjunctive concepts. Since various examples of disjunctive concepts may have no common features to promote generalization, disjunctive concept learning may actually be more like learning a set of two or more essentially independent concepts, which are simply responded to with equivalent forms. Markle and Tiemann (1969) have called this "multiple situations with convergent responses."

In a related study, Kurtz and Hovland (1956) hypothesized that learning would proceed more rapidly under a condition in which the
instances of a given concept were presented one after another without the interpolation of instances of other concepts. Subjects gave both more correct identifications and more correct verbal descriptions of concepts following unmixed presentation as compared to mixed presentations. A study by Newton (1965) investigated three sequence variables in programmed instructional materials designed to teach a verbal concept. These were order of two sub-concepts, position in the program where the sub-concepts were introduced (all sub-concepts first, or as they were needed), and finally, program direction (principle or rule was either at the beginning or the end of the program). These variables did not influence the number of errors made during learning. Performance was quicker when principles were stated first and when sub-concepts were learned together rather than separately. Subjects made significantly poorer scores on a subsequent test under the condition where learning of two-concepts was most remote from integration to form the major concept.

Factors relating to the types of errors classified by Markle and Tiemann

Tennyson (1971) and Tennyson et al. (1972) investigated several variables that were hypothesized to produce the types of errors described by Markle and Tiemann (1969) called overgeneralization, undergeneralization, and misconception. By manipulating probability level of examples and non-examples (Tennyson and Boutwell, 1974b), matching examples and non-examples so that irrelevant stimuli are similar, and using either divergent or convergent sets of examples,
they believed they could determine the type of error that a student would be most likely to make. Divergent sets of examples are designed so that the irrelevant stimuli vary from example to example; whereas, convergent sets share the same irrelevant stimulus features. The following hypotheses were tested: 1) Using instances with all probability levels, that are matched and divergent, will produce correct classification. 2) Using low probability examples that are not matched, but are divergent, will produce overgeneralization. 3) Using high probability examples that are matched and divergent will produce undergeneralization. 4) Using both low and high probability examples that are unmatched and convergent will produce misconceptions. The data supported all hypotheses.

**Concept learning from definitions**

Concept learning research done in the psychological laboratory with artificial concepts has not dealt with learning concepts by definition, yet this is perhaps the major way that they are taught in schools beyond the lower elementary grades. Anderson and Kulhavy (1973) have pointed out the obvious reason for this. "In most research on so-called "concept learning" people are expected to induce concepts, such as "two green borders" from cards displaying geometric figures. It is obvious that if the subject were told such a concept in advance he would sort out the cards perfectly." Only since the exploration of conceptual behavior moved into the classroom with its real life concepts have the effects of definitions on concept learning been the subject of research.
The results of the studies on the effects of definitions on conceptual learning are not in agreement. Anderson and Kulhavy (1972) presented students with the definitions for the concepts, "atavistic" and "diluvial," and correct selection in a multiple-choice situation was above 90% in most cases. Markle (1975) indicated that we should not expect learning from definitions alone. "When a student reads a definition that is meant to specify three critical properties in a conjunctive relationship, does he necessarily conclude that he must make three decisions about each and every specimen that he inspects before he can determine whether it satisfies the conditions or does he jump to conclusions on finding that the most salient critical property is there."

At the other extreme from Anderson and Kulhavy's findings, Swanson found that a definition plus examples and non-examples was not more effective than just the examples and non-examples alone. The results of Markle and Tiemann (1974) are perhaps in between. They compared several different definitions, including ones from Webster's Third New International Dictionary and ones that contained technical and non-technical and no irrelevant attributes. Best generalization performance was obtained with either no or technical irrelevants. The non-technical definitions including irrelevants produced the best discrimination. All groups given examples identified examples of the concept "morpheme" at significantly higher levels than those groups which received no examples, although scores indicated
that approximately 80% of the subjects correctly identified all the
test examples given just the definition. Klausmeier and Feldman
(1975) also reported significantly better performance by subjects
given both a definition and examples compared to students given only a
definition. Finally, Feldman (1972) found that scores for subjects
who had received either definition alone or definition plus examples
and non-examples were higher than for those subjects who had received
only examples and non-examples.

Consequences

Although Becker et al. (1975) stated that "The first require­
ment in teaching a concept is to use differential reinforcement -
present both positive and negative concept instances and reinforce
appropriate response to them," very little research has been done along
those lines. Bresauhan (1973) investigated response sequences
following a "wrong" from the experimenter. The first two responses in
a trail were followed by the experimenter saying "wrong" irrespective
of the correctness of the response. The findings indicated that when
a response to a given stimulus is followed by "wrong", the response is
preserved if a completely different stimulus is presented on the next
trial, and the response is changed if a similar stimulus is presented.
Green (1955) investigated the effects of different ratios of reinforce­
ment in an operant study of conceptual learning, and found that the
extent to which subjects discriminated was inversely related to the
ratio of responses to reinforcement, using ratios of 1:1, 15:1 and 30:1.
Criticism of the laboratory approach to conceptual learning

Although in his review of the literature on concept learning, Clark (1971) developed a set of teaching prescriptions, some aspects of his prescriptions, especially about the use of negative examples (Markle 1975), and, more generally, the research that he reviewed have been criticized extensively. Anderson and Kulhavy's (1972) comment that, if given the definition, all subjects could easily sort the cards correctly, has already been mentioned. Carroll (1964) has stated, "It is not self-evident that there is any continuity at all between learning "DAX" as the name of a certain geometrical shape or a certain color and learning the meaning of the work "longitude" (p. 179-180). Tennyson and Boutwell (1974a) noted that only 10% of the articles reviewed by Clark (1971) dealt with concepts that normally would be associated with the classroom. Martorella (1972) stated that "While a considerable quantity of research on concepts has been amassed, unfortunately, there is a serious question as to how much of the findings may be applied to classroom instruction with any degree of assurance."

Carroll (1964) noted that "real concept learning is primarily deductive, whereas research is typically inductive." Tennyson et al. (1972) pointed out that real life concept acquisition deals with infinite concept classes as contrasted with the finite classes used in concept attainment research. An infinite class is one in which all irrelevant attribute values cannot be specified. Finally, Markle
(1975) indicated that the main criticisms of the laboratory research by people in applied fields is that the research is based upon an oversimplified too-rational universe, with all-too-obvious attributes of simple visual figures, and has a game-like structure in which the learner tries to discover which of a restricted set of classification rules the experiementer happens to have in mind. These criticisms have also been made by Markle and Tiemann (1970), Anderson and Faust (1973), and Klausmeier et al. (1974). According to Johnson and Stratton (1966) most lab studies employ a classification method - teachers use 1) defining, 2) using it in a sentence, 3) synonyms. They indicate that all of these methods are about equally effective and suggest using a mixed approach.

Teaching Prescriptions

"Hope springs eternal that some revelation will occur, that confusions will dissipate, that a new conceptualization of a murky field will clarify principles and rationalize practice. I make no claims to have found the burning bush, but I've been following smoke signals that may lead somewhere.

Markle 1975

Markle (1975) has tried to delineate the "primitive requirements" for teaching concepts. She has identified three. First, the set of words which purport to be a definition should bear some clear relationship to the domain of the concept, where "domain" means the range of examples that are included and the limits of the domain that separate examples from non-examples. A second requirement is appropriate
exemplification. Finally, test items must follow certain rules:
at the classification level, all the examples and non-examples must
be new and must bear a predictable relationship to the domain of
the concept.

The following section will attempt to expand on these three issues
and also to determine to what extent they are consistent with a
behavioral analysis of teaching concepts. The field of applied
behavior analysis has thus far shown little interest in teaching con­
cepts or concept attainment. Skinner (1957) briefly mentioned con­
cepts; however, much of his discussion of tacts and tact extension is
highly relevant to concept learning, and indeed, there is little func­
tional difference between Skinner's "tact" and the notion of concept
when specified as a functional relationship. Only a few attempts have
been made (other than in some of the animal literature already cited)
to provided an operant analysis of concept acquisition.

One of the earliest was made by Buss (1950). Lawsom (1962)
also demonstrated successful concept acquisition using operant pro­
cedures. Markle and Tiemann (1970) presented a "behavioral" analysis of
"cognitive" content.

Engelmann (1969) derived a set of teaching prescriptions from
a purely formal analysis which has more recently been set in a behavi­
oral framework (Becker et al. 1971, 1975). Engelmann pointed out
that teaching specifications implied by a concept analysis specify
what must be taught and emphasized what the teacher must do, rather
than what the student must do, which has been emphasized in conceptual
learning research. Teaching must account for inducing those discrim­
inations on which the child will be tested.
How to analyze a concept

Once you have selected a concept to be taught, the first step is to identify the relevant and irrelevant attributes (Engelmann 1969; Markle and Tiemann, 1969; Voelker, 1971; and Frayer, in Martorella, 1972). Additionally, to determine how the concept fits into the set of concepts involved in a particular subject area, supra-, co-, and subordinate concepts must be identified (Engelmann, 1969; Voelker, 1971). Markle and Tiemann (1969) stressed that identifying relevant and irrelevant features is not an easy, straightforward task when dealing with real concepts. The discussed at length the difficulties involved in carefully identifying all the relevant attributes of a chair. Michael (1973) has pointed out that it is not essential (though obviously very helpful) to be able to identify all the relevant features. What is essential is that the trainer be able to correctly identify the concept in the presence of an instance so that he will be able to differentially reinforce the subject's response to that instance or non-instance.

Writing a definition

This is perhaps the area most in need of research in the field of teaching concepts. As was noted earlier, the few studies done this area are not in agreement about the utility of definitions. Furthermore, the nature of an adequate definition is not well understood, although a few tentative statements can be made. Becker et al. (1975) indicated that the student's ability to use definitions probably increases as his language skills become more sophisticated. Young
children are probably best taught using only examples and non-examples much in the same manner that concepts have been taught to non-verbal infra-human subjects. Feldman and Klausmeier (1974) compared the performance of fourth-graders with that of eighth-graders when each group was given two levels of definitions. The fourth-graders had their best performance when given a "common usage" definition. The eighth-graders, however, performed best when given a "technical definition", specifying each defining attribute.

Identifying a concept on the basis of a definition alone is probably best viewed as a form of what Skinner (1968) has called "rule-governed" behavior, and virtually no research has been done in this area. Perhaps the only findings that may be of use to the teacher wishing to write a definition for a concept are those of Markle and Tiemann (1974) and, to a lesser extent, those of Anderson and Kulhavy (1972). Markle and Tiemann found that a definition that lacked one critical attribute (found in Webster's Third International) resulted in significantly worse discriminations of non-examples lacking only that attribute. They concluded that:

Such a finding seems to confirm common sense in that we cannot expect a student to make fine discriminations on test items if he is not given the basis on which to make such discriminations. That basis would be either the verbalization of the rule for making the discrimination, in other words, the critical attribute, or the provision of model non-examples lacking only that critical attribute.

The question of whether to include irrelevant attributes in the definition is open to question. Markle and Tiemann (1974) found
that the absence of irrelevants in the definition did not degrade generalization performance and similarly inconclusive findings on discrimination performance. It seems that the presence of irrelevants in the definition would aid discrimination of instances from non-instances especially in preventing errors based upon misconception, but this remains to be investigated systematically. What seems certain is that definitions should include all relevant attributes. Other factors concerning length and complexity of a definition also need to be researched.

Developing the minimum rational set of examples and non-examples

The current consensus is that both examples and non-examples are necessary for teaching concepts. Examples are necessary primarily for promoting generalization to new instances of the concepts while non-examples are useful in discriminating non-examples (Markle and Tiemann, 1969; Engelmann, 1969; Becker et al., 1961, 1975). Non-examples should lack only one critical element and one non-example is minimally required to illustrate each critical attribute; therefore, the minimum rational set of non-examples equals the number of critical attributes possessed by the concept. Furthermore, the results of Tennyson (1971) and Tennyson et al. (1972) indicated that the non-examples should be matched so that irrelevant attributes are similar to examples so that the presence or absence of the critical attribute is the main distinctive feature when comparing the example and non-example.
In preparing examples, Tennyson (1971) and Tennyson et al. (1972) indicated that examples should be divergent; that is, all irrelevant attributes should differ. Engelmann (1969) stated, "If a characteristic is not shared by all instances of a concept, it should not be shared by all members of a group of instances assembled to demonstrate the concept" (p. 25). Tennyson et al. also encouraged using probability levels ranging from high to low, since the use of low probability alone engenders overgeneralization and the use of only high probability engenders undergeneralization. Markle and Tiemann encouraged the same thing when they call for "far out examples" (1969). They also suggested that the minimum rational set of examples must be sufficient to vary each irrelevant attribute listed in the analysis.

Sequencing examples and tasks (programming)

Engelmann (1969) proposed a test of programmed material: at any given point in a program, a child may make a variety of mistakes ... if the teacher can correct them by using demonstrations (examples and non-examples) that have already been presented in the program, the material is programmed. Engelmann further told us to analyze words and operations involved and set up teaching routines and tests for each component skill. Tennyson (1975) has developed what he calls the "adaptive Concept Acquisition" model.

Other factors to be taken into consideration include the sequencing and pacing of examples and non-examples. The relationship of instance contiguity needs to be investigated further. Experimental
findings support the notion that presentation should be simultaneous rather than successive (Bourne et al., 1964; Cahill and Hovland, 1960). Finally, Becker et al. (1971, 1975) indicated the need for differential reinforcement of correct responses. For additional prescriptions on how to teach two concepts at the same time, on different levels, the reader should see Engelmann (1969).

Testing for conceptual learning

It is difficult to derive prescriptions for testing from the laboratory studies in concept learning. Both Markle and Tiemann (1969) and Engelmann (1969) emphatically stated that you cannot test for conceptual understanding with only one instance. Markle and Tiemann (1974) listed three requirements for test items: the items must be new, they must cover the range identified by the concept analysis, and they must include close-in non-examples. Close-in non-examples differ from an example only as a result of the absence of one critical attribute, with all the irrelevant attributes similar.

Frayer (1970) argued that tests have to go beyond simple recognition of examples and non-examples, to determine the knowledge of relevant characteristics, definitions, and relationships to other concepts. Extending this notion, Frayer (in Martorella, 1972) has proposed a twelve component schema for testing conceptual understanding:

1. Given the name of an attribute value, the student can select the example of the attribute value.
2. Given an example of an attribute value, the student can select the name of the attribute value.

3. Given the name of the concept, the student can select the example of the concept.

4. Given an example of the concept, the student can select the name of the concept.

5. Given the relevant attributes, the student can select the name of the concept.

6. Given the name of the concept, the student can select the names of the relevant attributes.

7. Given the name of the concept, the student can select the names of irrelevant attributes.

8. Given a definition, the student can select the name of the concept.

9. Given the name of a concept, the student can select the definition.

10. Given the name of a concept, the student can select the name of the concept sub-ordinate to it.

11. Given the name of a concept, the student can select the name of a concept supra-ordinate to it.

12. Given the names of two concepts, the student can select the principle that relates them.

Frayer also suggested that the student would be able to verbalize the answer rather than select it, which is more in line with the strong notion in the programmed instruction area that composed responses should be required.

The relationship between concept analysis and behavior analysis

Brigham's (1972) definition certainly seems to have provided an adequate definition of conceptual behavior: "A single response, verbal or non-verbal, under the discriminative control of a group
of stimuli whose parameters are defined by the differential reinforcement of the environment." In the case of conceptual behavior, the environment is primarily the verbal community (Skinner, 1957). The verbal response that Brigham describes is almost identical to the concept of "tact" as offered by Skinner (1957). Skinner defined a tact as "a verbal response of given form evoked (or at least strengthened) by a particular object or event or property of an object or event (p. 82)." Although Skinner defined the tact in terms of a specific stimulus, the notion of a "enerically extended tact" takes us to something quite similar to the type of generalization that is at the heart of conceptual behavior. It is this type of generalization that distinguishes conceptual behavior from rote learning - which perhaps is exemplified by the unextended tact.

The teaching prescriptions and the notions of generalization along the dimensions defining the concept and discrimination of those attributes is certainly compatible with operant usages of the terms, although as used by writers discussing concept learning, they tend to have a "phenomenological" flavor. Learning concepts through the use of definitions is also understandable when viewed as a form of what Skinner (1968) has called "rule-governed" behavior.

There are two areas of major weakness in this review with respect to an operant approach. The operant approach is characterized by the "three term contingency:" stimulus, response, and consequence. Most of what has been dealt with in this review concerns only the first term, the antecedent stimuli. In some of the discussion about testing
for concept learning, it became clear that we are dealing with several
different response classes, including naming, selecting, identifying
attributes, exemplification, etc. No systematic analysis of these
response classes has been offered to date. With respect to consequences,
only the Green (1955) study has systematically begun to investigate
this area.

Summary

After reviewing the literature relevant to the teaching of con-
cepts, I must share Susan M. Markle's (1975) optimism that the smoke
signals that she has been following are leading somewhere. They at
least appear to have lead some of us out of the psychological labora-
tory with its synthetic concepts. Research in the classroom has
yielded considerable information about those factors that lead to
"really understanding concepts (Markle and Tiemann, 1969)." A major
shift in emphasis is now placed upon environmental manipulations that
minimally must be performed to insure concept learning. "Simply
because research shows that college sophomores do not employ efficient
strategies when acquiring concepts is no justification for instructional
designers to overlook such efficient strategies when teaching
concepts (Markle and Tiemann, 1970)."

The present project is an attempt to employ such efficient
strategies to a set of concepts that have proven themselves to be
difficult to master. These are the basic concepts in B. F. Skinner's
Verbal Behavior. Previous research on a small subset of the concepts
in that text (Peterson, 1975) has shown that instructional materials
based upon a concept analysis can teach those concepts at a higher
level of understanding than the original text. The scope of the
present project is to identify all of the basic concepts in *Verbal
Behavior*, excluding introductory concepts of operant conditioning, and
attempt to develop a set of instructional materials to teach them
based upon the set of teaching prescriptions previously presented in
this paper.
This section describes the development and preliminary validation of a set of instructional materials designed to teach the concepts in B. F. Skinner's *Verbal Behavior*. The design is based directly upon the teaching prescriptions presented in the previous section. A specification of those concepts to be taught is presented first. Next, the steps used in designing the materials are presented, followed by a description of the way in which materials were presented to students. Finally, a description of how students tests were evaluated, including test data, and how revisions were made is presented.

Specification

The list of concepts identified for inclusion in the set of instructional materials is presented in Table II. These concepts were divided into five instructional units.
TABLE II

List of Concepts Included in the Instructional Materials

<table>
<thead>
<tr>
<th>Unit</th>
<th>Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Introductory Concepts</td>
<td>Mediated Reinforcement - Verbal Behavior</td>
</tr>
<tr>
<td></td>
<td>Self-Verbal Behavior</td>
</tr>
<tr>
<td></td>
<td>Establishing Operation</td>
</tr>
<tr>
<td></td>
<td>Response-Product</td>
</tr>
<tr>
<td></td>
<td>Formal Control</td>
</tr>
<tr>
<td>II. Elementary Relationships</td>
<td>Echoic Behavior</td>
</tr>
<tr>
<td></td>
<td>Taking Dictation</td>
</tr>
<tr>
<td></td>
<td>Mand</td>
</tr>
<tr>
<td></td>
<td>Intraverbal</td>
</tr>
<tr>
<td>III. Extensions of Verbal Behavior</td>
<td>Stimulus Features</td>
</tr>
<tr>
<td></td>
<td>Irrelevant Features</td>
</tr>
<tr>
<td></td>
<td>Metaphorical Extension</td>
</tr>
<tr>
<td>IV. Multiple Control</td>
<td>Multiple Controlling Variables</td>
</tr>
<tr>
<td></td>
<td>Multiple Responses</td>
</tr>
<tr>
<td></td>
<td>Prompt</td>
</tr>
<tr>
<td></td>
<td>Distored Tact</td>
</tr>
<tr>
<td></td>
<td>Word Blend</td>
</tr>
<tr>
<td></td>
<td>Main Thematic Source</td>
</tr>
<tr>
<td>V. Private Controlling Variables</td>
<td>Private Stimuli</td>
</tr>
<tr>
<td></td>
<td>Collateral Response</td>
</tr>
<tr>
<td></td>
<td>Autoclitic Mand</td>
</tr>
</tbody>
</table>

The design of the instructional materials to teach this list of concepts involved five steps: (1) identification of supra-, sub-, and
coordinate concepts; (2) identification of relevant and irrelevant features; (3) development of examples and non-examples for the teaching sequence; (4) sequencing of examples and non-examples; (5) development of study frames and answers. Appendix A provides an example of the form used for completing steps one and two.

Implementation

The implementation or validation of the set of instructional materials consisted of two major phases. In the first phase, four graduate students, each of whom had previously demonstrated mastery of the concepts included in this project, were asked to review the instructional units. Their comments and suggestions were then pooled and a revised draft of the instructional materials was developed. This revised draft was edited and used in the second phase.

In the second phase, the instructional materials were used as the primary text in a course on Skinner's analysis of verbal behavior. This course was taught during the spring session, 1977, at Western Michigan University. Seven students were enrolled in the course, five undergraduates and two first year graduate students. Four of the students were male and three were female. All of the students had previously had at least an introductory course in operant psychology. The course was run according to the Keller plan (Keller and Sherman, 1975). There were no lectures or other supplementary materials; the written units were the only instructional materials. There were eight units; the five developed for this project and three more advanced units from B. F. Skinner's *Verbal Behavior*, in which these concepts were expanded.
The testing was self-paced and a score of 90% or higher was required on each unit exam before the next unit was provided to the student. Each student was given one unit at a time and instructed to read that unit and work through the study frames. Students were further instructed to make note of any section that they had difficulty understanding, and material that they thought might be erroneous, and any study frames that they had difficulty answering.

Evaluation

When a student thought that a unit had been thoroughly studied, the student then took an exam over that unit. Unlike the typical exam in a Keller plan course, these exams covered everything that the student was required to learn, rather than a small subset of the objectives. This was done to insure that information was collected on each concept presented in the materials. The exams typically took between thirty and sixty minutes to complete. See Appendix B for a sample exam.

Once the student finished the exam, he sat down with the experimenter and the exam was immediately graded. Each time an erroneous answer was encountered, the experimenter probed the student orally to determine the nature of the error. This was done to distinguish between errors that resulted from insufficient study and errors that resulted from inadequacies in the instructional materials. The student was asked to state why the answer given had been chosen, and to state
the relevant and irrelevant features for the concept the student had written as the answer. If the student could not list the relevant and irrelevant features, he was told to restudy the materials and return to take another exam over the same set of concepts, but with different questions.

Revisions

If the student demonstrated that he had studied adequately, by listing the relevant and irrelevant features, an attempt was made to trace the reason for the error to some inadequacy in the program. Once the probable source of the error had been identified, the necessary revisions were made (usually has written on the students copy of the materials) and the student was required to restudy those concepts where errors had occurred, and then take another exam over the unit until mastery was demonstrated by a score of 90% or higher on the entire exam. Table 2, page 50, presents the test data for each individual concept. These data were collected from the final test over each unit taken by each student. These data indicate that the overall level of achievement was, as required, just above 90% (90.1% range 82 to 100% for individual concepts).

Summary

This project demonstrates that instructional materials can successfully be developed based upon a set of teaching prescriptions derived from research on concept learning. Complex verbal concepts
taught at the college level can be analyzed according to relevant and irrelevant features and definitions, examples, and non-examples can be developed and sequenced based upon that analysis. Although considerable research remains to be done on concept teaching, it is evident that enough is now known to begin designing instructional materials that permit virtually all students to master those concepts we are interested in teaching. Effective learning requires both a sufficient amount of study by the student and instructional materials designed to prevent misconceptions, and over and under generalization when learning new concepts. Effective procedures for maintaining study behavior can be rendered fruitless unless the materials being studied are adequately designed. This project provides evidence that a set of teaching prescriptions can be followed which will result in the design of adequate instructional materials.
### TABLE III

Percent of Test Items Correctly Identified Each Individual Concept Taught

<table>
<thead>
<tr>
<th>Unit Number</th>
<th>Concept</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mediated Reinforcement</td>
<td>98%</td>
</tr>
<tr>
<td></td>
<td>Verbal Behavior</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Verbal Stimuli</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Establishing Operation</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>Point-to-point Correspondence</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Formal Similarity</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Thematic/Formal Control</td>
<td>96</td>
</tr>
<tr>
<td>2</td>
<td>The Echoic</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Mand</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Tact</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Intraverbal</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Taking Dictation</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Copying a Text</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Textual Behavior</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Audience Control</td>
<td>86</td>
</tr>
<tr>
<td>3</td>
<td>Generic Extension</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Metaphorical Extension</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Metonymical Extension</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Relevant Features</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Irrelevant Features</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Multiple Controlling Variables</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Multiple Responses</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Fragmentary Source of Strength</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Supplementary Stimulation</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Prompt/Probe</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Impure Tact/Distorted Tact</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Word/Phrase Blend</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Main Thematic Source</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Secondary Source</td>
<td>64*</td>
</tr>
<tr>
<td>5</td>
<td>Public Accompaniment</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Collateral Response</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Autoclitic Tact</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Autoclitic Mand</td>
<td>100</td>
</tr>
</tbody>
</table>

*No revisions made on this concept because students were able to verbalize the reason for their mistakes and then provide the correct answer during the probe following completion of the test.
The first comprehensive behavioral analysis of language was B. F. Skinner's *Verbal Behavior*, published in 1957. The book was scholarly and complex; to be fully understood, it required the reader to have strong background both in traditional approaches to language and radical behaviorism. Unfortunately, these requirements left few readers in a position to make optimal use of the book.

However, those who have tried to teach radical behaviorism have always wanted to include an analysis of verbal behavior, and have had no choice, except to try to use Skinner's *VB* as the text. The book has not fared well as a text. Instructors have had difficulty using it and students have had even greater difficulty. The current text has two general goals: 1) to present all of the underlying concepts of Skinner's analysis of verbal behavior, and 2) to teach each concept in a manner designed to minimize misconceptions and also foster the appropriate generalization when the student encounters novel examples of the concepts.

The text represents an emerging approach to writing instructional materials. An analysis of each concept reveals those features that should come to evoke the concept name, but also reveals features that are likely to result in misconceptions, that is, irrelevant features which may nevertheless gain some degree of control over a response. Such an analysis allows for a precise definition of a concept in terms of those stimulus features that define the concept, and those that are irrelevant to the definition. Furthermore, a
minimum rational set of examples and non-examples can be determined by the analysis. It is also possible to determine the most efficient order for presenting the examples and non-examples, and how many of each are minimally necessary. The mastery of each new concept is dependent upon the mastery of certain prerequisite concepts.

This text is divided into 5 sections. Each section begins with a brief introduction to the category of concepts being presented and then the specific concepts are listed. For each concept to be taught, the necessary prerequisite concepts are identified, then a definition is given, followed by a sequency of examples and non-examples designed to teach the range and boundary of the concept. Following this, samples of verbal behavior are given for the student to try to classify as examples of the concept being taught, a previously learned concept or simply a non-example of the concept being taught. Answers will be provided that not only give the concept classification but also indicate the reasons for that classification.
INTRODUCTORY CONCEPTS

Before beginning the classification of elementary verbal relationships, the student must master several concepts that are used in the definitions of those relationships. The concepts concern the classification of stimuli and response as either verbal or non-verbal and also several types of relationships between stimuli and responses. Another type of controlling variable, that is unique to one category of verbal relationships, is also presented.

OBJECTIVES

For each concept in this unit, the student should be able to:

1. Given the concept name, state the defining features of the concept.

2. Given the defining features of a concept, state the concept name.

3. Given examples and non-examples of the concept, state which are examples of the concept and which are examples of other concepts.

4. Given the concept name, provide an original example of the concept.
This text is concerned with the concepts presented in B. F. Skinner's *Verbal Behavior*. But what is the subject matter of that text? What is verbal behavior? Language scholars have developed many definitions of language based upon what appears to be the unique features, but there is considerable disagreement on what those features are. One approach that was not taken, however, was that of identifying those variables that were responsible for a particular occurrence of verbal behavior. Indeed, verbal behavior was studied on the basis of form or structure, quite apart from the circumstances under which it occurred. Skinner's approach was an attempt to analyze exactly those circumstances under which verbal behavior occurs and how it is maintained.

Skinner begins with the basic assumption that verbal behavior is behavior that is subject to the same principles that govern non-verbal behavior. In fact, there is only one feature of verbal behavior that sets it significantly apart from non-verbal behavior: the nature of the reinforcement that establishes and maintains it. Skinner has defined V. B. as behavior that is reinforced through the mediation of another person. He further qualifies this by stating that the action of the individual mediating the reinforcement must have had his/her response specifically trained to provide such reinforcement. Therefore, in order to master the concept, verbal behavior, the concept of mediated reinforcement must be acquired first.
MEDIATED REINFORCEMENT

Prerequisites: reinforcement, stimulus change, dynamic characteristics, response

MEDIATED REINFORCEMENT is a stimulus change that has the following features:

DEFINING
1. It occurs after a response has been emitted
2. It increases the future probability of that response
3. It results from the action of another individual

IRRELEVANT
1. Whether or not the stimulus is conditioned or unconditioned
2. The type of receptor effected by the stimulus change
3. Dynamic characteristics of the stimulus change
4. Any evocative or eliciting effects of the stimulus change

MEDIATED REINFORCEMENT occurs when you emit the vocal response "water" and someone then presents you with a glass of water, and this tends to increase or maintain your tendency to say "water" whenever water would currently be reinforcing. The key feature is that the reinforcement was provided by the actions of another person. Getting a glass of water yourself, as a result of water currently being reinforcing, is not an example of MEDIATED REINFORCEMENT because the reinforcement was not provided by another individual. If water is presented first, and then the word "water" is emitted, that is
not MEDIATED REINFORCEMENT because it lacks feature number one of the
definition, and is probably an example of a discriminative stimulus
of a type that will be discussed later. If the presentation of the
water results in either no increase or a decrease in the tendency to
say "water," this lacks feature number two and is not an example of
any kind of reinforcement.

Another example of MEDIATED REINFORCEMENT involves emitting the
vocal response "token" and receiving a token from another person.

The reinforcement need not be "named" by the verbal response.
If a child says "dog" in the presence of the family dog, a parent
might say "Good, that's right!" if the child is just learning the
response. This is MEDIATED REINFORCEMENT if it tends to increase
the future probability of this response under similar circumstances.
STUDY FRAMES

Write MEDIATED REINFORCEMENT, NON-MEDIATED, or NEITHER in the blank after each example below. Then check the answers on the next page.

1. You emit the response "milk" and someone presents you with a glass of milk. This increases the probability that you will say milk in the future under similar circumstances. ________________

2. You write the word "water," as a result of hearing someone say "water," and someone says, "correct." This increased your tendency to write "water" as a result of hearing someone say "water." ________________

3. Someone presents you with a picture of a dog, and you say "dog." Presenting the picture of the dog is an example of ________________

4. You write the word "milk" as a result of hearing someone say "water," and someone says, "That's dumb!" The effect is a decrease in your tendency to write "milk" as a result of hearing someone say "water." Someone's saying "That's dumb" is an example of ________________

5. You turn on a light switch and the lights come on. This results in an increase in your tendency to turn on lights by turning on the switch. The lights coming on is an example of ________________
ANSWERS

1. MEDIATED REINFORCEMENT: All three relevant features are present: the presentation of the glass of milk occurs after the response, the effect is an increase in the probability of the response occurring in the future, and the milk resulted from the action of another person.

2. MEDIATED REINFORCEMENT: Again, all the defining features are present. The response mode is different from the first example, but that is listed as an irrelevant feature. Also, the reinforcement is conditioned; the milk in the first example was unconditioned reinforcement. Also note that the stimulus modes are different in these two examples. In #1, the stimulus is visual, olfactory, and if drunk, gustatory; the stimulus in the second example is auditory.

3. NEITHER: This is not even an example of reinforcement because the stimulus is prior to the response. It also has only the immediate effect of evoking a response, not strengthening it.

4. NEITHER: This lacks the defining feature of having the effect of increasing the probability of the behavior it follows.

5. NON-MEDIATED: This is an example of reinforcement, but it lacks the defining feature of resulting from the action of another person. The fact that another person built the light switch is irrelevant because the action must occur after the response has been made.
VERBAL BEHAVIOR

Prerequisites: behavior, mediated reinforcement, stimulus mode

Definition: VERBAL BEHAVIOR is behavior that has the following features:

DEFINING
1. It is established and maintained by reinforcement
2. The reinforcement is mediated by another person
3. The other person's action that results in the reinforcement must have been specifically trained in order to reinforce speakers

IRRELEVANT
1. The topography of the behavior
2. Dynamic characteristics of the response: speed, intensity, repetition
3. Verbal or non-verbal stimulus
4. Dynamic characteristics of the stimulus
5. Stimulus mode
6. Reinforcement features: conditioned, unconditioned, type of schedule

The first example given of mediated reinforcement is also an example of verbal behavior. Saying "water," and then receiving some water as the result of the actions of another person is an example of VERBAL BEHAVIOR. Salivation at the sight of a steak is not VERBAL BEHAVIOR for several reasons. First of all, the response is not established.

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and maintained by reinforcement. Getting a glass of water yourself is not verbal behavior because feature number two is lacking. The reinforcement is direct, not mediated. Squirting lemon juice into someone's mouth to get him to salivate is not verbal behavior either because the listener's action (salivation), although an example of mediated reinforcement, is not specifically trained in order to reinforce speakers. Since the type of topography is irrelevant to the definition of verbal behavior, we could also write the word "water," or use sign language, or tap out the morse code for "w.a.t.e.r." Whether we shout or whisper it makes no difference. Whether the form of the response is controlled by a state of deprivation (as is "water") or by a prior stimulus also makes no difference. If we say "water," because there is a glass of water on the table, that is also verbal behavior...even if it is given to us and we say, "No, thank you."
VERBAL BEHAVIOR

Answer by writing either VERBAL BEHAVIOR or NON-VERBAL BEHAVIOR in the blank.

1. You enter a very cold room, see that the window is open, and say, "Close the window, please." Someone else in the room then gets up and closes the window. This results in an increase in your tendency to say, "Close the window" in the future under similar conditions. This is an example of ______________________.

2. Someone asks you how many cookies you would like and you hold up two fingers. He then gives you two cookies. In the past when you did this you got two cookies. Holding up two fingers is an example of ____________________.

3. You are walking on some ice and you slip and fall. Falling is an example of ______________________.

4. You ask someone for a cigarette and he refuses to give it to you. In the past, you sometimes have received a cigarette when you asked. Asking for it now is an example of ______________________.

5. As a result of the person refusing to give you a cigarette, you go out and buy a pack, open it and take out a cigarette. Taking out the cigarette is an example of ________________________.

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6. Your ophthalmologist shines a bright light in your eye to get your pupil to contract. Shining the bright light is an example of ________________.

7. You look up a phone number in the directory and then copy it down. Copying the phone number is an example of ________________.
1. VERBAL BEHAVIOR: All of the relevant features are present. The behavior is increased by the reinforcement it receives. The reinforcement is mediated by another person, and the other person's actions required specific training to come under the control of what was said.

2. VERBAL BEHAVIOR: Remember that the response topography is irrelevant. Giving someone two somethings when they hold up two fingers is a response that must be specifically trained for that reason.

3. NON-VERBAL BEHAVIOR: It is not likely that this behavior was established or is being maintained by mediated reinforcement.

4. VERBAL BEHAVIOR: Just because there is not any reinforcement in the current situation doesn't make any difference. If the behavior was established and maintained for awhile as the result of reinforcement, then it is verbal behavior. The current schedule of reinforcement, even if it is extinction, is irrelevant.

5. NON-VERBAL BEHAVIOR: This violates the second feature of the definition, that the reinforcement must be mediated through another person.

6. NON-VERBAL BEHAVIOR: Even though the reinforcement is mediated, the contracting of the pupil is not a response that was specifically trained for the purposes of reinforcing ophthalmologists for shining bright lights into people's eyes.
7. VERBAL BEHAVIOR: The response topography can be anything, and the controlling variable need not be something that you want, but can and often is some feature of the environment—in this case, some ink marks on a piece of paper. Although there is no current mediated reinforcement in this example, it can only occur now as a result of a history of mediated reinforcement, in the form of either praise or some other appropriate reaction to what you had written.
We have indicated that verbal behavior is reinforced through the mediation of a listener. Another fact that contributes to the uniqueness of verbal behavior is that the speaker can function as his own listener. He can hear or see stimuli produced by his verbal behavior, just as other listeners can. Thus, the listening self can mediate the reinforcement for the behavior of the speaking self.

When one or more listeners provide a consistent pattern of mediated reinforcement for a speaker's verbal behavior, they can be called the speaker's verbal community. Skinner often makes reference to "the verbal community."
SELF-VERBAL BEHAVIOR

Prerequisites: Verbal Behavior

Definition: SELF-VERBAL BEHAVIOR is verbal behavior which has the following features:

DEFINING
1. Established and maintained by reinforcement
2. Reinforcement is mediated
3. Listener must have been trained to do so specifically to reinforce speakers
4. The controlling variable must be some aspect of the person himself, his/her physical features, his/her behavior or his/her doing something currently being reinforcing.

IRRELEVANT
1. Topography
2. Type of controlling variable
3. Dynamic characteristics of either the controlling variable or the response
4. Stimulus Modality
5. Type of establishing operation
6. Reinforcement features (schedule, amount, etc.)

Examples and non-examples:

If you say "I'm running" as a result of the fact that you are currently running, this is an example of self-verbal behavior. If you see someone else running and have a tendency to say "running" that is not self-verbal behavior. Of course, if the example of

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behavior does not meet the definition of verbal behavior, it is also not an example of SELF-VERBAL BEHAVIOR. For example, shining a light in your own eye to get your pupil to contract is not an example of SELF-VERBAL BEHAVIOR...because it is not an example of verbal behavior. If you write yourself a note telling yourself to remember to buy some more beer, writing the note is an example of SELF-VERBAL BEHAVIOR. Although, this is not behavior whose reinforcement is mediated through another person, it can only occur now as a result of a history of such mediated reinforcement. This is an "extension" of verbal behavior or the type that will be presented in Chapter Three. A special type of SELF-VERBAL BEHAVIOR will be discussed in section five, under the heading of Autoclitic Behavior.
STUDY FRAMES

Answer by writing either SELF-VERBAL BEHAVIOR, VERBAL BEHAVIOR, OR NON-VERBAL BEHAVIOR in the blanks provided.

1. As a result of seeing your stomach hanging out, you have a tendency to say "fat." __________________________________________

2. Saying "fat" as a result of seeing the word "fat" written on a piece of paper. __________________________________________

3. Saying "fat" as a result of hearing someone else say "fat." __________________________________________

4. Telling yourself to get up in the morning. __________________________

5. Writing your name. __________________________________________

6. Pinching yourself to see if you are awake. __________________________

7. Squirting lemon juice in your own mouth. __________________________
ANSWERS

1. SELF-VERBAL BEHAVIOR: All of the relevant features are present, particularly, the defining feature of the controlling variable being some aspect of the person himself, his/her physical features, his/her behavior, or the fact that his/her doing something specific would currently be reinforcing.

2. VERBAL BEHAVIOR: This has all the relevant features of an example of verbal behavior, but lacks the defining feature of being controlling by some aspect of the person him or herself.

3. VERBAL BEHAVIOR: For the same reasons as number two.

4. SELF-VERBAL BEHAVIOR: This example has all the relevant features of verbal behavior, plus the defining feature of being controlled by the fact that some specific action on the part of the speaker himself would currently be reinforcing.

5. SELF-VERBAL BEHAVIOR

6. NON-VERBAL BEHAVIOR: The reinforcement is not mediated through the actions of another person.

7. NON-VERBAL BEHAVIOR
TYPES OF CONTROLLING VARIABLES

In the analysis of verbal behavior, there are three basic types of controlling variables that need to be taken into account. Most verbal behavior is controlled by a prior discriminative stimulus. These discriminative stimuli are divided into verbal discriminative stimuli, and non-verbal discriminative stimuli. One particular class of verbal responses does not seem to be controlled by a prior discriminative stimulus. This type of verbal behavior is controlled by what is called an establishing operation. The establishing operation will be presented in greater detail later; at present, let it suffice to say that it is an environmental event or operation that momentarily increases the reinforcing effectiveness of some particular reinforcement.
VERBAL STIMULUS

Prerequisite concepts: stimulus, verbal behavior

Definition: A VERBAL STIMULUS is a physical energy change capable of affecting an organism's sensory receptors, with the following features:

DEFINING
1. It has a specific form or pattern which as a unit has controlling affectiveness.
2. It is the result of verbal behavior.

IRRELEVANT
1. Modality: auditory, visual, etc.
2. Dynamic characteristics, such as size, intensity, etc.
3. Function: can be discriminative, reinforcing, punishing, etc.

When someone engages in the behavior of saying "dog" they produce sound waves that result in an auditory stimulus that can be heard, either by someone else or the speaker himself. The auditory stimulus "dog" is a verbal stimulus. A picture of a dog, or an actual dog itself, is a non-verbal stimulus, a visual stimulus that is NOT the result of prior verbal behavior.

A verbal stimulus may have features that are non-verbal. For example if you say "dog" very loudly and someone says "too loud," the response, "too loud," is not controlled by the pattern of the stimulus that results from your verbal behavior, but rather by a dynamic
characteristic of that stimulus. The topography of the verbal behavior that results in the verbal stimulus is not important. Our first example involved vocal verbal behavior, but if we had written the word "dog," then the resulting visual pattern "dog" and the resulting visual pattern or sequence would be a verbal stimulus.
Write either VERBAL or NON-VERBAL in the blank following each sample.

1. Someone picks up a rock and throws it at you. Seeing the throwing motion and the approaching rock can be considered a visual stimulus that is ____________.

2. The same person throws a rock at you, but you don’t see him. Your friend says, "duck." The auditory stimulus that results from your friend’s vocal behavior is ________________.

3. You are driving down the road and see a sign that says, "Beware of falling rocks." The sign is a visual stimulus that is ____________ ________________.

4. A bee when it flies produces an auditory stimulus that we call a buzzing sound; the buzzing sound is a ____________________________ stimulus.

5. A doughnut looks a lot like the letter "o" and you have a tendency to say "o" whenever you see a doughnut. The doughnut is a visual stimulus that is ________________.

6. You see the word "Pepsi" written in the sky and have a tendency to say "Those are really large letters." The size of the letters is a visual stimulus feature that is ________________.

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7. The spatial relationships between the letters, and their overall pattern is a ________________ stimulus that evokes the response "Pepsi."
1. NON-VERBAL: The visual stimulation is not the result of verbal behavior on the part of someone else. Even though the reinforcement for throwing the rock may be mediated through another person, the action of the other person was not trained for the purpose of reinforcing rock throwers.

2. VERBAL: The auditory stimulation is the result of someone's verbal behavior and the controlling feature of the stimulation is the overall pattern or sequence of auditory stimulation, and not some other feature of the stimulation, such as the pitch, or the loudness. (Note that it is the case that certain dynamic features do in fact come to differentially control our behavior. If "duck" is said very quietly, we may think someone is talking about a water bird, or that there is not any urgency in the situation; if it is shouted, however, we may react quickly and appropriately.)

3. VERBAL: The sign is the result of verbal behavior and you are reacting to the pattern on the sign, and not the color or some other feature.

4. NON-VERBAL: The sound is not the result of someone's verbal behavior.

5. NON-VERBAL: A donut is typically not the result of someone's verbal behavior, but rather of one's cooking behavior.
6. NON-VERBAL: Although the letters are the result of verbal behavior, the controlling feature is the size of the letters and not their overall pattern.

7. VERBAL: In this case, the control is a result of the overall pattern of the stimulus.
CONCEPT: ESTABLISHING OPERATION

Prerequisite concepts: reinforcement, stimulus change, deprivation, aversive stimulus

Definition: An establishing operation is environmental change or event that has the following features:

1. Precedes the response it is functionally related to.
2. Increases the effectiveness of a particular stimulus change

Perhaps the most common types of establishing operations, those mentioned by Skinner in *Verbal Behavior*, are deprivation and aversive stimulation. The stimulus change that results from a situation in which you have no water to a situation in which you now have water available often acts as reinforcement for the verbal response, "Water, please." However, this change is likely to be reinforcement only if you are currently water deprived. Therefore, it is possible to consider the controlling variables for the response, "Water, please" as involving two factors: a necessary level of deprivation, and discriminative stimuli, typically involving a listener who is likely to get you water and a source from which to get the water. The response
may occur in the absence of the typical discriminative stimuli if the level of deprivation is sufficient, as in the case of a man dying from thirst in the desert.

Deprivation, as an establishing operation, is typically related to substances which are biologically required by an organism, such as food, water, air, heat, and possibly sexual contact. We can be "deprived" of many other things without a resultant increase in the reinforcing effectiveness of a related stimulus change. If we have not had a pencil for a long period of time, we do not say that we have become pencil deprived and then ask for a pencil. Another common establishing operation that was mentioned by Skinner is aversive stimulation. If someone shines a bright light in our face, that event makes the stimulus change which results in the light no longer shining in our face, an effective reinforcement. Another general class of establishing operations involved acquiring some object which would allow the organism to make a subsequent response that would be reinforced. If someone says that he will give you ten dollars for a recognizable sketch of a cat, your tendency to ask for a pencil is sharply increased. The reinforcement value of a pencil has suddenly been increased.

The concept of an establishing operation for reinforcement is a new concept and not well understood. What has been presented here is a simple introduction to the concept. This much of an introduction is necessary to understand a later concept, the MAND, which is presented in Section Two.
STUDY FRAMES

Write either ESTABLISHING OPERATION or DISCRIMINATIVE STIMULUS in the blank following each example.

1. You get out a cigarette and then find that you have no matches. Having a cigarette that needs to be lit is an example of _____________________.

2. You are trying to think of examples of establishing operations and are having a difficult time. Not being able to think of an example is an example of _____________________.

3. As a result of eating several handfuls of salted peanuts, you have an increased tendency to ask for water. Eating the peanuts is an event that function as _____________________.

4. As the result of seeing someone place a glass of water on the table in front of you, you have an increased tendency to say "water." _____________________.

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1. ESTABLISHING OPERATION: This situation would presumably increase the reinforcing effectiveness of receiving matches. Up until this situation, matches probably had almost no current reinforcing effectiveness. (Note that this situation is simultaneously a discriminative stimulus for a response such as "I have no matches.")

2. ESTABLISHING OPERATION: If someone provided you with an example of an establishing operation at this time, it would presumably act as reinforcement for whatever behavior preceded their giving you the example. (Again note, this also can simultaneously function as an SD for a response as in "I can't think of an example of an establishing operation.")

3. ESTABLISHING OPERATION: This event functions to increase the current reinforcing effectiveness of water.

4. DISCRIMINATIVE STIMULUS: This would not function to increase the effectiveness of water as reinforcement.
POINT-TO-POINT CORRESPONDENCE

Prerequisite concepts: discriminative stimulus, response

Definition: POINT-TO-POINT CORRESPONDENCE is a relationship between a discriminative stimulus and the response it controls with the following features:

DEFINING
1. The discriminative stimulus must have two or more components.
2. The response must have two or more components.
3. The first component of the stimulus must control the first part of the response; the second part of the stimulus must control the second part of the response, etc.

IRRELEVANT
1. Formal or dynamic characteristics of the stimulus.
2. Formal or dynamic characteristics of the response.

The response "cat" made as a result of hearing someone say "cat" has POINT-TO-POINT CORRESPONDENCE between the stimulus and their response. The "c" controls the "c" as the first part of the response, the "a" sound in the stimulus controls the second part of the response, and the "t" sound controls the final part of response, the "t." If you said "cat" as the result of hearing someone say "feline," there would be no POINT-TO-POINT CORRESPONDENCE between the stimulus and the response. "Feline has five sounds or components while "cat" only has three." Making the sound "b" as a result of hearing someone say...
"b" also is not an example of POINT-TO-POINT CORRESPONDENCE because neither the stimulus nor the response has two or more components. Seeing the letter "b" and saying "bee" also is not an example of POINT-TO-POINT CORRESPONDENCE because the stimulus only has one component. Saying "dog" as the result of seeing the word "dog" is an example of POINT-TO-POINT CORRESPONDENCE. It makes no difference whether the stimulus is auditory or visual. It also makes no difference whether the response is vocal or written. Writing "dog" as the result of hearing someone say "dog" would illustrate POINT-TO-POINT CORRESPONDENCE. Dynamic features are also irrelevant. If you shouted "dog" as the result of hearing someone whisper "dog" that would still be POINT-TO-POINT CORRESPONDENCE.
STUDY FRAMES

Write POINT-TO-POINT or NONE to indicate whether or not the example preceding each blank is an example or non-example of POINT-TO-POINT CORRESPONDENCE.

1. The vocal response "cat" is controlled by the written word "cat." _______________________________

2. The vocal response "dog" is controlled by the written word "cat." _______________________________

3. The vocal response "cat" is controlled by the auditory stimulus "cat." _______________________________

4. The stimulus is the written letter "a" and the response is the vocal response "a." _______________________________

5. The stimulus is the written letter "w" and the response is the written response "double-you." _______________________________
ANSWERS

1. POINT-TO-POINT CORRESPONDENCE: Both the stimulus and the response have more than one component. And the first part of the response, the "k" sound, is controlled by the visual stimulus of the "c;" the second part of the response, the short "a" sound, is controlled by the second component of the stimulus, the visual stimulus "a." The final "t" sound is controlled by the last part of the visual stimulus, the "t."

2. NONE: Although both the stimulus and the response have more than one component, it is not the case that each part of the stimulus controls the respective sequential part of the response. This would have been more obvious if the response had been "alligator."

3. POINT-TO-POINT CORRESPONDENCE: This is just like number one, except that the response is vocal rather then written. Remember that the formal characteristics of the stimulus and the response, which would include whether the form of the response is vocal or written, are irrelevant when it comes to deciding whether or not point-to-point correspondence is present.

4. NONE: Although a strong controlling relationship may exist between this stimulus and response, there is no point-to-point correspondence because neither the stimulus nor the response has more than one component.
5. NONE: This fails for the same reason that number 4 did, except in this case it is only the stimulus that does not have more than one component.
RESPONSE-PRODUCT

Prerequisites: stimulus, response

Definition: A RESPONSE-PRODUCT is a stimulus with the following features:

DEFINING
1. It is the result of someone's behavior.

IRRELEVANT
1. Formal or dynamic characteristics of the stimulus (e.g., mode or intensity).
2. Formal or dynamic characteristics of the response that produces it.
3. The function of the stimulus (e.g., discriminative, reinforcing, etc.)

Virtually all behavior produces a change in the environment that can function as a stimulus. Any movement that an organism makes results in a change in the visual stimulation affecting another organism that is observing the situation. Many actions also result in the production of other stimuli. Appropriate movements of the vocal musculature result in auditory stimuli. Behavior which results in contact with another organism may result in tactile stimuli which can affect the other organism. Behavior may result in permanent or relatively permanent stimuli, as do the arm movements required for writing, when they leave visible marks on a piece of paper. A response may have more than one product. The same writing that produces marks on a piece of paper

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also produces visual stimuli related to arm movements; we can see that someone is engaged in writing. Furthermore, if it is quiet, some auditory stimuli may be produced as a result of the friction between the pen and the paper. Additional response-products may be private; the movements resulting from writing also produces kinesthetic stimulation which the writer may be able to react to.

Of course, not all forms of stimulation result from someone's behavior. The physical environment also changes and these changes result in the production of stimuli. Rain falling from the sky results in visual stimulation, auditory stimulation when it strikes the ground or windows, and tactile stimulation if it strikes someone's skin. If the rain is cold, it may also affect the body's thermoreceptors on the surface of the skin.

Also, we are talking about stimuli that are the direct and immediate product of a prior response. If someone starts a motion picture projector, the visual stimuli that are the result of the scenes changing on the screen are not to be considered as response-products of the behavior of turning on the projector. The response-products of turning on a projector include the visual stimuli that result from the movement of the wrist and hand, auditory stimuli produced if the machine clicks when it is turned to the "on" position, and even visual stimuli that result from the change in position of the "on-off" switch or knob.
FORMAL SIMILARITY

Prerequisites: stimulus, response-product, point-to-point correspondence

Definition: FORMAL SIMILARITY is a relationship between a stimulus that evokes a response and the response-product of that response with the following features:

DEFINING
1. The stimulus and the response-product are both in the same modality, e.g., they are both visual or both auditory.
2. Their physical patterns or sequences resemble one another, e.g., they may look or sound alike.

IRRELEVANT
1. Specific formal or dynamic features of both the stimulus and the response product
2. The number of additional formal or dynamic features resembling one another.

Someone says "horse" and as a result of that auditory stimulus, you also say "horse." Formal similarity exists in this case between the auditory stimulus "horse" and the response-product of the vocal response "horse." The pattern of auditory stimuli is the same, with the "h" sound at the beginning and the "s" sound at the end. Some degree of formal similarity exists even if other formal or dynamic features are somewhat different. For example, the stimulus may have been low-pitched, whereas, the response-product may have been very high-pitched.
STUDY FRAMES: RESPONSE-PRODUCT

Write either "RESPONSE-PRODUCT" or "NOT RESPONSE-PRODUCT" in the blank after each of the following examples.

1. The auditory stimuli produced by someone who is standing behind you making the vocal response "dog." ___________________

2. The visual stimulation produced by a deaf person making the manual sign "dog." ____________________

3. The visual stimulation produced by the shape of an actual dog. ____________________________

4. Auditory stimulation that results from windshield wipers moving back and forth that could like the phrase "You're late." ____________________________

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1. RESPONSE-PRODUCT: The stimuli produced are the result of the person's vocal response. If the person had been standing in front of you, an additional response-product might have been the visual stimulation of the person's lips moving.

2. RESPONSE-PRODUCT: Remember, the form of the response is not important as long as the response is a type of verbal behavior. Technically, any response will produce some kind of response-product, but in an analysis of verbal behavior, we are only interested in those that are the result of someone's verbal behavior.

3. NOT A RESPONSE-PRODUCT: The visual stimuli are not the result of someone's behavior, although they could result in someone emitting the verbal, vocal response "dog."

4. NOT A RESPONSE-PRODUCT: These auditory stimuli are not the result of someone's verbal behavior, even if they do sound somewhat like it.
Another example might involve a stimulus that was produced very rapidly, and the response-product may be the result of a response made somewhat more slowly. If in fact the pitch is about the same and the speed is about the same, then it could be said that a greater degree of formal similarity exists than when the pitch or speed is difficult.

The existence of formal similarity, even minimally, allows for a unique form of self-reinforcement, which makes the acquisition and maintenance of responses which produce formal similarity between their products and their controlling stimuli more likely to occur. This essentially allows for a form of self-correction. In the case of verbal behavior, the two general categories in which this can occur are when we repeat what has just been said, or when we copy what someone has written. This same type of self-correction is possible in any type of vocal mimicry and/or type of copying.

Formal similarity may exist when the stimulus and response-product have only one component. When formal similarity exists between a stimulus and a response-product that have more than one component, point-to-point correspondence must exist between the stimulus and the response it controls.
STUDY FRAMES

Write FORMAL SIMILARITY, POINT-TO-POINT CORRESPONDENCE, BOTH, or NEITHER in the blank following each example.

1. Saying "response" as a result of hearing the word "stimulus."

2. Saying "stimulus" as a result of hearing the word "stimulus."

3. Saying "stimulus" as a result of seeing the written word "stimulus."

4. Writing the word "stimulus" as a result of hearing it spoken.

5. Writing the word "stimulus" as a result of seeing the word "stimulus" written.

6. Writing the letter "q" as a result of seeing the letter "q" written on a blackboard.
1. NEITHER: Although both the stimulus and the response-product would be in the same modality (auditory), there is no physical resemblance between them. There is also no point-to-point correspondence since the first part of the stimulus cannot be said to control the first part of the response, etc.

2. BOTH: The stimulus and the response-product are both auditory and would bear a physical resemblance to one another. There is point-to-point correspondence between the stimulus and the response because in this case the first part of the stimulus does control the first part of the response, etc.

3. POINT-TO-POINT CORRESPONDENCE: There is no formal similarity because the stimulus and the response-product are in different modalities: visual and auditory respectively.

4. POINT-TO-POINT CORRESPONDENCE: Same as number three, except the different modalities have been reversed.

5. BOTH: The example is just like number two, except that the modality of the stimulus and the response-product is visual instead of auditory, and it makes no difference what the modality is, as long as it is the same for both the stimulus and the response-product.

6. FORMAL SIMILARITY: There is no point-to-point correspondence because neither the stimulus nor the response has more than one component.

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FORMAL AND THEMATIC CONTROL

Prerequisites: controlling variable, response, point-to-point correspondence

Definition: FORMAL CONTROL exists whenever a controlling variable evokes a response and has the following features:

DEFINING
1. There is point-to-point correspondence between the controlling variable and the response.

IRRELEVANT
1. Whether or not there is formal similarity
2. Formal characteristics of either the controlling variable or the response
3. Dynamic characteristics of either the controlling variable or the response

Definition: THEMATIC CONTROL describes a situation in which a controlling variable evokes a response. The situation has the following features:

DEFINING
1. There is NO point-to-point correspondence between the controlling variable and the response.

IRRELEVANT
The same as the irrelevant features for formal control.
A tendency to say what you have just heard illustrates FORMAL CONTROL. Someone says, "Say alligator," and you then say "alligator." If you were to respond to the same request by saying "crocodile," this would then be an example of THEMATIC CONTROL because there would be no point-to-point correspondence between the stimulus and the response. For that matter, you could say "door knob" and that would be THEMATIC CONTROL also. If you say "alligator" as a result of seeing the word "alligator," this is also an example of FORMAL CONTROL because there is point-to-point correspondence between the stimulus and the response. If you see an alligator and then say "alligator," the type of control is THEMATIC because there is no point-to-point correspondence between the stimulus and the response. The head of the alligator does not control the "al" and the tail does not control the "gator." If you write the word "alligator," the control is still THEMATIC, even through the stimulus and the response-product are now in the same mode, visual. The concepts of FORMAL and THEMATIC CONTROL play an important role in several of the aspects of the analysis that follows.
STUDY FRAMES

Write either FORMAL or THEMATIC in the blank following each of the examples below.

1. A tendency to say "response" as a result of seeing the word "stimulus." ___________________________

2. A tendency to say the word "stimulus" as a result of hearing the word "stimulus." ___________________________

3. A tendency to write "stimulus" as a result of seeing the written word "stimulus."

4. A tendency to say "water" as a result of water deprivation ___________________________

5. A tendency to write "water" as a result of seeing a glass of water. ___________________________

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1. THEMATIC: There is no point-to-point correspondence between the controlling variable and the response.

2. FORMAL: There is point-to-point correspondence between the controlling variable and the response. In this case there is also formal similarity between the stimulus and the response-product.

3. FORMAL: Same as number two; the only difference is that the modes of the stimulus and their response are visual and written instead of auditory and vocal, respectively.

4. THEMATIC: There is clearly no point-to-point correspondence between water deprivation (the controlling variable) and the response: "water."

5. THEMATIC: Again, there is no point-to-point correspondence between the controlling variable and the response.
ELEMENTARY VERBAL RELATIONSHIPS

The first step in an operant analysis of verbal behavior is to classify the different types of relationships between controlling variables and verbal responses. This classification is based upon three factors: the musculature involved in the behavior -- either those muscles used in speaking or writing; the type of controlling variable -- verbal stimulus, non-verbal stimulus, or establishing operation; and finally, the nature of the controlling relationship -- point-to-point correspondence, formal similarity, or neither. This classification represents the basic building blocks of verbal behavior. As we shall see in later sections, they often combine with one another or can themselves become controlling variables for other types of more complex verbal relationships.

OBJECTIVES
For each concept presented in this section the student should be able to:
1. Given a concept name, state the defining features of that concept.
2. Given the defining features of a concept, state the concept name.
3. Given examples and non-examples of the concept, correctly identify each as either an example of the concept or some other concept.
4. Given the name of a concept, provide original examples of the concept that vary each of the irrelevant features listed for that concept.
5. Given the name of a concept, explain how a new response is acquired as an instance of that concept.
ELEMENTARY RELATIONSHIPS

2:1 The Echoic
2:2 Copying a Text
2:3 Taking Dictation
2:4 Textual Behavior
2:5 The Mand
2:6 The Tact
2:7 The Intraverbal
2:8 Audience Control
ECHOIC BEHAVIOR

Prerequisite concepts: auditory verbal stimulus, vocal response, point-to-point correspondence, response-product

Definition: ECHOIC BEHAVIOR is verbal behavior which has the following features:

DEFINING
1. The response is vocal.
2. It is controlled by a prior auditory verbal stimulus.
3. There is point-to-point correspondence between the stimulus and the response.
4. There is formal similarity between the prior stimulus and the response-product.

IRRELEVANT
1. Formal characteristics of both the stimulus and the response.
2. Dynamic characteristics of both the stimulus and the response.
3. The meaning of either the stimulus or the response.
4. Whether or not the current response is reinforced.

The dynamic features of both the stimulus and the response are irrelevant. The stimulus may be very strong and the response very weak. Whether or not the response has any meaning does not enter into the definition. Also, the relevant reinforcement variable is in the past. Whether or not the response receives current reinforcement is not relevant. Speaking non-technically, echoic behavior involves saying what you have just heard someone say.
Saying "echoic" as a result of hearing someone say "echoic" is an example of echoic behavior. Saying "echoic" as a result of seeing the word is not echoic, nor is saying it as a result of hearing someone say "imitative." It is possible that there can be a great deal of formal similarity in the case of echoic behavior, and this is clearly the case with the skilled mimic, who not only says the "same thing," but uses the same intonation and pitch as the original speaker.
STUDY FRAMES

Write either ECHOIC or NON-ECHOIC in the blank following each example below.

1. A tendency to say "ice cream" as a result of hearing someone say "ice cream." __________________

2. A tendency to say "dog" as a result of seeing a dog. __________________

3. When someone tells us his name and we repeat it so that we will remember it. __________________

4. Your instructor writes the next assignment on the blackboard and then you write it in your notebook. __________________

5. A tendency to say "stop" as a result of seeing a stop sign. __________________

6. You see someone yawn and as a result find yourself yawning. __________________

7. You write the word "ice cream" as a result of hearing someone say it. __________________

8. You say "ice cream" as a result of seeing the word "ice cream." __________________

9. You say "ice cream" as the result of wanting some. ________________
10. You say "ice cream" as the result of hearing someone say "popsicle."

11. Saying "ZEB" as the result of hearing someone say "ZEB."
ANSWERS

1. ECHOIC: The response is vocal, the prior controlling stimulus is auditory and verbal, and there is point-to-point correspondence between them. The response-product of the vocal response and the prior auditory stimulus have formal similarity.

2. NON-ECHOIC: Although the response is vocal, the prior controlling stimulus is NOT auditory. Notice also that there is no point-to-point correspondence.

3. ECHOIC: (Assuming it is repeated correctly) All of the defining features are present in this example.

4. NON-ECHOIC: This example lacks the first two features of the definition.

5. NON-ECHOIC: This is not echoic because the prior controlling stimulus is visual, rather than auditory. There is point-to-point correspondence but no formal similarity.

6. NON-ECHOIC: This is not an example of verbal behavior.

7. NON-ECHOIC: The response must be vocal in the ECHOIC relationship.

8. NON-ECHOIC: Same reason as in number 5.

9. NON-ECHOIC: There is no prior controlling stimulus in this example, the controlling variable is an establishing operation that would result in ice cream being currently reinforcing.
10. NON-ECHOIC: Although the response is vocal and there is a prior auditory verbal stimulus, there is no point-to-point correspondence between them nor any formal similarity.

11. ECHOIC: This has all of the defining features. The meaning of either the stimulus or the response is irrelevant to the classification.
COPYING A TEXT

Prerequisites: written response, response-product, point-to-point correspondence, formal similarity

Definition: COPYING A TEXT is a form of verbal behavior with the following features:

DEFINING:
1. The response is writing or printing.
2. The controlling variable is a response-product of previous writing behavior on the part of someone.
3. There is point-to-point correspondence between the controlling variable and the response.
4. There is formal similarity between the controlling variable and the product of the response (in some cases there is little or no formal similarity, but these can be considered exceptions to the general rule).

IRRELEVANT:
1. Formal and dynamic features of the response.
2. Formal and dynamic characteristics of the controlling variable.
3. Whether or not the current response is reinforced.
4. The "meaning of either the stimulus or the response."

Anytime you copy something that someone, including yourself, has written that is called COPYING A TEXT. If you see "Test next Friday" written on the black board and you then write the same thing in your
notebook, that is an example of COPYING A TEXT. It does not matter whether the message was printed on the blackboard and you used cursive writing in your notes, as long as there is point-to-point correspondence between the stimulus and the response-product. Writing the word "table" as a result of seeing "la mesa" written is not copying a text. Although the stimulus and the response are in the right modes, there is no point-to-point correspondence between them. Writing "table" as a result of hearing "table" is also not copying a text, but is a type of elementary verbal relationship which will be presented next. It doesn't matter whether the letters in the stimulus are huge and the writing response is tiny or vice versa.
STUDY FRAMES

Write ECHOIC, COPYING, or NEITHER in the blanks following each example.

1. Saying "chili" as a result of seeing the word "chili" written.

2. Writing "chili" as a result of hearing the word "chili."

3. Salivating as a result of hearing the word "chili."

4. Writing "chili" as a result of seeing the word "enchilada."

5. Printing the word "CHILI" in capital letters as a result of seeing the word written in script.

6. Writing the words "coca cola" as a result of seeing them written with ten foot high letters on a billboard.

7. Writing "BEZ" as the result of seeing the "BEZ" written on a blackboard.
1. NEITHER: This is not ECHOIC because the prior stimulus is not auditory. It is not COPYING A TEXT because the response is not writing.

2. NEITHER: This is not ECHOIC because the response is not vocal. It is not COPYING A TEXT because the prior controlling stimulus is not the visual response-product of someone's writing behavior.

3. NEITHER: This is not an example of any kind of verbal behavior.

4. NEITHER: This is clearly not ECHOIC. It does have some of the defining features of COPYING A TEXT, but does not have point-to-point correspondence between the stimulus and the response. There is no formal similarity between the stimulus and the response-product.

5. COPYING A TEXT: This is a somewhat tricky example because it has only minimal formal similarity between the script stimulus and the printed response. All of the other features are clearly present and all that is required is a minimal degree of formal similarity.

6. COPYING A TEXT: Same as number 5, except there is probably more formal similarity in this example.

7. COPYING A TEXT: As was the case with the ECHOIC, meaning is an irrelevant feature in the classification of verbal behavior.
TAKING DICTATION

Prerequisites: stimulus, response, response-product, point-to-point correspondence

Definition: TAKING DICTATION is a form of verbal behavior which has the following features:

DEFINING
1. The form of the response is writing.
2. The controlling variable is the response-product of someone's prior vocal verbal behavior.
3. There is point-to-point correspondence between the stimulus and the response.

IRRELEVANT
1. Formal and dynamic characteristics of the stimulus.
2. Formal or dynamic characteristics of the response.
3. Whether or not there is reinforcement for the current response.
4. The "meaning" of either the stimulus or the response.

Someone tells you the name of a good restaurant and you write it down; that is TAKING DICTATION. In Skinner's analysis taking shorthand is not called TAKING DICTATION because it lacks the necessary point-to-point correspondence. Writing the name of the restaurant as the result of seeing the name in the phone book has already been classified as COPYING A TEXT. It is not TAKING DICTATION because the controlling variable is not the result of someone's prior vocal verbal behavior. Writing "diner" as the result of hearing someone say "restaurant" is also not TAKING DICTATION because there is no point-to-point correspondence.
between the stimulus and the response. It doesn't matter what is said, even if it is nonsense. It also doesn't matter whether the stimulus is the result of shouting or whispering. The response can either be written or printed.
Identify each of these examples of verbal behavior by writing ECHOIC, COPYING A TEXT, TAKING DICTATION or NONE OF THESE in the blanks.

1. Writing "textbook" as a result of seeing the word "textbook."

   ____________________________

2. Saying "student" as the result of hearing someone say the word "student."

   ____________________________

3. Writing "calendar" as a result of hearing someone say "calendar."

   ____________________________

4. A tendency to write "textbook" as the result of hearing someone say "classroom."

   ____________________________

5. Writing "BAJ" as the result of hearing someone say "BAJ."

   ____________________________

6. Writing "BAJ" as the result of hearing someone say "TEK."

   ____________________________
1. COPYING A TEXT: The response is writing and the stimulus is the response-product of someone's prior writing behavior. There is point-to-point correspondence between the stimulus and the response and formal similarity between the stimulus and the response-product.

2. ECHOIC: The response is vocal and the stimulus is the response-product of a prior vocal verbal response. There are both point-to-point correspondence and formal similarity.

3. TAKING DICTATION: The stimulus is auditory and the response is writing. There is point-to-point correspondence between them.

4. NONE OF THESE: This is not TAKING DICTATION, ECHOIC, or COPYING A TEXT because there is no point-to-point correspondence between the stimulus and the response.

5. TAKING DICTATION: Again, meaning is not a factor in the classification of elementary verbal relationships.

6. NONE OF THESE: Same reason as in number 4.
TEXTUAL BEHAVIOR

Prerequisites: vocal response, response-product, verbal behavior, point-to-point correspondence

Definition: TEXTUAL BEHAVIOR is a form of verbal behavior which has the following features:

DEFINING
1. The response is vocal.
2. It is controlled by a prior stimulus that is the response-product of writing behavior.
3. There is point-to-point correspondence between the stimulus and the response.

IRRELEVANT
1. The specific topography and dynamic characteristics of the vocal response.
2. The specific form of the visual verbal stimulus (written, printed, typed).
3. Whether or not there is any reinforcement for the current response.
4. The "meaningfulness" of stimulus and the response.

If you look at the title of this page and that evokes the vocal response "textual behavior," all three parts of the definition are present and that would be an example of TEXTUAL BEHAVIOR. Hearing
someone say "textual behavior" and then saying it yourself is not
TEXTUAL BEHAVIOR because the prior stimulus is not the kind specified
in defining feature number 2. You should have identified this as an
example of ECHOIC BEHAVIOR. Writing "textual behavior" as a result
of looking at the title of this page has already been described as
COPYING A TEXT. It is not TEXTUAL BEHAVIOR because the response is
not vocal, which it must be according to defining feature number 1.
Looking at the title of the last page and then saying "reading" is
also not TEXTUAL BEHAVIOR even though the types of stimulus and
response are correct. The problem is that there is no point-to-
point correspondence between the stimulus "textual behavior" and
the response "reading". Remember that it doesn't matter whether the
stimulus is written, printed, or typed because they all have approxi-
mately the same formal characteristics. Seeing "KAJ" as a result
of saying "KAJ" is TEXTUAL BEHAVIOR because all the defining features
are present. We have already noted that the "meaningfulness" of the
stimulus and the response is an irrelevant feature.
Classify the following examples of verbal behavior by writing TEXTUAL BEHAVIOR, COPYING A TEXT, TAKING DICTATION, ECHOIC BEHAVIOR or NONE OF THESE in the blank.

1. A tendency to write "no smoking" as a result of seeing a "no smoking" sign.

2. A tendency to say "no smoking" as a result of hearing someone else say the same thing.

3. Saying "stupid sign" as a result of seeing a "no smoking" sign.

4. A tendency to say "DAK" as a result of seeing the work "dak" written.

5. Saying "beer can" as a result of seeing a beer can.

6. A tendency to say "no smoking" as the result of seeing a "no smoking" sign.
ANSWERS

1. COPYING A TEXT: The response is writing and the stimulus is visual. There is both point-to-point correspondence and formal similarity.

2. ECHOIC: The response is vocal, the stimulus is auditory and there is both point-to-point correspondence and formal similarity.

3. NONE OF THESE: This has many features in common with textual behavior, but there is not the required point-to-point correspondence in this example.

4. TEXTUAL: All the defining features are present. Meaning is irrelevant.

5. NONE OF THESE: This has some of the defining features of textual behavior, except that the controlling stimulus, although visual, is not a response-product of someone's writing.

6. TEXTUAL: This is a common example of textual behavior.
VERBAL RELATIONSHIPS WITH THEMATIC CONTROL

All of the elementary verbal relationships that we have studied thus far - ECHOIC BEHAVIOR, COPYING A TEXT, TAKING DICTATION and the TEXTUAL BEHAVIOR - are examples of formal control; that is, they all are functional relationships in which there is point-to-point correspondence between the controlling stimulus and the evoked response. Not all elementary verbal relationships have such point-to-point correspondence. We learned previously that if there is no point-to-point correspondence between the stimulus and the response, then we call the type of controlling relationship thematic. What follows are the types of elementary verbal relationships that are examples of thematic control. They are thematic because in most cases the controlling variable strengthens several responses. This fact will become clearer as each of the elementary relationships involving thematic control is presented. In the relationships involving formal control each controlling variable strengthens only a single response form.
THE INTRAVERBAL

Prerequisites: verbal stimulus, verbal behavior, point-to-point correspondence

Definition: The INTRAVERBAL is a form of verbal behavior which has the following features:

DEFINING
1. A verbal response.
2. The prior controlling the variable is a verbal stimulus.
3. There is no point-to-point correspondence between the stimulus and the response.

IRRELEVANT
1. The musculature involved in executing the response.
2. The modality of the prior verbal stimulus (usually either visual or auditory).
3. Dynamic features of either the stimulus or the response.
4. The "correctness" of the response.

Word association tests are a common example of INTRAVERBAL behavior. Saying "response" as a result of the experimenter saying "stimulus" is INTRAVERBAL. Mathematics provides more good examples. Saying "four" as a result of seeing "two plus two equals" is INTRAVERBAL. Saying "response" as the result of hearing "response" has already been classified as ECHOIC. It is not INTRAVERBAL because

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there is point-to-point correspondence between the stimulus and the
response, which violates the third part of the definition. Saying
"stimulus" as the result of seeing a light come on is also not
INTRAVERBAL because the prior controlling stimulus is non-verbal. The
response may be in any form. Writing "response" as the result of
either hearing someone say "stimulus" or watching someone write
"stimulus" is INTRAVERBAL. The modality of the stimulus and the
response is unspecified in the INTRAVERBAL. The final issue is
correctness. Saying "five" as the result of seeing or hearing "two
plus two equals" is still INTRAVERBAL because all three of the defining
features are present. The "correctness" of the response is irrelevant.

When you first begin learning a foreign language, most of your
behavior is INTRAVERBAL. The English "good day" evokes the French
"bon jour" and vice versa. Some critics have claimed that the
eamples of intraverbals you have just read represent trivial
language behavior. While it is true that many INTRAVERBAL relations-
ships are "trivial," much of our learning is in the form of defini-
tions, instructions, and associations that are also INTRAVERBAL.
INTRAVERBAL behavior also plays a role in conversation; although
an analysis of ongoing conversation would involve several different
types of elementary verbal relationships, plus some more complex
relationships that have not been introduced yet.
STUDY FRAMES

Fill in the blanks by writing INTRAVERBAL, ECHOIC, TEXTUAL, COPYING A TEXT, TAKING DICTATION or NONE OF THESE.

1. A tendency to say "water" as the result of water deprivation.

2. A tendency to write "water" as a result of hearing "bread and..."

3. Saying "water" as a result of seeing a lake.

4. Writing "water" as a result of seeing the word "water" written.

5. A tendency to say "water" as a result of seeing the word "ocean."

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ANSWERS

1. NONE OF THESE: Water deprivation is an establishing operation. The controlling variable for an INTRAVERBAL must be a verbal stimulus.

2. INTRAVERBAL: There is no point-to-point correspondence between the stimulus and the response in this example.

3. NONE OF THESE: In this case, the controlling variable is neither an establishing operation nor a verbal auditory or visual stimulus. The lake is a non-verbal stimulus.

4. TEXTUAL: The verbal stimulus is visual and the response is writing and there is point-to-point correspondence between them.

5. INTRAVERBAL: There is no point-to-point correspondence between the stimulus and the response. Notice that both the stimulus and the response are in different modes than those in example number 2. Remember that the stimulus can be either visual or auditory and the response can be either vocal or writing.
THE TACT

Prerequisites: verbal behavior, non-verbal stimulus, point-to-point correspondence

Definition: The TACT is a form of verbal behavior which has the following features:

DEFINING
1. A verbal response.
2. The controlling variable is a non-verbal stimulus, which is an object or event or a property of an object or event.

IRRELEVANT
1. The musculature with which the response is executed (it may be vocal, written, gestural, etc.)
2. The modality of the stimulus (it may be auditory, visual, gustatory, olfactory, etc.)
3. Whether or not there is any reinforcement for the current response.
4. The correctness of the response.

All of the elementary verbal relationships which we have studied up to this point have had some type of verbal stimulus as the controlling variable. But what about verbal behavior whose form is controlled by a prior non-verbal stimulus? Whenever we identify some feature of our physical environment the description we give is typically controlled by prior non-verbal stimuli in the form of objects or events or the properties of objects of events.

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Saying "dog" as the result of seeing a dog is an example of the TACT relationship. If we say "dog" either because you see the word "dog" or hear it spoken, then the relationship is either TEXTUAL or ECHOIC, respectively. These latter two cases would not be TACTS because the prior controlling stimuli are not non-verbal stimuli as is required in the definition. Likewise, if you say "bring me the dog" the response form "dog" is controlled by the fact that being presented with the dog would currently be reinforcing; that is, the form of the response is controlled by an establishing operation, not a non-verbal stimulus.

The response topography is not an important consideration in the classification of the TACT. The response may be vocal, writing, gestural, or any other form of behavior, as long as the reinforcement is mediated and the form of the response is controlled by a prior non-verbal stimulus. Furthermore, the controlling stimulus may be any type of stimulus (as long as it's non-verbal) and may be simple or complex. It may only be a single property, such as color, or it may be the entire object, such as a dog, or a city, or the universe.

When we say that a speaker uses a word to refer to an object, we are usually talking about a TACT relationship. To say that a word refers to something often simply means that the word is a response controlled by a non-verbal discriminative stimulus.

Correctness is a final issue. Saying "cat" in the presence of a dog is a TACT. We call it incorrect and typically do not continue to reinforce this response, but it is nevertheless a TACT. Incorrect
TACTS often represent a type of extension of verbal behavior which is discussed in the next unit.
Write in the name of any of the types of elementary verbal relationships that you have learned up to this point. If the example is not any of them, then write NONE in the first blank (a). Also indicate whether the relationship is FORMAL or THEMATIC in the second blank (b) after each example.

1. The type of verbal behavior that occurs when we say "duck" as the result of hearing someone say "soup" is called
   a. __________________________ b. __________________________

2. Saying "goose" as a result of seeing a duck.
   a. __________________________ b. __________________________

3. Saying "duck" in order to get someone to get out of the way of something that has been thrown at him.
   a. __________________________ b. __________________________

4. Someone holds up a card with the word "duck" on it and you say "duck."
   a. __________________________ b. __________________________

5. Saying "dog" as a result of hearing a dog bark.
   a. __________________________ b. __________________________

6. Saying "loud" as a result of hearing someone shout "UCK!"
   a. __________________________ b. __________________________
1. a. INTRAVERBAL The prior controlling stimulus is a verbal
b. THEMATIC stimulus, but there is no point-to-point correspondence between the stimulus and the response.

2. a. TACT The prior controlling stimulus is non-verbal.
   b. THEMATIC There is no point-to-point correspondence.

3. a. NONE This response is controlled by an establishing operation rather than a prior stimulus and there is no point-to-point correspondence between it and the response it controls.
   b. THEMATIC

4. a. TEXTUAL This is TEXTUAL because a vocal response is controlled by a prior visual verbal stimulus and there is point-to-point correspondence between them.
   b. FORMAL

5. a. TACT Although most tacts are controlled by visual stimuli, many responses are controlled auditory stimuli. Remember that the important consideration is whether or not the stimulus is verbal.
   b. THEMATIC

6. a. TACT Remember that the definition of a verbal stimulus centered around the pattern of stimulation. All of
the other features of the complex response-product of vocal behavior are non-verbal, including intensity.
THE MAND

Prerequisites: establishing operation, verbal behavior, response reinforcement

Definition: The MAND is a form of verbal behavior with the following features:

DEFINING
1. The response is verbal.
2. The form of the response is controlled by an establishing operation.

IRRELEVANT
1. The musculature with which the response is executed (may be vocal, written, gestural, etc.)
2. The type of reinforcement made currently effective by the establishing operation (may be conditioned or unconditioned, etc.)
3. Whether or not the current response is followed by reinforcement.

All of the elementary verbal relationships which you have studied up to this point have had a prior discriminative stimulus, either verbal or non-verbal, as the controlling variables. One remaining class is notable because its controlling variable is of a different nature. Certain verbal responses are followed by characteristic reinforcement. By characteristic we mean that a reinforcement for a certain class of
response topographies is typically the same - time and time again. For example, when we ask for "water" we characteristically receive water. We do not usually receive milk or a cookie, nor does any one typically reinforce this response by saying "thank you" or "good, that's right." Saying "stop!" to someone who is walking usually results in the person stopping. This is another example of characteristic reinforcement. If we observe a response which is followed by this type of characteristic reinforcement, this type of response is called MAND. Many responses of this type are commonly called demands, commands, and reprimands and the classification derives its name from these terms.

A history of characteristic reinforcement does not account for the occurrence of a current response. What is needed is some environmental event that precedes the response and is responsible for increasing the probability of its occurrence. We need some event that is related to the reinforcement that typically follows the response. This type of event has already been discussed; it is the ESTABLISHING OPERATION presented in unit 1.

The MAND "water!" occurs as a function of some degree of water deprivation, which is the establishing operation for this response form. If you say "water" because there is a glass of water present and the form of the response is not controlled by water deprivation, then the response is not a MAND. The glass of water is a non-verbal stimulus and the response would, therefore, be a TACT. Likewise, if you say "water" either as a result of seeing the word written or hearing it spoken, then the response is not a MAND, but is either

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TEXTUAL or ECHOIC. The form of the response is not a MAND, but is either TEXTUAL or ECHOIC. The form of the response in the MAND relationship must be controlled by an establishing operation.

Remember that the type of response is not specified in the MAND. You can say "water," write "water," use sign language - any kind of response, as long as the controlling variable is an establishing operation. The MAND may also be controlled by an establishing operation for some type of conditioned reinforcement, such as money or social reinforcement - "Tell me that you love me." Even if there is no reply, the response is still a mand because current reinforcement is irrelevant.
Write the name of any of the elementary verbal relationships that you have learned up to this point, including the MAND. Some examples may be NONE OF THESE.

1. You have an important appointment and when you check your watch you find that it has stopped. You ask a person who is standing nearby, "What time is it?"

2. You're watching T.V. and a horrible singing commercial comes on. You jump up, go to the T.V. and turn the volume down so that you can no longer hear the commercial. Turning the volume down is

3. Someone asks you what time it is; looking at your watch, you say "2:30." Your response is

4. A child is acting very bad. Her mother comes into the room and says nothing, but merely points to the child's room. The pointing is an example of

5. You see a pencil on a desk and say "pencil." Someone overhears you and hands you one of their pencils. You say "No, thank you." Your saying pencil is an example of

6. You haven't eaten in several hours and could be reinforced currently by any kind of food. You say to a friend whom you are visiting, "I haven't eaten in hours." Your friend says "Good, that's right. You haven't eaten in several hours." You don't smile but repeat the statement as you walk towards the refrigerator. "I haven't eaten in several hours" is a

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1. MAND: This response is controlled by an establishing operation, rather than a prior controlling stimulus.

2. NONE OF THESE: This is an example of NON-VERBAL behavior. The controlling variable is an establishing operation.

3. NONE OF THESE: The other person's response is a "mand." Your response is controlled by a prior non-verbal stimulus, the position of the hands on your watch.

4. MAND: This response is controlled by an establishing operation. Remember that in the case of the MAND, the form of the response doesn't make any difference.

5. TACT: The form of this response is controlled by the pencil as a non-verbal stimulus. There is no establishing operation which has made receiving a pencil effective reinforcement at the moment.

6. MAND: The topography of response is TACT-like, but remember that the topography of a verbal response is not the basis for its classification. It is necessary to consider the controlling variable and its relationship to the response.
A Comparison of the MAND and the TACT

The first basis for comparison concerns who benefits from the response. In the case of the TACT, the listener benefits because the speaker has provided information about the environment, to which the listener may not have ready access. In the case of the MAND, the speaker is the one who benefits because the listener provides the reinforcement indicated by the verbal response. It could be said that the speaker also benefits in the TACT because the listener provides him with generalized conditioned reinforcement. But this benefit requires little expenditure of effort on the part of the listener and is probably not nearly as beneficial as the information the listener receives.

A second basis for comparison concerns the type of controlling variable. The controlling variable for the TACT is a prior non-verbal stimulus. The controlling variable for the MAND is a prior establishing operation. It could be said that the TACT tells the listener something about the environment regardless of the condition of the speaker; whereas, the MAND tells something about the condition of the speaker regardless of the surrounding circumstances. You will see in section four how these two types of relationships may combine to determine the form of the response that is emitted.
Prerequisites: verbal behavior, controlling variable, response

Definition: The AUDIENCE is a type of controlling variable with the following features:

DEFINING
1. The audience is usually a listener in the presence of whom verbal behavior is typically reinforced.
2. It controls a group of response forms.

IRRELEVANT
1. Whether or not the listener provides reinforcement for the current response.
2. The size or specific nature of the group of response forms controlled.

In each of the preceding seven elementary relationships, the form of the response is specifically determined by the controlling variable. However, in almost all cases, each of the different types of controlling variables requires an additional factor to be present before the appropriate verbal response is emitted. This factor is a listener. Since the reinforcement for verbal behavior is mediated by a listener, the presence of one is a discriminative stimulus for verbal behavior in general. In other words, the presence of a listener sets the occasion for the speaker to be reinforced for speaking. A more complex analysis arises when the speaker becomes his own listener, and that situation
will not be dealt with in this introduction to the audience variable. Compared to the other types of controlling variables that we have examined, the audience controls a large group of responses rather than a specific response form. This is because the same audience may be present in a wide variety of situations in which virtually all of the other types of controlling variables are also present.

The audience has three different types of control. First, if a stimulus such as a dog evokes only the response "dog," then the presence or absence of the audience determines the occurrence of the response in an all or none fashion. If, however, the same stimulus has a tendency to evoke either the response "dog" or the response "canine," then the audience may also determine which of the response forms is emitted. In the presence of a friend, the less technical form may result: "That's a dog." However, in the presence of a zoology instructor, the response, "That's a canine," may instead be evoked, even though the controlling variable is the same dog that evoked the response "dog" in the presence of the friend. The final audience effect is to select what is talked about. You may talk extensively about your most recent drunken spree in the presence of your peers in class the next day, but when your mother calls on the phone, you talk almost exclusively about how hard you studied for your exams and how difficult they were.

The fact that you say "table" in the presence of an English speaking listener and "la mesa" in the presence of a Spanish speaking listener, if there is a table present, illustrates the AUDIENCE variable. The fact that you say "table" in the presence of a table and "chair" in the presence of a chair illustrates the TACT relationship rather than
AUDIENCE control, although the presence of an audience may determine to a large extent whether the response is ever emitted or not.

Things other than listeners can come to exert AUDIENCE control. Places such as churches, libraries may act as "negative" AUDIENCES because they have been the occasion upon which many forms of verbal behavior have been followed by punishment. Listeners can have the same type of effect ... we tend not to say certain things in the presence of listeners who have punished similar responses in the past, or who are similar to listeners who have punished certain types of verbal behavior in the past. Places where verbal behavior has often been reinforced may increase the likelihood that any type of verbal behavior will be reinforced. We see an increase in the level of verbal behavior when people enter the lobby of a theatre after a movie or a play. The inside of the theater is a negative audience and the level of verbal behavior, even when there is nothing on the stage or screen is usually considerably lower than in the lobby.
STUDY FRAMES

Answer each of the following by writing either AUDIENCE or the name of one of the other seven elementary relationships.

1. A tendency to say "hooker" in the presence of your college friend, but in describing the same person to your maiden aunt, you say "Lady of the night."

2. A tendency to say "fat" in the presence of your 250 pound friend and a tendency to say "skinny" in the presence of your 85 pound friend.

3. A tendency to talk a lot about what a terrible class you are taking, but a sudden tendency to stop talking about how terrible the class is when the professor walks into the room.

4. Same thing as number three, except you keep right on talking about what a wretched class this is even though the professor is standing right next to you.
ANSWERS

1. AUDIENCE CONTROL: This example demonstrates how a single stimulus can have an effect in one situation and a different effect in another situation, with a different person present. Both response forms are controlled by the same stimulus.

2. TACTS: Two separate responses, each controlled by a different stimulus.

3. AUDIENCE CONTROL: The presence of the professor does not control any specific response, but does control what is going to be talked about. This is an example of a "negative" audience.

4. NONE OF THESE: The professor in this case simply has no stimulus control over the speaker's behavior in this example. There are, of course, other variables controlling the verbal behavior that is occurring.

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Other Forms of Verbal Behavior

When B. F. Skinner wrote *Verbal Behavior* he restricted the analysis primarily to vocal behavior and included some discussion of writing; however, the definition of verbal behavior does not specify the response mode at all. Other forms such as American Sign Language (ASL), morse code, typing, braille, etc. are clearly forms of verbal behavior and can, therefore, become verbal stimuli. All of these forms of verbal behavior can easily be classified into analogous elementary relationships. In fact, in three of the elementary relationships the form of the response is unspecified and there is no need to discuss analogous categories. These three are the INTRAVERBAL, TACT, and MAND.

The appearance of a particular response form in ASL can be a function of someone else making the same sign (ASL ECHOIC). There is a written form of ASL (developed by Dr. William Stokoe) which is somewhat analogous to a phonemic form of written English. Rather than the letters corresponding to speech sounds, the "letter" corresponds to significant features of signs, and therefore, has point-to-point correspondence that allows for relationships analogous to TEXTUAL BEHAVIOR, COPYING A TEXT, and TAKING DICTATION. Although these relationships are possible they have not become common place in the deaf community.

A sign in ASL as the result of word written in English is not analogous to TEXTUAL BEHAVIOR because there is no point-to-point correspondence between the sign and the controlling stimulus. This would have to be classified as a type of ASL INTRAVERBAL. Another
form of ASL INTRAVERBAL would involve making the sign "cat" as a result of seeing the sign "dog." The ASL INTRAVERBAL which had the English word as the controlling variable is the same type of INTRAVERBAL discussed in the acquisition of a foreign language. Indeed, ASL and English are two different languages, just as German and English are two different languages. The analysis for the other forms is similar. The key point to remember is that Skinner's analysis of verbal behavior is not based upon the type of behavior involved, but rather upon the type of reinforcement for that behavior -- mediated reinforcement.
EXTENSIONS OF VERBAL BEHAVIOR

The verbal relationships we have studied this far represent well established responses controlled by specific stimuli. Verbal behavior, however, is not so simple. A major complexity involves verbal behavior that occurs in the presence of novel stimuli. B.F. Skinner, in *Verbal Behavior*, opens the discussion of the "extended tact" by writing:

But a verbal repertoire is not like a passenger list on a ship or plane, in which one name corresponds to one person with no one omitted or named twice. Stimulus control is by no means so precise. If a response is reinforced upon a given occasion or class of occasions, any feature of that occasion or common to that class appears to gain some measure of control. A novel stimulus possessing one such feature may evoke a response. There are several ways in which a novel stimulus may resemble a stimulus previously present when a response was reinforced, and hence there are several types of what we may call "extended tacts."

Skinner limits his analysis to "tact extension," but the principles that underlie that type of extension also seem to be at work in all of the other types of elementary verbal relationships that were discussed earlier, including the audience relationship.

This section will introduce you to the basic concepts involved in the extension of verbal behavior, and also will introduce basic categories of extension. Finally, it will deal with some special concepts that are related to the problem of extending verbal behavior to the control of private stimuli.
OBJECTIVES

For each of the concepts presented in this unit, the student should be able to:

1. Given the name of the concept, state the defining features of that concept.
2. Given the defining features of a concept, state the name of the concepts.
3. Given an instance of verbal behavior, indicate whether or not that instance is an example or non-example of the concept.
4. Given the name of a concept, provide an original example of that concept.

For each of the three types of extension, the student should be able to identify examples and non-examples and also give examples involving each of the elementary verbal relationships, except the mand.
The following concepts are presented in this unit:

3:1 Stimulus Features
3:2 Relevant Features
3:3 Irrelevant Features
3:4 Generic Extension
3:5 Metaphorical Extension
3:6 Metonymical Extension
We talk about behavior being under the discriminative control of a stimulus. Most often we talk about a stimulus as being some object or event, such as a dog or an explosion. A very common stimulus in animal research is a light onset. But a light has many properties, such as intensity, color, duration, position, shape, etc. As Skinner pointed out in his remarks about tact extension, any feature of an occasion (object or event) appears to gain some control over a response that is reinforced at that time. However, it is generally the case that the person presenting the stimulus wants the organism to respond under the control of only one or a few of the features present at any given time. If we want a pigeon to peck in the presence of a red light, then we want the property of color to evoke the response. If the pigeon pecks at bright red lights but not at dim red lights, then the property of intensity has gained unwanted control over the response. Likewise, if the pigeon pecks only a red disk that is in the center of a wall, but will not peck at a red disk which is to the left or right of center, then position has gained unwanted control over the response. It is convenient to break the various stimulus features into two major categories — RELEVANT and IRRELEVANT.

A RELEVANT stimulus feature may be defined as:

A property of an object or event that must be present before a response is reinforced.
An IRRELEVANT stimulus feature may be defined as:
A property of an object or event whose presence reinforcement is not contingent upon.

Let's consider the tact "dog." Dogs have several stimulus features, including canine teeth, four legs, claws on feet, tails, fur, barking, color, size, shape, and so on. Which of these features must be present before we would reinforce someone for saying "dog" on that occasion? (For introductory purposes, it will be helpful to ignore strange examples or uncommon exceptions: e.g., a Basenji doesn't bark, but is still called a dog -- but most dogs bark.) We would certainly require fur (ignoring the Mexican Hairless chihuahua); we would require barking, four legs, canine teeth, claws, tails, and perhaps others. Would we require a specific color? A specific size? Since we would not require a specific color or a specific size, these features are to be considered IRRELEVANT. The features that we would require are RELEVANT. A horse is the improper occasion for saying "dog" because it has hooves rather than claws. It also has the wrong kind of teeth. Note that although the size of a horse is different from most dogs, it is still IRRELEVANT: if we saw a Saint Bernard as big as a horse, we would still call it a dog. A chicken is even less likely to be the occasion for saying "dog" because it shares very few features in common with a dog. On the other hand, a wolf has almost all of the RELEVANT features of a dog, and we would not be at all surprised to find someone calling a wolf a dog. We would not be quick to punish this response, whereas we might be in the case of the chicken.
STUDY FRAMES

Write RELEVANT, IRRELEVANT, OR NEITHER in the blanks.

1. Which of the following are relevant or irrelevant if we want to reinforce a child for correct responses to triangles?
   a. number of sides ________________________________
   b. closed or open figure __________________________
   c. size of the figure ______________________________
   d. color of the object presented ____________________
   e. a triangle _____________________________________

2. Which of the following are relevant or irrelevant if we want to reinforce a child for correctly tacting "chair?"
   a. number of people who can normally sit on it __________
   b. presence or absence of a back _________________________
   c. color _____________________________________________
   d. material __________________________________________
   e. size _____________________________________________
ANSWERS

1a. RELEVANT: A specific number of sides (3) must be present for the response "triangle" to receive reinforcement.

1b. RELEVANT: The figure must be closed.

1c. IRRELEVANT: It doesn't matter what size the example is as long as all the other features are present.

1d. IRRELEVANT: It also doesn't matter what size the object is.

1e. NEITHER: A TRIANGLE is not a feature, it is the object itself. It is triangles which have features.

2a. RELEVANT: For an object to be a chair only one person would normally be able to sit on it.

2b. RELEVANT: To be a chair it must have a back.

2c. IRRELEVANT: It doesn't make any difference what color an object is as long as it has all of the other defining features of a chair.

2d. IRRELEVANT: Again, it doesn't matter what the material is -- wood, metal, cloth, plastic, etc.

2e. IRRELEVANT: This feature is irrelevant as long as the chair is only designed to hold one person. The size of person the chair was designed for may vary considerably all the way from a doll's chair to a giant's chair.
A Classification of Three Different Types of Extension

A new situation may have varying degrees of resemblance to an old situation; furthermore, the degree of resemblance may be the result of having either many relevant or irrelevant features in common with a previous situation. This fact allows for three general categories of extension based upon the degree to which a novel stimulus shares relevant or irrelevant features with a stimulus which has already gained some measure of control over a particular verbal response.

Skinner restricted almost his entire treatment of extension to the TACT relationship, and that is perhaps the relationship whose extensions are most interesting. Indeed, the names of the categories are based upon extensions of the TACT relationship. Extension of the MAND is treated separately because the MAND is somewhat free from stimulus control.
GENERIC EXTENSION

Prerequisites: stimulus, response, relevant stimulus features, irrelevant stimulus features, verbal behavior

Definition: GENERIC EXTENSION is an instance of verbal behavior which has the following features:

DEFINING
1. The response form must be a previously learned one.
2. The stimulus must be novel.
3. The novel stimulus must have all of the relevant features of the stimulus which previously controlled the response.

IRRELEVANT
1. The type of elementary verbal relationship between the stimulus and the response.
2. Formal and dynamic characteristics of the response.
3. Formal or dynamic characteristics of the stimulus.
4. Whether or not the current response is followed by reinforcement.

GENERIC EXTENSION results in classifying things into groups or categories. For example, if a child has been taught to say "dog" in the presence of the family cocker spaniel and also in the presence of his/her uncle's beagle, any tendency to say "dog" in the presence of a new dog, such as a German Shepard, would be GENERIC EXTENSION of the tact relationship. Once a response has been reinforced in the presence of a stimulus, the process of extension is not required to
explain the occurrence of the same response in the presence of that stimulus at some time in the future. Extension requires a novel stimulus; therefore, if the child sees the same German Shepard the next day and again says "dog," that is simply another occurrence of an already acquired tact relationship. If the child sees a badger at the zoo and says "dog," that is not GENERIC EXTENSION because the novel stimulus (the badger) does not have all of the relevant features which must be present for the verbal community to provide reinforcement for the response "dog." This is, however, a type of extension that is presented next.

GENERIC EXTENSION also occurs in the other elementary relationships. In the echoic relationship, the response would have to be evoked by "the same word" but it would have to be novel in either its pitch or intensity or some other irrelevant feature. Notice that which is novel in stimuli that control GENERIC EXTENSIONS are irrelevant features.

In the Intraverbal, the novel stimulus may be a complex verbal description or definition. The appropriate verbal response may be the result of GENERIC EXTENSION if all of the relevant descriptive or defining words are present that were also present when the response was acquired under the control of the original description or definition. A common irrelevant feature may be the order of the words. You may have learned to say "reinforcement" as a function of hearing "a stimulus change which increases the probability of the response it follows." Now someone says, "What do we call it when a response is followed by a stimulus change and the probability of that response occurring under similar circumstances in the future is increased?" Saying "reinforcement" after hearing that would be an example of GENERIC EXTENSION.
Fill in the blank by either writing GENERIC or NON-GENERIC.

1. A child learns to say "chair" in the presence of a straight-backed, wooden chair and then later says "chair" in the presence of a new large, rounded, over-stuffed chair.

2. When someone learns to say "guitar" in the presence of a guitar and then later sees a banjo for the first time and says "guitar," that response is an example of ________________ extension.

3. The first time a child goes to the zoo, he learns to make the response "zebra" in the presence of a zebra. Later when he returns to the zoo and sees the same animal, he again says "zebra".

4. The same child sees an animal (an aardvark) and asks his father what the name of that animal is. His father says "aardvark" and then as a result the child says "aardvark." The child's response is ________________________ .

5. You have learned to say "verbal behavior" when you see the words typed in the kind of typeface that you are reading now. If you were to see the same words in script typeface, and were to say "verbal behavior," your response would be an example of ________________________ extension.
ANSWERS

1. GENERIC: The child has already acquired the response, the stimulus is novel and all of the relevant stimulus features are present in the novel chair. Only irrelevant features are somewhat different.

2. NON-GENERIC: The response has already been acquired and the stimulus is novel, but all of the relevant features are not present in the new stimulus. The novel stimulus has the wrong number of strings and the wrong shape. Some relevant features are present, however, such as strings, a neck, tuning pegs, etc.

3. NON-GENERIC: This is not Generic Extension because the stimulus is not novel. The other two defining features are present in this example.

4. NON-GENERIC: Although the stimulus is novel and all of the relevant features are present, the third defining feature is absent. The response has not previously been acquired or brought under the control of this set of features.

5. GENERIC: All the defining features are included in this example. The only thing that makes it novel is the change in an irrelevant feature, the specific kind of typeface.

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METAPHORICAL EXTENSION

Prerequisites: stimulus, response, verbal behavior, relevant stimulus features, irrelevant stimulus features

Definition: METAPHORICAL Extension is a form of verbal behavior with the following features:

DEFINING
1. The response form has previously been acquired.
2. The stimulus is novel.
3. The novel stimulus has some, but not all, of the relevant features of the stimulus that previously controlled the response.

IRRELEVANT
1. The type of elementary verbal relationship.
2. Formal or dynamic characteristics of the response.
3. Formal or dynamic characteristics of the stimulus.
4. Whether or not the current response is followed by reinforcement.

If someone had acquired the response "dog" in the presence of several different types of dogs and then saw a wolf for the first time and said "dog," that would be an example of METAPHORICAL EXTENSION. The response form is controlled by the many features a wolf has that are the same as many of the relevant features of a dog. To say "dog" when seeing a wolf is quite likely; to say
"dog" when seeing a Shetland pony for the first time is not so likely. This is because the wolf has many of the relevant features that control the response, but a Shetland pony has only a few of the relevant features that control the response "dog." The fewer relevant features present in a new stimulus, the less likely the response is to be emitted in the presence of that novel stimulus. Likewise, striking differences in irrelevant stimulus features, even if several relevant features are present, will result in the probability of the response being quite low.

We have already seen that if all relevant features are present in a novel stimulus, then the type of extension is GENERIC. Because any feature of an occasion can gain some control over a response made on that occasion, it is possible for a response to be evoked when only irrelevant features which accompanied relevant features are present in a novel situation. This latter type of extension is presented next.

What type of stimuli would result in METAPHORICAL EXTENSION in the other elementary verbal relationships? In the echoic, the stimulus would have to have partial point-to-point correspondence. In textual behavior, the stimulus would either resemble letters or might consist of partially obscured letters. Unusual spellings or misspellings could also result in METAPHORICAL EXTENSION. In intraverbal behavior, only part of the relevant aspects of a definition or description might be present. You might say "reinforcement" as a result of hearing about any stimulus change that follows a response.
STUDY FRAMES

Write GENERIC, METAPHORICAL or NEITHER in the blank after each example.

1. You have learned to say "espadrille" as an intraverbal controlled by the following definition: "A sandal with a canvas upper and a roped sole." Now someone describes some footwear by saying "It is a sandal with a canvas upper and a leather sole." You say "That's an espadrille."

2. You have learned to say "Mozart" as a result of having heard several of his piano concertos. Now, while listening to a piano concerto of a totally different style by Wagner, you say "Mozart."

3. Having learned to say "tree" in the presence of oaks and maples, you now see a white pine for the first time and say "tree."

4. Same background as in number three, except this time you see a lilac bush for the first time and say "tree."
1. **METAPHORICAL**: This response has already come under appropriate stimulus control and the new stimulus is novel. Because the new verbal stimulus has only some of the relevant features of the stimulus that previously controlled the response, the type of extension is **METAPHORICAL**.

2. **NEITHER**: This is somewhat tricky because it is hard to identify the relevant stimulus features for the tact, "Mozart." In this case, since the style is totally different, the extension is simply based upon the new stimulus also being a piano concerto. But being a concerto or being for the piano are probably irrelevant features when it comes to tacting a piece of music as "Mozart."

3. **GENERIC**: The white pine has all of the relevant features which were part of the previous stimulus that controlled the response.

4. **METAPHORICAL**: The lilac bush has some of the relevant features of trees -- leaves, branches, etc., but does not have such features as a trunk or sufficient height.
METONYMICAL EXTENSION

Prerequisites: stimulus, response, verbal behavior, relevant stimulus features, irrelevant stimulus features

Definition: METONYMICAL EXTENSION is a form of verbal behavior which has the following features:

DEFINING
1. The response has already been acquired in one or more of the elementary verbal relationships.
2. The stimulus must be novel.
3. The novel stimulus must have none of the relevant stimulus features of the class of stimuli which previously controlled the response.

IRRELEVANT
1. The type of elementary verbal relationship.
2. Formal or dynamic characteristics of the response.
3. Formal or dynamic characteristics of the stimulus.
4. Whether or not the current response is followed by reinforcement.

Because any feature of an occasion may gain some control over a response reinforced on that occasion, it is possible for irrelevant stimulus features to gain control of a response. For example, it is often reported by the press that a statement was issued by the White House. Skinner says this type of extension occurs because the stimulus frequently accompanies the relevant features.
Sometimes a response may occur in a situation in which there appears to be no appropriate stimulus present. A child may often have had an orange for breakfast. She may sit down one morning when there is no orange on the table and say "No orange." Responses are not controlled by the absence of something and we must, therefore, find some aspect of the current situation that is controlling the response. Skinner accounts for the tendency to say "orange" by suggesting that all of the other features of the breakfast table which have been present when the response orange was reinforced before (when there was an orange on the table) can also gain some control over that response.

Often, when asked to indicate the color they see, people will say "purple" as a result of seeing an ace of spades which is actually red. There is METONYMICAL EXTENSION to the extent that people see some blackness which makes the red look purple.

Saying "stop" as the result of seeing a red hexagonal sign with no letters on it is another example of METONYMICAL EXTENSION. The shape and color are irrelevant stimulus features which frequently accompany the written word "stop." If you had learned to say "espadrille" as a result of hearing "A sandal with a canvas upper and a roped sole usually made in Spain," you might have some tendency to say "espadrille" as a result of hearing about a "Shoe with a cloth upper and leather sole usually made in Spain." In this case, the irrelevant feature "Made in Spain" exerts some control over the response.
Write GENERIC, METAPHORICAL, METONYMICAL, or NONE in the blank following each example below.

1. A child learns to say "record" when he sees a record playing on a stereo. He later sees the stereo alone and says "record."

2. When we teach a child to say "red" by showing him several red circles, he may later say "red" when he sees a blue circle.

3. A child learns that the object on which he eats in the dining room is a table. One morning at breakfast, he sits down at the same place and says that he is going to eat at the "table."

4. A child learns to say "42" as a result of hearing "6 times 7." The child then hears "7 times 6" and says "42."
1. METONYMICAL: The stereo is a set of irrelevant stimulus features which often accompany the relevant features for the response "record."

2. METONYMICAL: Again, the circular shape is an irrelevant feature which has accompanied the relevant feature in each of the training stimuli. There is always a good likelihood that an irrelevant feature which is always present in a set of training stimuli will gain unwanted control over the response.

3. NONE: This is not a form of extension of any kind. The stimulus is not novel.

4. GENERIC: All of the relevant features of the first stimulus are present in the new stimulus. What has changed is the order of stimulus features, which in this case is an irrelevant feature.
MAND EXTENSION

All of the extensions of verbal behavior that have been presented up to this point have been the result of a novel stimulus sharing either relevant or irrelevant features with a stimulus which had previously acquired control over the response that is now evoked. The form of the mand, however, is not determined by a prior stimulus. Therefore, there are no relevant stimulus features. Whether or not those environmental events which we call establishing operations have features that can be called either relevant or irrelevant is a complex matter and is beyond the scope of this introductory analysis.

Although the form of the response is not controlled by a prior stimulus, other stimuli, including audience variables, may determine whether or not the specific response form is emitted. A child may learn to mand "Candy!" from his parents and then have a fairly strong tendency to mand candy from strangers who may in some way resemble his parents. Similarly, a child who has learned to mand water in his own kitchen may also begin to mand water in other people's houses or any place that has a faucet or fountain that resembles the faucet in his own kitchen.

We may also begin to mand in the presence of listeners who are not really capable of reinforcing us. The process of extinction minimizes this tendency; however, we still retain some tendency to mand the behavior of dolls, small babies, or untrained animals. In such cases, the establishing operations are likely to be virtually

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identical to those that evoked the same response forms in the presence of reinforcing audiences.

A final type of mand extension occurs when we make a mand that has never been reinforced and has no possibility of being reinforced. The college student who says, "I wish it were saturday" while taking a test on friday exemplifies this type of mand extension. Most "I wish" statements are of this sort. This type of extension is controlled exclusively by establishing operations, irrespective of any other variables except under special circumstances like trying to be humorous or gain sympathy.
MULTIPLE CONTROL

Skinner, in *Verbal Behavior* notes, "Two facts emerge from our survey of the basic functional relations in verbal behavior: (1) The strength of a single response may be, and usually is, a function of more than one variable, and (2) A single variable usually affects more than one response." These two facts help account for the rich variety of verbal behavior and are also very important facts in the analysis of more complex forms of verbal behavior, especially those related to literature and humor. Multiple control exists whenever more than one variable controls a response of a given form or whenever a response is controlled by more than one variable.

Multiple control is a very important concept and a great deal of verbal behavior is multiply controlled. Multiple control plays a major role in the analysis of humor and literature.
OBJECTIVES

For each of the concepts presented in this unit, the student should be able to:

1. Given the name of the concept, state the defining features.
2. Given the defining features of the concept, state the concept name.
3. Given the name of the concept, provide an original example of the concept.
4. Given an instance of verbal behavior, indicate whether or not that instance is an example of the concept.

Analysis level objective:

1. Given an example of a multiply-controlled verbal response, the student will be able to identify and categorize each of the controlling variables for that response.
Unit 4 Multiple Control

4:1 Multiple Stimuli
4:2 Multiple Responses
4:3 Fragmentary Sources of Strength
4:4 Supplementary Stimulation
4:5 Prompt
4:6 Probe
4:7 Distorted Tact
4:8 Impure Tact
4:9 Word Blend
4:10 Phrase Blend
4:11 Main Thematic Source
4:12 Secondary Source
MULTIPLE CONTROLLING VARIABLES

Prerequisites: controlling variable, response

Definition: MULTIPLE CONTROLLING VARIABLES is a situation which has the following features:

DEFINING
1. There is a single response form.
2. That response is simultaneously strengthened by two or more controlling variables.

IRRELEVANT
1. Response topography.
2. The type of controlling variable (stimulus or establishing operation).
3. The specific number of multiple variables.
4. Whether or not the current response is followed by reinforcement.

If someone asks you what time it is, and it is five o'clock, your verbal response "five o'clock" is controlled by both the visual stimulus of the position of the hands on a clock and by the prior mand for the correct time. The last word in a line of poetry is often the function of more than one variable. In the lines from Shakespeare --

"Golden lads and girls all must, as chimney sweepers, come to dust."

-- the phrase "come to dust" is multiply controlled. The poem is about death, and therefore, one source of strength is a thematic source that
strengthens any response form about death. A second source of control is the intraverbal relationship between "chimney sweepers" and "dust." A final controlling variable is the formal control between the responses "must" and "dust." Another significant example of this type of multiple stimulus control that has already been introduced involves the audience relation. Saying "canine" in the presence of a zoologist may be controlled by both the presence of an appropriate animal as well as by the type of audience. In fact, speaking at all is often multiply controlled in that an audience determines the group of responses that is likely to be emitted, and a particular stimulus determines the specific response form. We are much more likely to say "cardinal" in the presence of both the bird and a friend who is a bird watcher than we are in the presence of the bird alone. Saying "cardinal" in the presence of the bird alone is not multiple stimulus control.
MULTIPLE RESPONSES

Because this concept is so closely related to MULTIPLE CONTROLLING VARIABLES, the study frames for both concepts are combined and presented after the presentation of MULTIPLE RESPONSES.

Prerequisites: controlling variable, response

Definition: MULTIPLE RESPONSES is a situation which has the following features:

DEFINING
1. There is a single controlling variable.
2. That controlling variable simultaneously strengthens two or more different response forms.

IRRELEVANT
1. The specific type of controlling variable.
2. The number of response forms which are strengthened.
3. The type of elementary verbal relationship.

All specific features of either the stimulus or the response are irrelevant. Furthermore, the different response forms may be emitted at different times or at about the same time. Any complex stimulus situation may affect more than one response. A dog walking by may simultaneously strengthen both the response "dog" and the response "canine." You may say both words on the same occasion or days apart. It may also strengthen to some extent the responses "fur," "German
Shepard" (if that is what it is), "brown," "walking," and others. Of course, it is typically the case that only one of these responses will actually be emitted, probably because several other controlling variables are also affecting it as we have just seen. This is an example of MULTIPLE RESPONSES in a tact relationship, but the same kind of thing also occurs in other elementary relationships. For example, the auditory stimulus "dog" may increase the likelihood of the echoic response "dog" or the intraverbal "cat" or the tact "common noun."
STUDY FRAMES

Write MULTIPLE RESPONSE, MULTIPLE CONTROLLING VARIABLES, or SINGULAR CONTROL in the blank.

1. Saying "aardvark" as a result of hearing someone say, "What is that animal in the cage?" when an actual aardvark is in the cage.

2. Saying "aardvark" as a result of seeing an aardvark and saying "armadillo" as a result of seeing an armadillo.

3. Saying, "There is a dog, a German Shepard." as the result of seeing a German Shepard dog.

4. You see a new pick-up truck in your neighbor's driveway and say, "Nice truck." The next day you see the truck again, but say, "Nice pick-up."

5. The response "double" in the ad: "Your A. B. Dick copy man will be there on the double."

6. Saying "bow (rhymes with "go")," when you see an archer write "bow," but later saying "bow (rhymes with "cow")," when seeing an actor write "bow."
ANSWERS

1. MULTIPLE CONTROLLING VARIABLES: The response "aardvark" is a function of the visual non-verbal stimulus and the mand for the name of the animal.

2. SINGULAR CONTROL: In each situation only one response form is the function of one controlling variable.

3. MULTIPLE RESPONSES: In this case, the single non-verbal stimulus, the dog, evokes two different response forms.

4. MULTIPLE RESPONSES: Same as number three. It doesn't matter whether the different response forms occur at about the same time or at different times, as long as the stimulus is capable of strengthening either response form.

5. MULTIPLE CONTROLLING VARIABLES: "Double" is controlled both by the "theme" (getting there is a short time) and by the intraverbal relationship between "copy" and "double."

6. BOTH: Each situation alone demonstrates multiple controlling variables. The fact that the same visual verbal stimulus evokes different responses in each situation illustrates MULTIPLE RESPONSES.
FRAGMENTARY SOURCES OF STRENGTH

Prerequisites: response, controlling variable, multiple controlling variables

In all of the examples of multiple controlling variables which we have examined so far, each of the controlling variables affected the entire response form. This, however, need not always be the case. Sometimes one variable will determine only part of the subsequent response. When this occurs, that variable is called a FRAGMENTARY SOURCE OF STRENGTH.

Definition: FRAGMENTARY SOURCE OF STRENGTH is a type of stimulus control which has the following features:

DEFINING
1. The response form is multiply controlled.
2. The entire response form is strengthened by one of the variables (usually as one of several alternatives as a case of multiple responses).
3. A second variable controls only part of the response form.

IRRELEVANT
1. Which types of elementary verbal relationships are involved.
2. The response topography.

A common example of this phenomenon is alliteration in poetry.

"The faint fresh flame of the young year flushes from leaf to flower and flower to fruit."

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In this line there is presumably a thematic controlling variable which strengthens such responses as "new," "beginning," "fresh," etc.

Having said "faint" provides a formal (echoic) additional source of strength for the first part of the response "fresh," but exerts no control over the other response forms, "new" and "beginning."

Therefore, the response "fresh" is somewhat more likely to occur.

A detailed treatment of the effects of multiple control as alliteration and other aspects of literature is presented in Chapter 9 of *Verbal Behavior*. If the multiply determined response is completely affected by a formal source, then the strengthening is not fragmentary. If you say "no smoking" both because it would be currently reinforcing to you if someone nearby stopped smoking and also because you faintly heard someone say "no smoking" the echoic source would not be considered fragmentary.
STUDY FRAMES

In each case, the underlined word is multiply controlled. The main source is thematic. Classify the second source as either a FRAGMENTARY or NON-FRAGMENTARY source.

1. Saying "vinyl is final."

2. Saying "make like a drum and beat it."

3. She sells sea shells by the sea shore.

4. Saying "stimulus" while reading a programmed text in a frame that says, "A response is elicited by a st________."
ANSWERS

1. FRAGMENTARY: There is formal control between "inyl" and "inal." The variable controls most, but not all, of the response "final."

2. NON-FRAGMENTARY: In this case, the secondary source is the thematic (intraverbal) relationship between "drum" and "beat it." The secondary source controls the entire response form.

3. FRAGMENTARY: The secondary source is the formal (echoic or copying a text) relationship between the "s's" in the first four words and the "s's" in sea shore. The formal source of control is clearly over only a part of the response being analyzed.

4. FRAGMENTARY: The secondary source is formal (textual) and clearly controls only the "st" part of the response. The primary source of control which controls the entire response is the intraverbal relationship between stimulus and responses.
SUPPLEMENTARY STIMULATION

Prerequisites: functional relationship, controlling variables, multiple controlling variables, response.

Under certain circumstances, a response that has previously been acquired in the presence of a given discriminative stimulus may not currently be evoked by the presence of that stimulus. There are many factors that temporarily weaken the effectiveness of a given stimulus in increasing the probability of a given response. These include the passage of time, other interferring stimuli, a stimulus which has only a few features in common with the set of stimuli under which the response was acquired, illness, and the effects of drugs. Even though the response is not forthcoming under ordinary circumstances, this does not mean that its probability of occurrence has not been increased to some extent. We can often demonstrate this by presenting an additional controlling variable, itself not generally sufficient to evoke the response, which when combined with the effects of the other stimulus conditions is sufficient to evoke the response. The additional controlling variable may be considered supplementary.

Definition: SUPPLEMENTARY STIMULATION is a type of controlling variable which has the following features:

DEFINING

1. It sums with another controlling variable to evoke a response in a case of multiple controlling variables.
2. The supplementary variable, by itself, is never likely to be sufficient to evoke the response.

IRRELEVANT

1. The type of controlling variable.

This situation often occurs when we are trying to remember some event or the name of something. Often only the additional stimulation of the first letter will then bring forth the desired response, or perhaps some weak intraverbal supplementation will be sufficient. If we are in a zoo and see an aardvark, and we have previously learned the name but cannot remember it currently, someone may say, "The name begins with an "a." That may be sufficient to then evoke the response. Notice that this would be called a fragmentary echoic source of strength. If we did not know the name of the animal, the letter or sound "a" would not be sufficient to evoke the response "aardvark." Similarly, if we had the response in our repertoire, but there was no aardvark present, we would have almost no tendency to say "aardvark" only as a result of hearing the "a" sound. The supplementary source need not be formal. If you are looking at a python, but the name is not coming to mind, someone may say "monty" and that may be sufficient to sum with the non-verbal stimulus to evoke the response "python." If there was not an already fairly strong tendency to "python," the stimulus "monty" could just as well evoke other responses, such as "Hall," or "That's not its name," or whatever.
STUDY FRAMES

Write either SUPPLEMENTARY or NOT-SUPPLEMENTARY in the blank.

1. A tendency to say "alligator" as the result of hearing someone say "alligator" in the presence of an alligator at the zoo.

2. A tendency to say "crocodile" as a result of seeing a crocodile (but forgetting the name) and then hearing someone talking about the new crockpot cooker that he bought.

3. You have never learned that the animal that you are looking at is called a crocodile, and you overhear someone talking about a crockpot, but have no tendency to say crocodile as a result.

4. You have again forgotten (a common problem of yours) that the reptile you are looking at is called a crocodile. Then you overhear some little kid say "crocodile" and as a result you find yourself saying, "Oh yes, that is right, crocodile."

5. Someone asks you what your uncle wants for his birthday and the answer is "on the tip of your tongue." The person then clears his throat and says, "I'm a bit hoarse." Suddenly you say, "I remember, he wanted shoes."
1. **NOT SUPPLEMENTARY:** The echoic stimulus is sufficient to evoke the response by itself.

2. **SUPPLEMENTARY:** The formal strengthening from "crock" sums with the visual stimulus to evoke the response. Only hearing someone say "crockpot" generally is not sufficient to evoke the response "crocodile."

3. **NOT SUPPLEMENTARY:** There is nothing to supplement in this case.

4. **NOT SUPPLEMENTARY:** Same as number 1.

5. **SUPPLEMENTARY:** This is like the Monty Python example. The auditory stimulus "hoarse" (which sounds like "horse") in this situation would not be very likely to evoke the response "shoe" if there was no other source of strength for the response.
Typically, supplementary stimulation is provided by another person for the speaker. Sometimes it is the case that this other person could identify the response that the speaker is likely to make and sometimes he or she could not. In the latter case, the person may imply supply the supplementary stimulation to see what responses might be at some strength in the speaker at that time. If the person providing the supplementary stimulation can identify the upcoming response, the type of supplementary stimulus is called a PROMPT. If he cannot, then it is called a PROBE. It does not matter whether the supplementary stimulation is formal or thematic.

Definition: A PROBE is a discriminative stimulus with the following features:

DEFINING
1. It is a supplementary stimulus
2. The person providing the supplementary stimulus cannot identify the response that the speaker is likely to emit.

IRRELEVANT
1. Whether the controlling relationship is formal or thematic.
2. Who provides the supplementary stimulus (either another person or the speaker himself).

Definition: A PROMPT is a discriminative stimulus with the following features:
DEFINING

1. It is a supplementary stimulus.
2. The person providing the prompt can identify the response that the speaker is likely to emit.

IRRELEVANT

Same as PROBE.

Whether or not the person providing the PROMPT or PROBE can identify the likely response is probably dependent upon whether or not he is capable of being controlled by the same controlling variable with which the supplementary stimulation is said to sum. Two people may both be looking at an aardvark and one of them cannot remember the name. So the other says, "It begins with an 'a.'" That is an example of a PROMPT because the provider is also stimulated by the primary variable and could emit the response. A person may say that he saw an animal at the zoo today but cannot remember the name of it. You might ask, "Did its name begin with an 'a'?" That is a PROBE because the person providing the supplement is in no way being affected by the animal that was seen by the speaker, which may have been an alligator, or an antelope, or an aardvark. The provider cannot identify the upcoming response.

Both a PROMPT and a PROBE may be either formal or thematic. If the source of stimulation has partial point-to-point correspondence with the response, then it is a formal prompt or probe, as in the case with echoic or textual stimuli. If there is no point-to-point correspondence, then the prompt or probe is thematic, as would be the case if the supplementary stimulus was a non-verbal stimulus or an
intraverbal stimulus. A final point is that the speaker can supply
him or herself with the prompt or probe; it needn't be another person.
Notice that this makes the prompt situation more likely since often the
speaker will be affected by the primary source.
Classify each of the following supplements as PROBE, PROMPT or NEITHER and as either FORMAL or THEMATIC.

1. A person is trying to remember another name for a pig. Expecting him to say "hog," you say, "It rhymes with dog."
   a. ___________________________  b. ___________________________

2. Same situation as above, except you say, "Have you had your swine flu shot yet?"
   a. ___________________________  b. ___________________________

3. You ask a person standing on top of a lookout tower what he/she sees.
   a. ___________________________  b. ___________________________

4. A Rorschach ink blot test.
   a. ___________________________  b. ___________________________

5. You record a series of vowel sounds and then play them back, telling someone it is a message of some kind and asking him to tell you what it says.
   a. ___________________________  b. ___________________________

6. Someone is trying to identify a photograph of a person. You say, "that's Aunt Gertrude." The other person then says, "You're right, it is Gertrude."
   a. ___________________________  b. ___________________________
ANSWERS

1a. PROMPT: The stimulus "dog" is supplementary and the provider can identify the likely response.
   b. FORMAL: There is partial point-to-point correspondence between "dog" and "hog."

2a. PROMPT: The same reason as number 1.
   b. THEMATIC: There is not point-to-point correspondence between "swine" and "hog."

3a. PROBE: The question strengthens no particular response form and the provider cannot easily identify the upcoming response.
   b. THEMATIC: There is no point-to-point correspondence between the question and any response (other than an echoic response).

4a. PROBE: It wouldn't be used if the provider knew the upcoming response.
   b. THEMATIC: No point-to-point correspondence -- tact relationship.

5a. PROBE: This is like an auditory Rorschach.
   b. FORMAL: There is a partial echoic source and there is therefore partial point-to-point correspondence.

6a. NEITHER: The stimulus "Gertrude" is not supplementary.
   b. FORMAL: This is an echoic relationship.
It was pointed out earlier that the Tact relationship primarily benefits the listener. This benefit is greatest when the form of the tact is primarily controlled by a non-verbal stimulus in the environment. Often, however, a second variable may partially control the form of the response. Although the verbal community typically provides some form of generalized conditioned reinforcement for the tact in order to free it from specific states of deprivation or aversive stimulation, certain aspects of generalized conditioned reinforcement can enter into the controlling relationship too. Those responses that have received the most reinforcement in the past are most likely to occur again, even if the stimulus conditions are not quite appropriate. A fisherman who has gotten more reinforcement when he described catching large fish than when he described catching smaller fish may have a greater tendency to talk about large fish. This may be the case even when the one just caught was not so large and therefore the verbal description of the size of the catch is often somewhat fishy. If the history of reinforcement is sufficient, the response may occur in the presence of totally inappropriate stimulus conditions. The person may not have caught any fish at all, but fantastic descriptions are still forthcoming in the presence of an appropriate audience.

Sometimes the presence of an establishing operation for some form of non-generalized reinforcement may partially control the form of the response. In this case, the response of the speaker can be said to be partially a tact and partially a mand. A common example
of this latter type of multiply controlled tact often occurs when someone who would be reinforced by another person hurrying is asked what time it is by that other person. It may actually be twenty minutes to two, but the speaker may say, "It's almost two o'clock." The response is partially controlled by the position of the hands on a clock, but is also partially controlled by the effect it has had in the past in inducing listeners to get ready to leave more quickly. If the form of the response is completely controlled by the prior non-verbal stimulus, then the response is just an ordinary tact. Only when some aspect of special measures of either generalized or non-generalized reinforcement enters into the controlling relation for a response is the response called either "distorted" or impure."

Definition: A DISTORTED TACT is a verbal response with the following features:

DEFINING
1. Partially controlled by a prior non-verbal stimulus.
2. Partially controlled by a history of special measures of generalized reinforcement.

IRRELEVANT
1. The specific non-verbal stimulus.
2. The magnitude of reinforcement.

Definition: An IMPURE TACT may be defined as a verbal response with the following features:
DEFINING

1. Partially controlled by a prior non-verbal stimulus.
2. Partially controlled by a history of special measures of non-generalized reinforcement (mand variable).

IRRELEVANT

Same as DISTORTED TACT
Classify each of the following examples as a PURE, DISTORTED, or IMPURE TACT.

1. Telling someone how good the cake that they baked looks as a result of both the physical appearance of the cake and the fact that a piece of it would currently be reinforcing.

2. Telling someone how nice their new glasses look as a result of the glasses themselves, but primarily as a result of the avoidance of the criticism for saying that they look a little funny.

3. Telling someone what an important role you played in a project, partially as a result of the fact that you played only a minor role, and partially because it is reinforcing to hear anyone, yourself included, say how important you are. (Let's further assume a disinterested audience.)

4. A tendency to say that the fish you caught was 22 inches long, as a result of measuring it and finding it to be 22 inches long.

5. A tendency to say that the fish you caught was 28 inches long (but it is really 22 inches) as a result of a bad guess.
1. IMPURE TACT: This is because the response form is partially controlled by the non-verbal stimulus and partially by a mand variable.

2. DISTORTED TACT: Partially controlled by the appearance of the glasses and partially controlled by the reduction of possible aversive consequences.

3. DISTORTED TACT: Partially controlled by the role you actually played in the project and partially controlled by the special measure of generalized reinforcement (self-praise).

4. PURE TACT: This is not controlled in part by either special measures of generalized reinforcement or by non-generalized reinforcement.

5. PURE TACT: Remember that correctness is irrelevant when it comes to classifying a verbal response as a tact.
Often, either a single variable or two or more variables will strengthen more than one response simultaneously. If either or both of the responses are complex, or composed of several elements, the possibility exists that the response form that actually is emitted will be composed of elements or fragments of each response. These recombinations of fragments are sometimes called slips of the tongue or are situations in which we say that we misspoke. The effects of fragmentary recombination can often be seen in the words that result from trying to say tongue twisters.

If one is looking at both a chair and table, there may be some tendency to say "cable" or "chable." In either case, the first part of the response is controlled by the presence of the chair (tact) and the second part of the response is controlled by the presence of the table (tact). If both responses are emitted, there is nothing fragmentary about the situation, and therefore nothing can be recombined. More complex responses can be recombined also. If a certain event or announcement strengthens both the responses "far out" and "right on," the resulting emission may be the phrase "right out."
WORD BLENDS and PHRASE BLENDS

Prerequisites: fragmentary recombination, controlling variable, multiple control

Fragments may recombine either at the word level or at the phrase level. Saying "cable" as a result of looking at a chair and table is a WORD BLEND. Saying "right out" as a result of a tendency to say both "far out" and "right on" is a PHRASE BLEND. The key distinction is in the size of the fragments that form the recombination. If the fragments are only letters, or phonemes, then the new response is a WORD BLEND. If, on the other hand, the fragments consist of entire words, then the new blend is a PHRASE BLEND.

Definition: A WORD BLEND is a form of fragmentary recombination which has the following features:

DEFINING
1. The blended response is a single word.
2. Part of the blend is controlled by one variable and part is controlled by another variable.

IRRELEVANT
1. Type of controlling variable.
2. Whether or not the new blend is a standard form (in the dictionary).

Definition: A PHRASE BLEND is a form of fragmentary recombination which has the following features:
DEFINING

1. The blended response is composed of two or more words.
2. The parts of the blend are separately controlled by different variables.
3. There are no word blends in the phrase.

IRRELEVANT

Same as word blend.

If the blending of the two phrases occurs as the blending of one word within them, then that is not considered a phrase blend. For example, if you have a strong tendency to say both "right on" and "far out," and end up saying "fright out," that is an example of a word blend.

The relationship between the controlling variables and each part of the blended response may be any of the elementary verbal relationships, excluding the audience relationship. You might say "chable" as the result of seeing the word "table" and hearing someone say "chair" at the same time. The response "guestimate" may have originally been the blend of two mands: "Give me an estimate" and "make a guess." The controlling relationships in phrase blends may also be any of the elementary verbal relationships.
Classify the following blends as either WORD or PHRASE BLENDS. Also indicate which type of elementary relationship each part of the blend is.

1. Saying "rone" as the result of a strong tendency to say both "rock" and "stone" as the result of looking at a pebble.
   a. 
   b. 
   c. 

2. Saying "frumious" as a result of a strong tendency to say both "furious" and "fuming" as a result of seeing the word angry and hearing someone say fuming.
   a. 
   b. 
   c. 

3. Saying "shut out" as a result of a strong tendency to say "get out" and "shut up" to a boisterous individual.
   a. 
   b. 
   c. 

4. Saying "fright out" as a result of seeing the written words "far out" and hearing someone say "That's right."
   a. 
   b. 
   c.
ANSWERS

1a. WORD BLEND: The blended response is a single word and the first part is controlled by one variable and the second part is controlled by another variable.

b. TACT: The controlling variable for the first part of the response is a non-verbal stimulus.

c. TACT: Same as 1b.

2a. WORD BLEND: The two defining features are both present.

b. INTRAVERBAL: The tendency to say "furious" is controlled by a prior verbal stimulus, "angry," and there is no point-to-point correspondence between them.

c. ECHOIC: The tendency to say "fuming" as a result of hearing someone say "fuming" has all of the defining features of the echoic relationship.

3a. PHRASE BLEND: The elements which blend are words and the boisterous individual simultaneously strengthens two response forms.

b. MAND: The response "get out" would be reinforced by the individual leaving.

c. MAND: The response "shut up" would be reinforced by the individual simply being quiet. The boisterous individual is a complex controlling variable part of which strengthens one of the mand forms and part of which strengthens the other form.
4a. WORD BLEND: Even though the response consists of a phrase, what is blended is only the first word in the phrase. The actual blend itself has the two defining characteristics of a WORD BLEND.

b. TEXTUAL: The response is vocal, the stimulus is visual and there is point-to-point correspondence between them. There is also formal similarity between the stimulus and the response-product.
STANDARD AND NON-STANDARD FORMS

Some fragmentary recombinations take the form of responses that have previously been emitted and reinforced by the verbal community. Saying "cable" as a blend of "chair" and "table" is an example. Other blends are entirely novel response forms that have never been reinforced by the verbal community. Saying "frum-i-ous" as a blend of "furious" and "fuming" is an example of this latter situation. Response forms that are typically reinforced by the verbal community are called STANDARD FORMS. Response forms that are not are called NON-STANDARD FORMS.

Generally, a non-standard form is not reinforced and is no more likely to be emitted in the future than it was in the past. Occasionally, however, a non-standard response form will receive some reinforcement and will, in fact, be more likely to be emitted in similar situations in the future. We call such a response form a neologism. The word "smog" is a good example of a neologism. Presumably the response was first emitted as a result of a strong tendency to say both "fog" and "smoke." Because both smoke and fog occur together as a stimulus situation, and because there was not already some response form appropriate in this combination of stimulus features, the response "smog" was reinforced since it provided useful information to the speaker. A word is not really a neologism until it has been emitted and reinforced.
Prerequisite: thematic control

In analyzing literature or poetry, a major variable that must be considered as contributing to the emission of a particular response is the previous words, or the general reasons for writing the prose or poetry. In Shakespeare's Cymbaline, the lines appear: "Golden lads and girls all must, as chimney sweepers, come to dust." An analysis of the variables responsible for the phrase "come to dust" would have to include the context, which is death. The context would presumably strengthen a number of responses such as "die," "meet their end," or "perish from the earth." A main thematic source functions very much like the audience variable. It selects what is to be talked about, though not necessarily any specific response form. The determination of the specific response form is a result of additional variables summing with the MAIN THEMATIC SOURCE, as it is called. For example, there is a thematic relationship between the phrase "chimney sweepers," and "come to dust." This controlling relationship sums with the MAIN THEMATIC SOURCE to further increase the likelihood of the phrase "come to dust." A final factor determining the emission in this case is the formal source of strength, the previous response "must." Neither "must" nor "chimney sweepers" is likely to evoke the response "dust" by itself. But of all the response forms strengthened by the MAIN THEMATIC SOURCE, "come to dust" is the strongest because of the additional two sources of strength.
Definition: A MAIN THEMATIC SOURCE is a controlling variable with the following features:

DEFINING
1. It controls a large group of responses.
2. All of the responses would have about the same effect on a listener.

IRRELEVANT
1. Type of thematic elementary relationship (mand, tact, intraverbal).
2. Specific features of the stimulus and response.

The easiest, although not the most precise, way of defining or describing a MAIN THEMATIC SOURCE is to say that, "It is the same source that would also strengthen ...," and then list several of the other responses that you are trying to analyze. For example, an advertisement for vinyl floors says, "Vinyl is final." The MAIN THEMATIC SOURCE for the response "final" would be the same variable that would also strengthen the responses "long lasting," "good forever," etc. If the response we are analyzing is the only response form typically evoked by a particular variable, then we do not call that variable a MAIN THEMATIC SOURCE. A MAIN THEMATIC SOURCE must strengthen two or more responses (all the multiple response forms must have essentially the same effect upon the listener).

The response may be in part controlled by more than one thematic source. One of the sources may also strengthen responses that would not have the same effect on a listener. In the line from T. S. Eliot's
poem, "Serontion" -- "What will the spider do, suspend its operations" -- the response "suspend" is controlled by the same variable that would also control such responses as "stop," "cease," "bring to a halt," etc. This is the MAIN THEMATIC SOURCE. There is also a thematic relationship between "spider" and "suspend." However, "spider" is not a MAIN THEMATIC SOURCE because the other responses that it might control, such as "web," "spin," "insect," would all have a very different effect upon the listener if they were substituted for the response being analyzed. We call this a secondary thematic source, which is the next concept to be presented.
STUDY FRAMES

Identify the MAIN THEMATIC SOURCE for each of the following examples. The response to be analyzed is underlined.

1. Your A. B. Dick copy man will be there on the double.
   MTS is

2. An ad for radio news says, "You don't need T.V. to get the picture."
   MTS is

3. From a song by Joni Mitchell -- "She'll wake up in the morning without him and go to the window and look out through the pane (pain)." Assume that you hear this rather than read it.
   MTS is

4. An ad for a local jewelry store reads: "Love has a golden ring to it."
   MTS is
ANSWERS

1. The MAIN THEMATIC SOURCE is the same variable which would also strengthen "in a hurry," "right away," or "very quickly."

2. The MAIN THEMATIC SOURCE is the same variable which would also strengthen "know what's going on," or "get the latest information."

3. The MAIN THEMATIC SOURCE is the same variable which would also strengthen "sorrow," "grief," or "loneliness."

4. The MAIN THEMATIC SOURCE is the same variable which would also strengthen "good sound to it," or "pleasing sound to it."
SECONDARY SOURCES OF STRENGTH

When a response is controlled only by a main thematic source, that response is usually not very interesting, compared to a response that is multiply controlled. Key words in puns, poetry, or humor are interesting and amusing because of the effects of multiple control. If the listener is not affected by all of the multiple sources, he may not find the response especially interesting, or he may not "get it." What typically makes a particular response especially appropriate is the strength it derives from some additional source other than the main thematic source. We call these additional sources SECONDARY SOURCES OF STRENGTH. Almost always, these sources are either intraverbal, as in the relationship between "spider" and "suspend," or they are echoic, as is the relationship between "vinyl" and "final." The echoic relationship is typically partial; that is, the response being analyzed only has partial point-to-point correspondence with a previous response.

Definition: SECONDARY SOURCES OF STRENGTH are controlling variables with the following features.

DEFINING

1. The response being analyzed is also controlled by a main thematic source.
2. It also controls other response forms.
3. The other response forms would have a different effect upon the listener.
IRRELEVANT

1. Whether the relationship between the secondary source and the response is formal or thematic.

We have already seen how "spider" meets these criteria. Remember the lines from Shakespeare: "Golden lads and girls all must, as chimney sweepers, come to dust." "Must" as an echoic stimulus might also strengthen "rust, crust, lust" -- each of which would have very different effects upon the listener.
Identify the MTS and all secondary sources for each of the following. (The response to be analyzed is underlined.) Indicate whether each secondary source is formal or thematic.

1. One ad for radio news says: "You don't need television to get the picture.
   a. MTS _______________________________________________________
   b. Secondary Source(s) ________________________________________
   c. F or Th ___________________________________________________

2. Printed on the side of a garbage truck: "Our business is always picking up."
   a. MTS _______________________________________________________
   b. Secondary Source(s) ________________________________________
   c. F or Th ___________________________________________________

3. A guitar player who misses the same chord several times in a row is told by a friend, "Don't fret about it." (A fret is part of a guitar.)
   a. MTS _______________________________________________________
   b. Secondary Source(s) ________________________________________
   c. F or Th ___________________________________________________

4. Samuel Johnson, who boasted he could invent a pun on any subject, was asked to make up a pun about the King. He said immediately, "The King is not a subject."
   a. MTS _______________________________________________________
   b. Secondary Source(s) ________________________________________
   c. F or Th ___________________________________________________
1. a. MTS is the same variable that would also strengthen such responses as "know what is happening" or "get the news."
   b. Secondary source is the intraverbal relationship between "television" and "picture."
   c. Thematic -- no point-to-point correspondence.

2. a. MTS: same variable that would also strengthen "improving" or "getting better."
   b. Secondary source: intraverbal relationship between "garbage" and "picking up."
   c. Thematic.

3. a. MTS: same variable that would also strengthen "worry" or "get upset."
   b. Secondary source: tact relationship -- fret is part of a guitar.
   c. Thematic.

4. a. MTS: same variable that would also strengthen "topic" or "person to discuss."
   b. Secondary sources: There are two. One is the intraverbal relationship between "King" and "subject," and the other is the echoic relationship between "(any) subject" and ",(not a) subject."
   c. Thematic and formal.
Private Stimuli and Simple Autoclitics

When the verbal community is affected by the same or similar stimuli which also affect a speaker, they can differentially reinforce appropriate verbal responses in the presence of that stimulus. However, a much more difficult situation arises when the stimuli to which the speaker is reacting are not available to the rest of the verbal community. This is, of course, the situation that exists when verbal behavior is brought under the control of private stimuli, or stimuli inside the speaker. Verbal behavior controlled by these private stimuli can be useful to the listener who would benefit from knowing more about the condition of the speaker or the way in which the speaker is being affected by external stimuli. This section presents several methods by which a speaker learns to behave verbally under the control of private stimuli and also introduces a category of verbal behavior which results from aspects of the ongoing verbal behavior of the speaker.
Objectives

For each of the concepts presented in this unit the student will be able to:

1. Given the name of the concept, give the defining features.
2. Given the defining features, provide the name of the concept.

For each of the four ways in which private stimulus control over verbal behavior may be developed, the student will be able to:

3. Given the name of the concept, provide an original example of how that method works.
4. Given a description of one of the methods, state the name of the method.

For both types of autoclitics, the student should be able to:

5. Given a sample of behavior, state the concept name.
6. Given a concept name, provide an original example of that type of autoclitic.
PRIVATE STIMULI

Prerequisite: stimulus

Most stimuli are capable of affecting several different people in the same way. This fact allows for the verbal community to differentially reinforce verbal responses when it is training one of its members. If the trainer can also make contact with the stimulus at the same time that the learner does, then the trainer can decide whether or not the learner's response is appropriate to the stimuli present. Training would be much more difficult if the stimuli were present only for the learner, and the trainer had to guess whether or not the appropriate stimuli for a given response were present. Unfortunately, for the verbal community and the individual, this is precisely the problem that must be overcome when the verbal community tries to teach an individual to describe his own private stimuli. Only the individual is in contact with the stimuli arising from some event like a toothache. The trainer can only assume or infer that the appropriate stimuli are present when someone says "toothache."

Definition: PRIVATE STIMULUS

DEFINING:
1. is a physical energy change
2. is capable of affecting a sense organ
3. affects only one individual -- other individuals are not affected

IRRELEVANT:
1. type of energy change
Those different parts of the nervous system that are capable of being affected by stimuli are called RECEPTORS. That part of the system that is affected by light is called a photoreceptor. The parts that are affected by chemical changes when we taste or smell something are called chemoreceptors. The following is a list of the types of receptors and the type of stimulus that is capable of affecting them:

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Type of Stimulus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photoreceptor</td>
<td>light</td>
</tr>
<tr>
<td>Phonoreceptor</td>
<td>sounds</td>
</tr>
<tr>
<td>Chemoreceptors (gustatory and olfactory)</td>
<td>chemicals -- either on the tongue or in the nasal passage</td>
</tr>
<tr>
<td>Mechanoreceptors (on the surface and within the body)</td>
<td>pressure</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>movement in the tendons, muscles, and joints</td>
</tr>
<tr>
<td>Vestibular</td>
<td>movement of the body in space</td>
</tr>
<tr>
<td>Thermoreceptors</td>
<td>heat or lack of it</td>
</tr>
<tr>
<td>Free nerve endings (surface and inside the body)</td>
<td>painful stimuli</td>
</tr>
</tbody>
</table>
Private stimuli are most often associated with the following types of receptors: free nerve endings deep within the body, thermoreceptors deep within the body, kinesthetic receptors, vestibular mechanoreceptors, phonoreceptors, chemoreceptors, and -- on or near the surface of the skin -- mechanoreceptors, thermoreceptors, and free nerve endings. The pain that results from a toothache is therefore a private stimulus, affecting free nerve endings within the body. The burning sensation produced by a hot stove is the result of a public stimulus, the heat radiating from the stove. Other individuals can also be affected by the heat, just as they can be affected by the visual stimulation of the stove, or the olfactory stimulation if something is burning on the stove.
Ways of Teaching Responses to Private Stimuli

There are four major ways in which the verbal community, in trying to teach verbal responses to private stimuli, attempts to overcome the difficulty of not having direct access to them. The first is PUBLIC ACCOMPANIMENT.

Definition: The method of PUBLIC ACCOMPANIMENT is a way in which the verbal community brings verbal behavior under the control of private stimuli and has the following features.

DEFINING
1. A private stimulus
2. A collateral public stimulus
3. Reinforcement for a given response contingent upon the presence of the public stimulus

IRRELEVANT
1. The type of private stimulus
2. Whether or not there is any causal relationship between the public and private stimulus (they need only be correlated)

If we see an object strike someone, or see damage to the tissue, we assume that these visual stimuli are correlated with private stimuli resulting from stimulation of free nerve endings. If we see a rash on someone's arm, we assume that the rash is correlated with private stimuli associated with itching. Of course, not all public stimuli have collateral private stimuli. A rash may in fact not itch. An
area of swollen or bruised skin may not hurt. On the other hand, a person may feel an itch although there is no public collateral stimulus, or a person may have pain without any public accompaniment.
Collateral Response

Prerequisites: private stimulus, behavior

Additional evidence is often available in the form of a COLLATERAL RESPONSE. The private stimulation of free nerve endings (pain) may be accompanied by crying or moaning. A toothache may have the collateral response of holding one's jaw, likewise for a stomachache.

Definition: The method of teaching responses to private stimuli by COLLATERAL RESPONSES has the following features.

DEFINING
1. A private stimulus
2. Some collateral behavior
3. The community's reinforcement is contingent upon the presence of the collateral response

IRRELEVANT
1. The type of stimuli
2. The form of behavior

By response, we typically mean some form of behavior involving muscle or gland movement. Bleeding is not a collateral response, but is a public accompaniment. Looking pale is also not a collateral response, although the act of paling could be considered a collateral response that has looking pale as a response-product.
Study Frames: PUBLIC ACCOMPANIMENT
COLLATERAL RESPONSE

Write PUBLIC ACCOMPANIMENT, COLLATERAL RESPONSE, or NEITHER in the blank.

1. You tell a child "That hurts" on the basis of seeing bruised skin on the arm._____________________

2. You reinforce a child for saying "It hurts" because you observe the child grimacing.______________

3. The same as number 2, except that the child is screaming.__________________________

4. An empty cookie jar (that was full when you left the room) prompts you to say to a child, "Does your stomach ache? You must have a stomachache."____________________

5. A child having learned to say "pounding" under a variety of circumstances, now says, "I have a pounding headache."____________________
ANSWERS

1. PUBLIC ACCOMPANIMENT: The bruise is a public stimulus that is presumably correlated with painful private stimuli.

2. COLLATERAL RESPONSE: The grimacing is a form of behavior that is presumed to be concomitant with painful private stimuli and is therefore a COLLATERAL RESPONSE.

3. COLLATERAL RESPONSE: Same reason as number two. Skinner would probably say that both the pain and the scream are caused by the same controlling variable. He would not say that some event, such as being cut, causes pain, and then the pain in turn causes the scream.

4. PUBLIC ACCOMPANIMENT: Same as number 1.

5. NEITHER: This example involves neither a public accompanying stimulus nor a collateral response. This is a type of "extension" that will be presented in the next section.
Some of the stimulus features that are present in a public stimulus may also be present in a private stimulus. These are most likely to be features that are either geometrical, temporal, or intensive. When private stimuli have these properties and the individual has already learned to respond to these properties when they are part of a public stimulus, the response is likely to be extended to the private stimulus. This type of extension can be any of the three categories that have already been discussed: generic, metaphorical, or metonymical.

Definition: The method of learning to respond to private stimuli known as COMMON PROPERTIES has the following features.

1. A response topography controlled by a feature or features of a public stimulus
2. A novel private stimulus that has properties in common with the public stimulus

IRRELEVANT
1. Whether the properties of the private stimulus which are in common with properties of the public stimulus are relevant or irrelevant
2. Type of extension
3. Type of properties

If you have learned to call some public stimulus that oscillates in intensity "throbbing," then there is a good likelihood that a headache
that oscillates in intensity may also evoke the response "throbbing."
This is another form of generic extension, since the throbbing headache
has all of the features that are relevant to the notion of throbbing
when a public stimulus controls that response.

Another way in which private stimuli can gain control over a
response involves the behavior of the speaker himself. We learn to
describe our own behavior because the verbal community can react to
the response-products of it and differentially reinforce appropriate
descriptive responses. For that matter, the speaker can also react
to those stimuli: he can see himself move or he can hear himself
talk. But the individual is also being affected by kinesthetic
stimuli that are produced by his body's movement in the muscles,
tendons, and joints. Even if the behavior was to be reduced in magni-
tude to the point that there was no externally observable response-
product, the individual could still feel the effects of private stimu-
lation and would therefore be able to describe his own covert behavior.
We may talk more and more quietly until we are producing no easily
observable movement or sound, yet we can report that we are engaging
in verbal behavior because the kinesthetic stimuli that accompanied
the overt behavior gain control over the response to some extent.

Definition: This is called RESPONSE REDUCTION and has the following
features.

DEFINING

1. A verbal response controlled by the speaker's own overt
   behavior

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2. Private kinesthetic stimuli that are collateral with observable public stimuli.

3. The response then is reduced in magnitude to the point where no public stimuli are produced.

IRRELEVANT

1. The topography of the response
2. The particular form of the speaker's overt behavior

Neither of these two additional ways involves any new concepts. The first, COMMON PROPERTIES, is just a special case of tact extension. The second, RESPONSE REDUCTION, may be considered a special case of PUBLIC ACCOMPANIMENT.
SECONDARY VERBAL BEHAVIOR

Verbal behavior that is in some way controlled by the speaker's own ongoing verbal behavior is the subject of this section. The elementary verbal relationships -- mand, tact, intraverbal, echoic, textual, copying a text, and taking dictation -- are called PRIMARY VERBAL BEHAVIOR. In all of these relationships except the mand and the tact, the controlling variable is some sort of verbal stimulus. There is no reason why that verbal stimulus cannot be the response-product of the speaker's own ongoing verbal behavior. A few examples will illustrate this point.

ECHOIC: The response-product of the speaker's ongoing verbal behavior may be the prior auditory verbal stimulus in an echoic relationship. This simply involves saying what you have just said. (To expand on this, see Skinner's section on "what echoic is not.")

COPYING A TEXT: The visual response-product of what you have written can become the prior visual verbal stimulus in the copying a text relationship. This involves copying something that you have written.

TAKING DICTATION: What you say can become the controlling variable for writing. In fact, much writing may take this form, when we talk to ourselves and write down what we say.

TEXTUAL: We may read what we have just written and therefore the visual response-product of ongoing written behavior may control subsequent textual responses.
INTRAVERBAL: What we have just said or written can control subsequent writing or speaking behavior for which there is no point to point correspondence between the stimulus and the response. This is a somewhat important notion that we shall return to when we consider how verbal behavior is actually constructed.

The preceding examples of how ongoing verbal behavior can control subsequent verbal responses are really no different than the same verbal responses controlled by stimuli which are the response-products of someone else's verbal behavior. However, the remaining verbal relationships, the mand and the tact, are somewhat more interesting because they are not controlled by a form of prior verbal stimulus. Certain tact and mand relationships are dependent upon the speaker's ongoing verbal behavior and their analysis is a bit more complex.

TACT: In the discussion of verbal stimuli, we noted that verbal behavior produces a response-product with many features, only a few of which are "verbal." These other features, being non-verbal, can therefore enter into the tact relationship. The loudness of a verbal response, made either by someone else or the speaker, can evoke the response "loud." A response emitted under inappropriate circumstances can act as an $S^D$ for the tact "incorrect" or "false." It doesn't matter who makes the verbal response.

MAND: The emission of a verbal response can be, at least in part, an establishing operation. Someone may say, "You should bet on the grey mare." We may then mand (having inside information), "Ignore that,"
The same process is at work when we say something ourselves and then say "Forget that," or "Ignore that remark." Or if we have said something important, we may mand, "Did you hear me?" or "Did you understand?" These mands do not occur unless primary verbal behavior is occurring, but the analysis of why they occur is the same as that for any mand.

There is another type of verbal behavior that is the result of a speaker's ongoing verbal behavior. In all of the previous examples it was the response-product of the speaker's own verbal behavior that became the controlling variable. However, there is an additional way in which we may be affected by our ongoing verbal behavior. When we look at something, not only can we see, but we can "see that we are seeing." We can tact the fact that we are currently being affected by visual stimuli. Likewise, when we hear something, not only are we controlled by the auditory stimuli, but we can also discriminate that we are hearing, or that we are being affected by auditory stimuli. Furthermore, we can discriminate between strong and weak stimulation. We say, "I can see clearly," or "I can barely see it." In other words, the controlling relationship itself is a stimulus that has features that can come to control verbal response just the way other stimuli or stimulus features do. This is equally true of verbal relationships. The relationship itself can become a controlling variable. This fact is the key to an important category of verbal behavior that Skinner has called the AUTOCLITIC.

The first type of AUTOCLITIC results from the fact that listeners eventually demand more and more information about the stimulus conditions.
that are controlling a speaker's verbal behavior. For a listener to hear a speaker say, "It's raining" is not sufficient. If it's only an echoic or textual response, no practical action may be taken. However, if it is a tact, controlled by the visual non-verbal stimulus of rain falling, some practical action such as getting an umbrella, is generally taken. As a result, listeners tend to reinforce verbal behavior that not only is controlled by certain stimuli, but which describes the nature of that controlling relationship. If it's echoic, the speaker may be reinforced for saying, "I heard someone say 'It's raining.'" If it's a tact, then the speaker is reinforced for saying, "I see that it's raining."
THE AUTOCLITIC TACT

Prerequisite: tact

Definition: The AUTOCLITIC TACT is a verbal relationship with the following features.

RELEVANT
1. A non-verbal stimulus
2. The non-verbal stimulus is some aspect of a primary verbal relationship

IRRELEVANT
1. The specific features of the controlling relationship (e.g., receptor being stimulated, or the intensity or strength of the stimulation; stimulation may include an establishing response)
2. The form of the response

"I see that it is raining" contains the AUTOCLITIC TACT "I see." "I see" is controlled by the visual stimulation that is controlling the response "raining." Stimulation of the visual receptor is a private discriminative stimulus that can come to control such verbal responses as "I see." To say "I see" as the result of seeing in writing "I see" is not autoclitic behavior, it is simple textual behavior.

The strength of the controlling relationship may also be a controlling variable. We may say "I think it is raining" under circumstances where the controlling relationship between the appropriate stimuli and the response "It's raining" is a weak relationship. "I know it's
raining" contains the autoclitic tact "I know," controlled by the strength of the controlling relationship between the controlling variable for "It's raining" and the response itself. It is important to remember that behavior cannot be classified on the basis of its form alone. Just as "fire" may be a mand to a firing squad or a tact of a conflagration, "I think" may be a tact of the weakness of a controlling relationship or merely a form of echoic behavior. If someone asks, "what do you think?" we often begin to reply by saying "I think..." regardless of the strength of the controlling relationship involving the upcoming response. "I think" may be somewhat mandlike if the listener's reacting to the upcoming primary verbal behavior as if it were weakly controlled would be currently reinforcing to the speaker.

The AUTOCLITIC TACT may be controlled by the fact that the controlling relationship is not quite appropriate. Someone may ask "Is it going to rain?" and we may be looking outside and see a clear sky. The response "rain" is currently strengthened as a result of the echoic relationship with what the speaker has said, yet the presence of other stimuli that would strengthen other responses may result in the speaker saying, "I doubt that it is going to rain." Negation is similar. A response that is strengthened to some degree may be about to occur under circumstances that do not usually control that response. The inappropriateness of the other circumstances may result in the tact "no" preceding the emission of the primary response. For example, a few drops of water may appear on the sidewalk from a lawn sprinkler, and this is sufficient to increase the probability of the response "rain";
however, the other stimuli in that situation, such as a clear sky, dry pavement all around, etc., may strengthen the tact of the inappropiateness of the primary response. Often the primary response may be a case of metonymical extension. A child who has always seen an orange at the breakfast table may have a tendency to say "orange" one morning when there are no oranges present because all of the other features that accompanied the orange are present and, as we have seen, may come to have some control over the response. The fact that only the irrelevant accompanying stimuli are present, yet the response is being strengthened may result in the autoclitic tact "no orange."

Metaphorical or generic extension can also be a controlling variable for responses such as "like" in the case of metaphorical extension and "kind of" or "sort of" in the case of generic extension. When we say "A dog is like a wolf," the autoclitic tact "like" is controlled by the nature of the stimulus control, the fact that only some of the stimuli that typically control the response are currently present. "Kind of" or "sort of" is controlled by the presence of unusual accompanying stimulus features that are irrelevant.
Study Frames: AUTOCLITIC TACT

Write AUTOCLITIC TACT, PRIMARY TACT, or NEITHER in the blank space after each example. The response to be classified is underlined.

1. "He is not well," controlled by the fact that "well" is emitted under inappropriate circumstances.

2. "He is not well," controlled by the fact that you just heard someone ask, "Is he well?"

3. "He is not well," controlled by the presence of the written words, "He is not well."

4. "I insist that he is wrong," as a result of the strength of the controlling relationship between "wrong" and its controlling variable.

5. "He is not well," controlled by the fact that the listener's reacting as though "he" is sick would be currently reinforcing to the speaker.

6. "He is well," controlled by certain visual characteristics (pink cheeks perhaps).
ANSWERS

1. AUTOCLITIC TACT: This response is dependent upon the presence of a primary verbal relationship, and it is controlled by a non-verbal aspect of that relationship.

2. NEITHER: "Well" is part of an echoic relationship in this example.

3. NEITHER: "Well," along with the rest of the response, is part of a textual relationship in this example.

4. AUTOCLITIC TACT: The controlling variable for this tact is the strength of the controlling relationship between the response "wrong" and its controlling variable.

5. NEITHER: This is not a tact relationship, but rather is a type of mand relationship, because the controlling variable is presumably the establishing operation for this particular reaction on the part of the listener currently being reinforcing to the speaker.

6. PRIMARY TACT: This is a verbal response controlled by a non-verbal stimulus that is not some aspect of the speaker's ongoing verbal behavior.

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AUTOCLITIC MAND

We have already defined an AUTOCLITIC TACT as a type of tact in which the controlling variable is some non-verbal aspect of a speaker's ongoing verbal behavior. It is therefore just a special subset of the TACT relationship. It is possible to describe a similar special subset of the MAND relationship. If the establishing operation that controls a MAND depends entirely upon or in part upon the speaker's ongoing verbal behavior in the sense that the speaker is being enjoined to react to the primary verbal behavior in a specified way, then we have what may be called an AUTOCLITIC MAND.

Definition: An AUTOCLITIC MAND is a type of verbal behavior with the following features.

DEFINING
1. The controlling variable is an establishing operation
2. It enjoins the listener to alter his reaction to the primary response

IRRELEVANT
1. Response topography
2. The listener's current reaction
3. The specific type of reinforcement specified by the response

If you say, "John loves Mary and vice versa," "vice versa" is an AUTOCLITIC MAND if the form of the response is controlled by the fact that the listener reacting as though the reverse were also true would currently be reinforcing to the speaker, even if it is not at
all true. If it is true and the listener's reaction is of no importance, then "vice versa" is an AUTOCLITIC TACT. Of course, it may be controlled partially as a TACT and partially as a MAND, as a form of impure tact. Another important type of AUTOCLITIC MAND involves negation. To say "Jones is not well," includes the AUTOCLITIC MAND "not." "Not" enjoins the listener not to react to the tact "well" as though it were occurring under normal circumstances, presumably because such an altered reaction would currently be reinforcing to the speaker. If the altered reaction of the listener is not reinforcing to the speaker and the response "not" is controlled by the inappropriateness of the circumstances evoking the response "well," then "not" is an AUTOCLITIC TACT. Remember, the form of the response, the topography of the utterance is irrelevant, that is, it plays no role in trying to classify a verbal response as either an AUTOCLITIC MAND or AUTOCLITIC TACT. Remember also that an AUTOCLITIC cannot occur unless some primary verbal behavior is occurring or is about to cocur.
Study Frames: AUTOCLITIC MAND

Write AUTOCLITIC MAND, AUTOCLITIC TACT, or NEITHER in the blank space after each example below.

1. "May I have the book?" "The" is controlled by the fact that the listener providing a specific book (one that has been talked about before, for example) would currently be reinforcing to the speaker.

2. "I see the book." "The" is controlled by the fact that the controlling variable that is currently strengthening "book" has recently strengthened that response.

3. "He is carrying a sort of briefcase." "Sort of" is controlled by the fact that it would be reinforcing if the listener reacted to "briefcase" as if it were a generically extended tact.

4. "It is not winter yet." "Not" is controlled by the fact that "winter" is being emitted under inappropriate circumstances.
ANSWERS

1. AUTOCLITIC MAND: "The" enjoins the listener to provide the speaker with a specific. We must assume an establishing operation which has resulted in receiving the specific book being reinforcing.

2. AUTOCLITIC TACT: The recurrence of the controlling variable is a non-verbal aspect of the primary relationship involving the tact "book."

3. AUTOCLITIC MAND: "Sort of" enjoins the listener to accept the primary response, "briefcase," as a generally extended tact. Again, one must assume a prior establishing operation.

4. AUTOCLITIC TACT: The inappropriateness of the controlling circumstances is a non-verbal aspect of the controlling relationship for the tact "winter."
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Sample Concept Analysis
Appendix A

Name of Concept  ECHOIC BEHAVIOR
Supra-ordinate VERBAL BEHAVIOR
Coordinates TAKING DICTATION, COPYING A TEXT, TEXTUAL, INTRAVERBAL
MAND, TACT
Subordinates none
Prerequisites Verbal Behavior, vocal response, auditory stimulus,
point-to-point correspondence, response-product,
formal similarity, verbal stimulus

DEFINING FEATURES
1. vocal response
2. auditory stimulus
3. point-to-point correspondence
4. formal similarity

IRRELEVANT FEATURES
1. formal characteristics of the response
2. dynamic characteristics of either the stimulus or response
3. whether or not the current response is reinforced
4. the meaningfulness of either the stimulus or response
Sample Exam
Appendix B

Psychology 598  Spring 77  Unit I  Exam A  Name________________________

For each of the concepts listed below, state the defining features:

1. Mediated reinforcement
2. Verbal stimulus
3. Response-product
4. Thematic control

For each of the definitions presented below, provide the name of the concept:

5. Behavior that is established and maintained by reinforcement mediated by another person. That person's actions have been specially trained to reinforce speakers.
6. The type of control that exists whenever there is point-to-point correspondence between a controlling variable and a response.
7. An environmental event which increases the reinforcing effectiveness of a given stimulus change.

For each of the following examples of behavior indicate each of the following:

a. Is the behavior verbal or non-verbal?
b. Is the controlling variable a verbal stimulus, non-verbal stimulus, or establishing operation?
c. Is there formal similarity between the controlling variable and the response-product?
d. Is there point-to-point correspondence between the controlling variable and the response?
e. Is the reinforcement direct or mediated?
f. Is the controlling relationship formal or thematic?
<table>
<thead>
<tr>
<th>Controlling variable</th>
<th>Response</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Hearing someone say &quot;red white and...&quot;</td>
<td>writing &quot;blue&quot; Hearing &quot;That's correct.&quot;</td>
<td></td>
</tr>
<tr>
<td>9. Seeing in writing &quot;test next Friday&quot;</td>
<td>writing &quot;test next Friday&quot; none</td>
<td></td>
</tr>
<tr>
<td>10. Water deprivation</td>
<td>getting a can of beer good cold beer</td>
<td></td>
</tr>
<tr>
<td>11. Someone standing in your way</td>
<td>saying &quot;excuse me&quot; they move out of the way</td>
<td></td>
</tr>
<tr>
<td>12. A bright light</td>
<td>writing &quot;that's a bright light&quot; none</td>
<td></td>
</tr>
<tr>
<td>13. The auditory output of a morse code receiver for the word &quot;mayday&quot;</td>
<td>making the gesture in Sign Language you sends a rescue plane</td>
<td></td>
</tr>
<tr>
<td>14. A bell being sounded</td>
<td>salivation none</td>
<td></td>
</tr>
<tr>
<td>15. &quot;2+2&quot; written on a sheet of paper</td>
<td>you write &quot;22&quot; teacher says &quot;That's dumb&quot; and you never give that answer again</td>
<td></td>
</tr>
<tr>
<td>16. An itch</td>
<td>you say &quot;scratch my back&quot; someone hears you, scratches your back and the itch goes away</td>
<td></td>
</tr>
<tr>
<td>17. Hearing yourself start to make a sarcastic remark</td>
<td>putting your hand over your mouth reduction of anxiety</td>
<td></td>
</tr>
</tbody>
</table>

18. Give an original example of formal similarity which does not involve either vocal or writing behavior.

19. Give an original example of an establishing operation.

20. Give an original example of thematic control.