Creative Behavior

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One theme of western society suggests a basic mistrust of both technology and systematic investigation. This basic distrust has as its major thesis that analysis destroys. Weaver¹ analyzed this trend with respect to science, noting that the classic protest was penned by Keats:

Do not all charms fly
At the mere touch of cold philosophy?
There was an awful rainbow once in Heaven:
We know her woof, her textures; she is given
In the dull catalogue of common things.
Philosophy will clip an angel's wings.

Philosophy can here be construed as analysis. Weaver further quotes e. e. cummings:

While you and I have lips and voices which are
for kissing and to sing with
Who cares if some one-eyed son-of-a-bitch
invents an instrument to measure Spring with

We would assume that such authors would look askance at the experimental analysis of creativity.

Behavior analysis has also been criticized from other quarters. We are told, sometimes with justice, that our applications, analysis and research are simplistic, mechanical, and unimaginative, and that the phenomena we study are also restricted to the simple. This paper is an attempt at analysis that does not destroy and that is sensitive to complexity. It is an approach to the study of creative behavior.

The Approach—What A Definition Requires

Definition of variables is an important step in studying phenomena, and defining creativity is a matter of determining what

is discriminative for tacting something as creative. Both empirical and theoretical analyses of creative behavior (creativity) have often proceeded with explicit examination of the kinds of stimuli controlling the tacting of behavior (or product of behavior) as "creative." In this paper we present our basic premise that audiences may not tact behavior or behavior products as "creative" solely on the basis of response characteristics such as topography, rate, or amplitude, or solely on the form of the product. Tacting an event as "creative" is partly controlled by variables which suggest the stimulus control of a potentially "creative" behavior, or the control leading to a "creative" product, rather than by the form or product alone.

An Example from Modern Dance: Response Topography Versus Stimulus Control

Several years ago the Danforth Foundation funded one of the authors² to explore, in an open-ended but brief manner, the possible value of educational technology in several areas of the humanities. One activity in this project was carried out under the direction of the senior author in cooperation with several members of the Department of Modern Dance at the University of Utah. It was not an unpleasant chore, requiring observation of dance classes and dance students at work. Our initial objective was to explore various procedures for modifying dancers' restricted use of space during improvised dance episodes. One faculty member in Dance³ stated that many inexperienced dancers have difficulty using

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¹Weaver, W. The Imperfections of Science. Unreferenced.

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space, frequently staying in the center space or some other restricted area, or repeating space use in a stereotyped manner. We began by marking off the dance rehearsal floor in a grid to allow measurement of space use, and set up behavioral objectives, such as increasing unused space by a specified amount. This was not overly fruitful. In his "Case History in Scientific Method" Skinner (1961) specifies several unformalized principles of scientific research, one of which is "When you run into something interesting, drop everything else and study it," while a second relates to serendipity, "the art of finding one thing while looking for something else." The dancers were not enthralled with the grid but were concerned with other problems. Continuing with the grid activity, and in keeping with Skinner's two principles, much of our concern shifted to a discussion of what the dancers felt were the objectives in teaching improvisation.

To us, the dance instructors' overall objective sounded vague but appeared to point to some important directions for our analysis. As the dance instructor put it, the objective was to "transform movement potential within the individual into an enriched development of movement vocabulary, choreographic possibilities, and meaning in everyday situations." This was further broken down into "readiness," which included "alertness and trust," "concentration," "spontaneity," "invention," "awareness and sensitivity," and "recall." These appeared exceptionally ambiguous but intriguing.

As the dance instructor in this project described it, these objectives comprised one of the two major areas in teaching modern dance. The first area, *technique*, was easily specified, but, she said, did not get into the creative aspects of dance. In addition, she felt sure that they knew how to teach technique, and she was right. The objectives we were discussing involved the area of *improvisation*, and this, she said,

encompassed the creative aspects of dance.

In a shift of emphasis we spent considerable time just observing dancers. Our procedure was to have the dance instructor or assistants point out exceptional positive or negative instances of readiness, concentration, spontaneity, awareness, sensitivity, or what have you, while we made notes and asked questions as to why the examples were representative of their objectives.

To our surprise, order emerged. In one sense, readiness, spontaneity, and sensitivity had nothing to do with *what* a dancer did or how well it was done, but it had to do with when a dancer did something in relation to the music, other dancers, and so forth. Thus topography was ruled out as a basis for judgment and we focused our attention more on the occurrences of individualized generative choreographic moves in relation to conditions identifiable within the teaching environment. It seemed that what our dance colleagues were saying was that creativity related to multiple stimulus control, to factors which controlled the timing and occurrence of particular dance moves. In other words, the discriminative characteristics of creative behavior lay in the stimulus control over behavior rather than in the form of the product itself. To analyze creative behavior then, we must look at the ways in which stimuli control behavior.

Kinds of Stimulus Control

The form of a verbal utterance (vocal or written) may be determined by any number of variables. With tacts, the major control is exerted by the object or event tacted, and its form is usually determined by the specific stimulus characteristics the community typically uses as the basis for reinforcement for the conventional response reinforced. This type of control is called "formal." Thus a child, seeing a dog, is more likely to say "That's a dog" than to say "That's a mammal" or "That's a brown furry ob-

ject." The community typically reinforces a response of a certain form controlled by only certain stimulus characteristics of the object tacted. With echoic or textual behavior the control is even more specific and the response form typically reinforced by the verbal community even more restricted. Intraverbal control, related to the probability of one word following another in the native language and by those community contingencies called grammar and syntax, has a similar effect. The community is more likely to reinforce "I went to the store" than "I to the store went." Thus contingencies programmed by the community may determine the content (calling a dog a "dog" rather than a "sentient being") and the form (grammar, structure, etc.). These are all examples of formal control, and statements under strict formal control are often called literal in non-technical usage.

Formal control is not limited to the written or spoken word. Some communities only reinforce painters or sculptors for products which "look like" an actual object, that is, for which a certain degree of one-to-one correspondence between the artistic product and the object depicted exists. Such a painting or sculpture can be considered similar to a formal or literal tact.

Auditory productions often have similar formal constraints. Traditionally, audiences have reinforced musical production which meets certain restrictions concerning harmony and progression, analogous to grammatical restraints on language.

However, much behavior is not under such formal control. It may be under the multiple control of several variables or sets of variables. Responses may be emitted which are controlled by variables discriminable by an audience although not those which usually occasion reinforcement for those responses. The latter is clear in metaphor. For example, the common properties of frailness and hurt might lead an author to describe a jilted

woman as a "wounded dove." Typically, a woman is not tacted as a "dove," although the triteness of this metaphor may have made it conventional. However, most audiences could respond to the characteristic of frailness as did the author, and discriminate the control of the response to "dying dove" this would illustrate the multiple control called alliteration, with "dying" controlled by the same variables as controlled wounded, then modified by the additional control exerted by the "d" in "dove."

It is convenient to label control by variables other than formal variables "informal" control, and this usually relates to multiple control, or to control by variables other than the usual ones which program reinforcement in the community in question. In discussing verbal behavior, Skinner (1957) notes "... multiple causation produces many interesting verbal effects, including those of verbal play, wit, style, the devices of poetry, formal distortions, slips, and many techniques of verbal thinking" (pp. 228-229).

The absence of any apparent control over behavior is usually discriminative for a listener or observer labeling the person behaving as "crazy," although this is not to say that the control of pathological communication is not potentially discriminable.⁴ If a person "sees" objects, events, or particular characteristics not discriminated by an audience, the audience may label the individual or his/her behavior as delusional or hallucinatory. When no formal intraverbal control exists, classical psychiatric texts may label the speech as "word salad."

Based on this analysis we feel that the behavior or the product of the behavior of an individual is likely to be labeled by an observer as belonging to one of 3 classes:

⁴For a discussion of stimulus control of pathological communication see Paul Watzlawick, Janet Helmick Beavin and Don D. Jackson, *Pragmatics of human communication*. New York: W. W. Norton & Co., Inc., 1967, pp. 72-117, 215, 217-219.

1. Crazy. The listener cannot discriminate any apparent controlling variables.

2. Literal. The listener discriminates that most of the control is formal.

3. Creative. The listener discriminates that much of the control is informal.

Obviously, the observer cannot actually determine the stimulus control of the individual's effort, particularly since the observer usually sees the product rather than the process of production. However, as Skinner (1957, p. 229) notes in discussing literary analysis, we can construct a "probable verbal history of speaker or writer."

Creative Verbal Behavior

Skinner, in *Verbal Behavior* (1957) lays the groundwork for an analysis of creative behavior. Skinner notes that "when T. S. Eliot writes

... What will the spider do,
Suspend its operations ...

suspend appears to be determined by a variable which might have prompted such a response as *cease* or *desist* and an intra-verbal connection with spiders (p. 239)."

The interest in the line comes from this multiple stimulus control. By comparison the lines

What will the spider do,
Hang on its thread and stop spinning

lack interest, and would be labeled non-creative by most. Further on, Skinner states

It is convenient to group such variables under the rubric "thematic." Two responses are thematically related when they are controlled by a common variable with respect to which they lack the point-to-point correspondence seen in echoic or textual behavior. We may refer to sources involving echoic or textual responses as "formal" ... (p. 243)

When sleep deprived, the statement, "I am tired," is under formal control; it is the response reinforced by the community under those specific stimulus conditions, and is a simple tact with similarities to textual, echoic, or imitative control. The verbalization has a one-to-one correspondence with the assumed private event it tacts, or with related antecedents such a sleep deprivation. This correspondence was taught in a manner

similar to that in which textual control is taught. The "I feel like a Model A Ford," response is under informal control multiply determined by the abstract characteristic of old, tired and worn, relating to both one's condition and the vintage automobile. This common stimulus characteristic controls the final verbal statement.⁵

Word sequences and selections controlled by the probability of such sequences in normal English, or by usual grammatical constraints, are another source of formal control. Della-Piana (1971) refers to the phrase

... your voice
baying the moon ...

Normal English usage would control "baying *at* the moon." The omission of the proposition makes more direct the relation between *baying* and *moon* and may evoke a different response in the reader. Similarly, in the opening lines of a sonnet, Shakespeare wrote

Believe, if ever the bridges of this town,
Whose towers are builded without fault or strain,

using the word "builded" rather than "built." Normal word probabilities and grammatical restraints would strengthen the response "built." However, it would appear that the "d" sound and the two syllables in the prior word "bridges" strengthened "builded," an informal source of strength rather than a formal source. Kreidler and Kreidler (1972) reviewed studies suggesting that voiced consonants are more "potent" than unvoiced consonants, presumably a reference to the discriminative or eliciting characteristics of sound. It seems reasonable to assume that Shakespeare's verbal behavior was sensitive to subtle

⁵We do not get into the problem of determining whether the response "I feel like a Model A Ford" uttered by a *particular* person is under formal control (a repetition of a statement heard uttered by someone else) or the informal control noted in our discussion. We simply argue that when from an audience point of view a response appears to be under informal control it is more likely to be judged creative. In a later section we discuss this concept of "assumed stimulus control."

controls of this sort, thus possibly also strengthening "bui~~ld~~ed" over "built."

In "A refusal to mourn the death by fire of a child in London" Dylan Thomas writes

Never until the /mankind making
Bird beast and flower
Fathering and all humbling/ darkness

Normal grammatical constraints would lead to placement of the construction "mankind making Bird beast and flower Fathering and all humbling" at a later location (probably in different grammatical form); the poet placed it such that it intrudes in the middle of another construction. Although unclear, the sources of this informal control were apparently more powerful than formal controlling variables.

Let's return to T. S. Eliot for a moment. In the *Hollow Men* are the lines:

Our dried voices, when
We whisper together
Are quiet and meaningless
As wind in dry grass
Or rats' feet over broken glass
In our dry cellar.

He could have said

We talk without communicating
As we have nothing to say.

In a sense both contain the same "message." Yet one would be labeled creative while the other would not. In the latter production the control is formal and literal, and the sequences are determined by English grammar and word probabilities. Eliot's production is controlled by thematic or metaphoric variables with respect to its overall structure of "image." In addition there is the internal control exerted by sequences such as

"when . . . we . . . whisper . . . wind"
"grass . . . glass"
"whisper . . . together . . . cellar," while
"dried . . . dry . . . dry . . ."

has a thematic variable controlling it, in the sense of dry related to moisture and dry in the sense "my ideas have dried up," as well as the control by the repetition of the hard "d" sound and its emotional impact, expanded in *dry* grass . . . broken glass.

Note that the differences between Eliot's poem and our paraphrase relate to the sequences of words and phrases, and thus, we assume, to the stimulus control of such sequences. The effect this has on an audience (including the writer) appears determined by what we have called informal control; the same words arranged in "formal" sequences would be uninteresting. Informal control exists with respect to small response units; in "we whisper" the word "we" may partially control the word "whisper." There is also informal control of larger units, such as the overall metaphoric structure used by Eliot in the *Hollow Men* and related to the common characteristics of various sounds. The controlling stimulus or stimuli may have a locus close to the production controlled, for instance, in adjacent words (e.g. "when we whisper"). The locus of control may also be more remote; in the Eliot poem the word "wind" may be controlled by the alliterative phrase "when we whisper" in earlier lines. The locus of the stimuli controlling a production may be entirely outside the production itself, that is, external rather than internal. Regardless of these considerations of response unit size or locus of the controlling stimuli, it appears that the stimulus characteristics of formal versus informal control are differentially discriminative for labeling responses "creative."

Creativity in Other Media

Let us briefly illustrate the difference between informal and formal control in other media. Dali's use of bent forms in much of his work probably was controlled at least in part by abstract stimulus characteristics which also control verbalizations such as "instability" or "irregularity." Formal control exerted by rules of perspective and photographic imitation were less powerful. Miller's sculpture appears controlled by single flowing lines or series of lines which are abstractions, perhaps, of the posture of individuals under certain conditions—

those labeled depression or joy. The construction of the entire figure is controlled by these abstractions rather than by the total visual characteristics of people in such "states." In music, rules of harmony, chord progression or structure, or tonality may be violated to produce a dissonant effect controlled by the emotional eliciting or discriminative characteristics for the composer of these dissonances.

Similarly, a dancer judged "sensitive" may have changed his or her direction of movement in response to the movement of another dancer, which we can call informal control, while the insensitive dancer may have continued the same direction of movement until some sequence learned in a technique class was completed, at which point the direction was, perhaps, altered. In another example, suppose that two children in two different schools both drew identical houses. Let us further assume that we had the means to determine the variables controlling each construction. For one child we determined that the variables controlling the drawing were analogous to echoic control; let us call them photographic or imitative control—the child had seen a similar picture in a book and reproduced it. The second child's drawing was determined to be partly controlled by aspects of a prior social studies lesson. In the earlier lesson, the adjustment of men to their physical environment had been discussed, and the second child drew a house partially controlled by this social studies lesson. The child might loosely refer to this control by saying she drew open walls to let air circulate and moisture evaporate, raised floor to avoid flooding and insects, and depicted the use of locally available materials. None of this was explicitly taught in the social studies lesson. Although the two products drawn by the two children were identical, the controlling variables were quite different. One was drawn under the formal control which we called photographic; the other

was under much less formal control which transposed sensory modalities in a number of ways—it was a visual product under control of basically nonvisual variables to which the child had been exposed. An educator might label one child's artistic activity as creative and the other as non-creative. This tacting of behaviors as creative or non-creative might be independent of the quality of the drawings, in the same sense that the dance instructors ignored technique in judging the creativity, if not the overall quality, of a dance episode.

Summary: What We Judge as Creative

Thus, labeling behavior as creative or non-creative appears to be controlled by dimensions of stimulus control. Behavior judged creative tends to have frequent informal rather than formal control. The product may be pleasing or not pleasing as a function of technique or response characteristics themselves, but is judged creative by the audience response to the assumed controlling variables; that is, the audience reaction is controlled by these factors. Dance technique, color theory, perspective, grammatical structure, short story form, theory of music, chord progressions, or sonata form may all control an audience's statements of the quality of a work, but, like technique in dance, may not determine statements related to its "creativity." This judgment, based on "assumed" stimulus control, or more precisely the controlling effects of this control (or correlated variables) on the audience, varies from time to time and place to place, but the dimension or modality controlling this variability can be known, and is (we suggest) the existence of informal rather than formal control.

Traditional Tests of Creativity

Most tests of creativity have been produced largely in research projects on the nature of creativity. Most treat creativity as a trait or traits, and test for its (their)

existence. Though some reliability and validity data are available for a few of the published tests, the tests are still considered to be in experimental form. For a critique of tests of creativity see Crockenberg (1972). Anastasi (1976) stated that the tests of creative aptitude she reviewed were lacking in evidence for strong relationships with criteria of creative achievement. She argued that creative achievement requires a complex pattern of (traditional) aptitudes and traits appropriate to a specific field. Feldman (1974), Nichols (1972), Mansfield, Busse & Krepelka (1978), and Coombs & Meux⁶ contend that raising scores on so-called creativity tests does not necessarily result in a person becoming creative. In fact, they call to question the entire notion of divergent thinking (said to be a hallmark of creativity) and divergent thinking tests on logical, conceptual, and empirical grounds.

The terms usually associated with standardized tests of creativity are the basic factors identified by Guilford's (1959) research; i.e. Fluency, Flexibility or divergent thinking, Originality, and Elaboration. *Originality* in verbal behavior is assessed by tasks like writing titles for short story plots, listing different consequences for a given hypothetical event, or describing in a word-picture what "comes to mind" when you hear a given sound (e.g. an alarm clock ringing) or an onomatopoeic word (like "blast" or "crackle"). The scoring of these items is typically on frequency of occurrence in a norm group, the less frequent responses being the more original. *The Fluency tasks* include items such as writing words containing a specified letter, naming things belonging in a given class (e.g. fluids that will burn), writing words similar in meaning to a given word, or writing four-word sentences, each word to begin with a given letter. Most of these

tests place heavy reliance on speed of response.

It should be noted that although these tests, of necessity, are scored on the basis of the product or response produced, a good argument can be made for the fact that variations in scores are partly a function of informal versus formal stimulus control. For instance, on a test purporting to measure originality, a person under strong formal stimulus control would make responses strongly prompted by the stimulus word—responses such as opposites, synonyms, or words based on high probabilities for such sequences in English. Such responses would occur with high frequencies in a norm group, and thus not be scored as "original." Similarly, on a measure of fluency, strong formal control would limit the number of responses which could be emitted in a set time, due to the restricted range of strengthening stimuli, and result in a low score. Thus, responses considered to be indicators of divergent thinking are more likely to be under informal control.

For instance, on a test by French, Eckstrom, Ruth, and Price (1963) the directions specify that one is to supply a word having a different meaning relationship to each of two words. For the pair "river . . . money" the response "bank" is scored correct, since a river has a bank and money is put in a bank, yet the relationship of "bank" to the two stimulus words is different. For our purposes we do not concern ourselves with how the test authors interpret the responses. We use the example simply to illustrate the difference between scoring based on a statistical frequency criterion and one based on stimulus control. We administered this item to some college undergraduates and obtained "bank" as a high frequency response and obtained the following very low frequency responses: "liquid," "Seine/Sen," and "currency." Using the statistical frequency criterion, these low frequency responses would all be scored as

⁶Coombs, J., and Meux, M. A Conceptual Analysis of Creativity. Transcription of class discussion.

“divergent” or “creative” although there is some question as to whether the homophones (Seine/Sen) would be allowable as a “word” and whether the playful “currency” would be allowed as an associative of “river.” But in any case it is more productive to think of the “unusualness” of these responses in terms of the stimulus control rather than the frequency. “Seine/Sen” is a response under the informal control of word-as-sound (rather than spelling) triggering its homophone. “Currency” is a response under formal control in relation to “money” and under informal control of the sound within the word (currents) in relation to river. The focus on controlling stimuli leads us to processes that may be useful for generating instructional strategies and assessment models more directly targeted to the performance of interest rather than a performance (rare responses) that predicts the desired accomplishments.

Jackson and Messick (1970) also list several criteria for judging creativity. Although many of these are not adequately specified from the point of view of behavioral research, they are suggestive in that they appear to refer to informal stimulus control. The first criterion, “unusualness,” is the same as Guilford’s “originality.” The second criterion is “appropriateness,” and is an attempt to exclude from being judged creative infrequent or unusual responses which have no apparent relationship to the test stimuli. These two criteria together suggest that a creative response must have some discriminable stimulus relationship to a theme, but that it must be one which is unusual. Thus they exclude as creative those behaviors which have no discernable control related to the stimulus *or* which have formal stimulus control, leaving only responses under informal stimulus control as creative. Their final two criteria, “transformation of material to overcome conventional restraints” and “condensation” seem to have a similar

relationship to issues of stimulus control. Unfortunately, the conceptual level and research generated by approaches such as these are very trait or test oriented, and are unlikely to be fruitful in terms of an experimental analysis of behavior. In all, little attention is paid to the controlling variables.

Ghiselin (1952) collected introspective reports of artistic and scientific geniuses generally considered to be highly creative. Anecdotal in nature, many of Ghiselin’s creative geniuses talked about the necessity for informal rather than formal stimulus control in generating creative behavior, and thus creative products. For example, concerning what he called ideas and images, Einstein stressed “combinatory play” and “associative play.” Serious researchers in this field may get suggestive leads as to informal controlling stimuli from work such as Ghiselin’s, in spite of its anecdotal format. This is probably especially true if complex creative behavior is studied.

Training for “Creative” Behaviors

Behaviorally oriented research on creative behaviors is sparse. To a great extent, much of it has followed in the footsteps of traditional creativity research in looking at the form of behavior rather than the type of stimulus control. Although a number of interesting and important studies have been produced, lack of a behavioral rationale for creative behavior has not produced the coherence that might stimulate a systematic program in this area.

Goetz and Baer (1971, 1973) showed that in preschool children’s block play, the number of different block forms used in a session could be increased by praise contingent upon a different form being produced. This was done by reinforcing the production of a form only the first time it appeared in a session. Most interestingly, not only did variability of forms within a session increase, but a generative process occurred in that new forms were produced which had never

previously appeared in the subject's observed repertoire. This suggests that specific topographic variations were not being reinforced, but that stimulus control was modified by the training or that the reinforcement of divergent topographies may also strengthen divergent stimulus control active at the time. Nevertheless it would be desirable to identify the controlling stimuli.

In a similar study Goetz and Salmonson (1972) increased the number of forms produced in easel painting. These results (blockbuilding, easel painting) were both replicated by Holman, Goetz & Baer (1977) with these and somewhat similar tasks. The latter study also indicated some evidence for generalization of the trends towards greater diversity with tasks similar to the trained task (e.g. from pen drawing to painting) but not to topographically dissimilar tasks (e.g. from drawing to blockbuilding).

Maloney and Hopkins (1973) reported that point (token) reinforcement increased the use of adjectives, action verbs, and sentence beginnings in short story compositions. There was also a small increase in adverbs, perhaps due to the increase in action verbs, although adverbs were not reinforced. As data are not reported on the specific words used, it is not possible to judge whether the changes were due to the reinforcement of specific responses which increased in frequency, or whether novel responses emerged suggesting the possibility of a change in the type of controlling stimuli. In addition, judges rated the stories as "most creative" under the conditions of reinforcement of action verbs.

Brigham, Graubard & Stans (1972) found that reinforcement contingencies increased the total number of words, the number of different words, and, more interestingly, the number of new words in written tasks. Ballard and Glynn (1975), using a number of self-management conditions, found increases in action words, describing words, sentences, and on-task

behavior when these were specifically reinforced. In addition, increases were found in the "quality" of the productions, as judged by two faculty members. The size of the increases and the reliability of this judgment were moderate.

In a multiple baseline design, Glover and Gary (1976) demonstrated that reinforcement, instructions and practice experimentally controlled the frequency of four traditional measures (Torrance, 1966) of verbal creative behavior with elementary school children. Fluency (number of different responses), flexibility (number of different verb forms), elaboration (number of words per response), and originality (statistical infrequency of verbal forms) were all increased by the procedures, as were scores on a written test of creativity (Torrance, 1966, 1974).

A somewhat different aspect of creative behavior was examined by Parsonson and Baer (1978). Where most studies have looked at the creation or arrangement of an "artistic" or novel product, the creative behavior in this research was children's finding a substitute to replace a conventional but unavailable tool in a play situation. For instance, the conventional tool for pounding in pegs on a play workbench was a toy wooden hammer; when this was unavailable using a toy wheel placed on an axle as a hammer was scored as "creative" or as an "improvisation." Training consisted of reinforced trials using various improvised exemplars of the tool class, and differential reinforcement for generating new improvisations. Generative improvisation occurred within tool classes; e.g. training using a variety of improvised hammers resulted in an increase in the child's "production" of novel hammer tools not previously trained. However, training in one tool class (e.g. hammers) did not result in generalized improvisation to other tool classes (e.g. containers). This study appears to clearly illustrate the role of complex stimulus control rather than

topography or product in defining creative behavior.

Two articles which have explicitly examined the role of stimulus control in relation to creative behavior are Goldiamond's (1977) paper on literary behavior and Della-Piana's (1978) review and analysis of the factors discriminative for revision in writing poetry. For a number of authors, Goldiamond reviews historical data suggesting the controlling variables for both theme or overall image and specific structures. Della-Piana examines a number of sources to explore the variables controlling a poet's revising written material rather than considering it as "finished" or in final form. Both papers suggest that the type of "informal" control we have discussed, rather than formal determinants, is critical.

Although space limitations prevent a review of the literature, persons interested in research in creativity would do well to carefully go over the many papers on generative language training. A large number of these have implications for teaching creativity, as well as for our suggestion that creativity research or trainers focus on the type of stimulus control of behavior.

Future research on creative behavior might focus more directly on procedures which attempt to change stimulus control. Programs which develop informal control seem more likely to produce "creative" learners than programs in which specific forms or topographies alone are taught. Of course, students who are expected to produce work which will be judged as of high quality also need to be taught formal control of media characteristics, analogous to technique in dance. Such a program to teach writing poetry has been developed in part by Della-Piana (1971).

Summary

Research on a topic is hampered if the topic is not clearly defined and if different researchers or writers refer to different phenomena with the same or similar language. In looking at the way in which a

variety of professionals use the term "creativity" we can isolate the variables controlling that label. Tacting a behavior or behavior product as creative is controlled more by factors related to the kind of stimulus control over the behavior (and thus its product) than by characteristics related to the topography of the behavior in isolation. As an audience often cannot respond directly to the stimulus control of another's behavior (especially when the behavior is not observed), the actual controlling variables are often relationships between a behavior product and the environment in which it is produced or observed, or the internal relationships which exist between the parts of a creative behavior or a behavior product.

A response controlled by a single variable, particularly when typically reinforced on that occasion by the community, is said to be under formal control. A response controlled by multiple variables, particularly when not typically reinforced under those conditions, is said to be under informal control. Stimuli or stimulus relationships suggesting informal control of a response or response product are often discriminative for tacting the response or product as "creative."

The implications of such a definition of "creativity" seem significant. A major one is that low reliabilities for judgments of "creativity" should be expected when topographic aspects of behaviors or products alone are examined, if in fact the term "creative" tacts the relationship of behaviors or products to controlling stimuli. Furthermore, training in "creativity" will be similarly ineffective if it attempts to develop certain behaviors or products when in fact it should focus on developing certain types of stimulus control.

At this point it would be premature to suggest that the extent of informal control corresponds one-to-one with the degree to which a production is judged creative, and we doubt that such a relationship exists. However, it does appear that some

degree of informal control, or some characteristics of control which are informal, are discriminative for such judgments and should be considered explicitly by behavior analysts working in creativity.

Skinner chose a case history approach to give an account of his own research behavior in part because "we do not know enough about human behavior to know how a scientist does what he does" (Skinner, 1961, p. 79). We are in the same position with respect to the complex behavior called "creative." We will need many examples of such behavior analyzed in terms of stimulus control before we can even formulate the questions to guide a proper functional analysis. But then, as e. e. cummings has put it

"Always the beautiful answer who asks
a more beautiful question."

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