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Behavior Analysis in Instructional Design: A Functional Typology of Verbal Tasks

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This paper describes and illustrates a typology of verbal instructional tasks for advanced classroom instruction and inservice training. The typology is based upon functional definitions of elementary and conceptual behavior, and incorporates the kinds of goals and objectives that surveys and research have shown to be important for experienced learners. The typology's metastructure is B. F. Skinner's (1957) verbal behavior classification system. This paper describes Skinner's system as a context for understanding and selecting instructional tasks for experienced learners. This paper also discusses rate of response as an important dimension of proficiency or mastery, and procedures for selecting proficiency criteria of tasks in the typology are also described. Results of the first of a series of validation studies indicated that high agreement between typology designer and subjects' classification of tasks can be attained after a short training session. The typology is discussed as a vehicle for standardizing instructional research and practice, and as a basis for research on transfer of control across classes of verbal behavior. Implications for research on building fluency of adult performance, and efficiency in instructional design are also discussed.

DEFINING THE PROBLEM

Our paper concerns the selection of goals and the design of instructional tasks for experienced learners. "Experienced learners" include high school, college, and university students, and staff such as teachers, salespersons, technicians, administrators, corporate executives, therapists, and social workers involved in inservice training programs. Experienced learners who "really understand" a subject matter, as Markle would say, behave like professionals in the discipline under the same conditions (Markle & Tiemann, 1970). Content experts can state the facts and figures of their field. They can relate seemingly obscure similarities between concepts and otherwise synthesize information in novel analyses. They can identify real-world instances of concepts developed in their fields, and can provide intriguing examples of these concepts. They can ask questions and determine methods for answering these questions, or when faced with a problem they can design strategies for solving it.

Professionals or advanced students in a discipline do not rely upon memorized situations or responses to demonstrate their expertise, but can engage in all of the mentioned behaviors *under novel conditions.* Previously learned performances that occur in the presence of novel stimuli, stimuli that the speaker or writer has never labeled that way before, are generalizations or *extensions* (Skinner, 1957). To the extent that students engage in extension, they are emitting key behaviors that distinguish content experts from nonexperts.

Professionals can also demonstrate their expertise at rates or frequencies that make the behaviors and their components maximally useful to themselves or others. Accuracy alone is insufficient; fluency is

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necessary. The airline pilot who can accurately lower the wheels of his jet will be ineffecive if he does not complete his task in a certain amount of time. And so it is, albeit more subtly so, for verbal behavior.

To summarize, experienced learners should learn a variety of concepts and skills derived from observations of what professionals say and do. Further, while many individuals may be able to successfully engage in these behaviors given enough time and in a narrow range of circumstances, that behavior does not make them proficient at what they do. *Proficient performance is accurate, extended or generalized, and fluent, and instruction for experienced learners should terminate only when proficient, real-world performance is achieved.*

What discrepancy, if any, exists between competence in the real world and current instructional practice to promote such competency?[1] To answer this question, we began with some theorists' claims (e.g., Markle, 1969; Popham, 1975, p. 60; Bostow, Note 1), and our own suspicions that most formal adult instruction ignores most of the goals and criteria that we just outlined. We located eight methodologically sound surveys of the kinds of goals taught to experienced learners and reclassified the findings according to our descriptors of content experts' behavior. The results are presented in Table 1.

When courses and training programs are based on the competencies of experts in a subject matter, the ability to state facts, figures, and definitions accounts for about 19% of the objectives (e.g., Sulzer-Azaroff, Thaw, & Olsen, 1975). However, all of the surveys in Table 1, except Sulzer-Azaroff, et al., reveal that between 50% and 98% of the instructional tasks for experienced learners require facts, figures, and definitions. *Only 2% to 49% of the instructional tasks teach and test for mastery of the remaining seven categories of competencies of content experts.* In the Semb and Spencer (1976) survey, instructors read the

TABLE 1

Percent of Instructional Tasks Described in Eight Surveys of Courses and Programs For Experienced Learners That Teach Simple and Complex Competencies of Content Experts

Competencies of Experts	Surveys: Sulzer-Azaroff, Thaw, & Olsen, 1975	Gall, 1970	Scannel & Stellwagon, 1960	Tyler & Okumn, 1965	Lawrence, 1963	Stanley & Bolton, 1957	Chase, Johnson, & Keenan, 1977	Semb & Spencer, 1976
State facts, figures, and definitions	18	40	35	30	02	49	13	08
Identify real-world instances of concepts and principles Provide examples of concepts and principles Compare and contrast facts, figures, definitions, concepts and principles Ask questions Determine methods for answering questions Synthesize information in novel analyses Engage in other kinds of problem-solving	19	60	65	70	98	51	87	92

[1]This paper describes the evolution of a set of procedures for coming to grips with the *verbal components* of what is meant by competent performance. Motor skill development and competence awaits further analysis.

authors' definitions of recall and complex instructional tasks and estimated that one-third of their examination items went beyond the level of facts, figures and definitions, when in fact *only 8%* did. None of the surveys we located included procedures for determining fluency criteria. Thus, it appears that most formal adult instruction requires specific memorized responses to specific sets of stimuli, with little or no attention paid to either proficiency or the conditions under which student performance takes place.

INADEQUACIES OF CURRENT "SOLUTIONS"

These reported surveys prompted us to ask a number of further questions. Has anyone attempted to reduce the large discrepancy between real-world competence and the instruction designed to promote it? Has anyone attempted to specify precisely the goals important for adult learners? In our search through the goals-and-objectives literature, we uncovered five schemas for classifying instructional tasks for adult learners, among them the well-known taxonomy by Benjamin Bloom and his associates (American Association for the Advancement of Science, 1965; Bloom, Englehart, Furst, Hill, & Krathwohl, 1956; Gagné, 1971[2]; Gerlach & Sullivan, 1967; Williams, 1977).[3] The virtues of such schemata are many: they can function as effective prompts for writing instructional tasks that teach and evaluate the range of simple and complex behavior characteristic of a professional within a discipline. They can also standardize terms, definitions, and other aspects of communications regarding instruction. Despite the virtues of task classification systems, at least five major problems plague current schemata. First, most of them classify instructional tasks on the basis of inferred mental operations. For example, the most influential task classification schema is Bloom's taxonomy of educational objectives for the cognitive domain (Bloom, et al., 1956; Krathwohl, 1964). The six classes within their taxonomy are "knowledge," "comprehension," "application," "analysis," "synthesis," and "evaluation." Bloom himself recognized the problem of using inferential constructs by saying that it is not always possible to know whether a student's answer was a product of "high or low level cognitive process" (1956). Further, it is not at all clear how these classes of inferred mental operations are comparable across various subject matters. How is "synthesis" in physics like "synthesis" in poetry or spelling? The definitions of such mental operations are unclear and the generality of the inferences across subject matter suspect.

Besides problems arising from inferring common mental operations among differing instructional content, classification schemata that focus upon internal, unobservable behaviors make it difficult to precisely determine how a given instructional task should be classified. For instance, some might classify the task of defining an idea at the "knowledge" or "comprehension" level of Bloom's taxonomy. If a content expert indicates that the idea is comprised of many simpler ideas, the task might be reclassified as "synthesis." Several studies comparing agreement among subjects' classification of tasks into schema categories have yielded poor results (McGuire, 1963; Popham, 1969; Stanley & Bolton, 1957; Williams, 1977). No schema that classifies instructional tasks is of practical value until a sample of practitioners are tested and the schema revised on the basis of individual performance errors until high agreement is achieved (Markle, 1967).

A third major problem, one that plagues *all* of the aforementioned schemas, is their focus upon formal or structural properties of objectives and

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[2]We reference an early attempt by Gagné to *classify instructional tasks, not* his well-known work in the area of *learning hierarchies* (e.g., Gagné, 1977).

[3]Many more classification systems have been designed for elementary instruction, including schemata that focus upon teachers' oral questions (e.g., Gallagher, 1965; Pate & Bremer, 1967) students' questions (e.g., Carner, 1963) and curriculum-specific questions in disciplines such as art (Clements, 1964), and reading (Guszak, 1967).

their neglect of the conditions under which the task will be performed. To quote Markle and Tiemann (1970),

> A long essay relating various trends (supposedly "synthesis") can represent rote learning, while a multiple-choice selection of the date of some event (supposedly "knowledge") can represent some high-powered analytical thinking (p. 44).

A good "discovery learning program" may get high school or college students or professionals in the real-world to classify an example of a concept that they have never seen before. Such classification illustrates sophisticated extended or conceptual behavior. The same example may be presented in an "expository learning program." Student classification of the example at a later date will illustrate memorization. The classification of an instructional task depends much more upon the relation between the learner's task and previous instruction, than upon the particular words used in the task. The past behavior of the teacher and student should help define how successful completion of an instructional task is like the extended behavior of a professional.

Procedures for using some current classification shemas are based on the assumption that instructional tasks can be arranged in a *taxonomy* or hierarchy from simpler to more complex prerequisite behaviors (e.g., Bloom, et al., 1956; Gagné, 1971; Krathwohl, 1964). For example, Bloom's taxonomy assumes that tasks classified at the "comprehension" level are less difficult and less complex than "analysis" level tasks. "Analysis" tasks are said to subsume "comprehension" tasks. If a student is observed engaging in an "analysis" task such as creating a compound out of two or more elements, it is assumed that she can engage in lower, "comprehension" level "prerequisites" such as telling which of several substances are compounds. Further, the concept of a hierarchy of prerequisites assumes that teaching a lower level task will not lead to correct performance on a higher level task. Hierarchical assumptions also dictate that a student who fails a low level task will also not be able to complete a high level task. These hierarchical assumptions are not always supported by empirical evidence (e.g., Johnson, 1966; White, 1973). The lack of empirical support is due to at least three related factors.

First, while it is clear that hierarchies of prerequisite behaviors for learning a task do indeed exist (Gagné, 1977; Tiemann & Markle, 1978; White, 1973), there is not always a one-to-one correspondence between the prerequisite behaviors an instructional task is intended to evoke, and the behaviors actually evoked by it. This discrepancy will be especially hard to detect when the prerequisite behaviors are described as inferred unmeasurable mental operations, and when the classification of a task does not depend upon knowledge of the learner's history of instruction (Kropp, Stoker, & Bashaw, 1966). For example, if an instructional task asking for a "synthesis" of economic concepts is presented in order to be sure that a student has this prerequisite operation in his repertoire, the student may complete the task correctly on the basis of a "synthesis" he read and memorized without the teacher's knowledge. The prerequisite "synthesis" repertoire may not then be available when the instructor presents an "evaluation" task that requires it.

Second, all tasks classified at a higher level in current taxonomies are not necessarily more "complex" in the sense that their completion requires correct responses to tasks classified at lower levels. For example, prerequisite behavior for criticizing an illustration of a concept ("evaluation" level in Bloom, 1956) may not necessarily require correct completion of a "lower level" task, such as classifying a desirable range of illustrations as examples or nonexamples of that concept ("comprehension" level in Bloom, 1956).

Third, not all kinds of learning, let alone instructional tasks, are hierarchically arrangable (Gagné, 1973, 1977). The concept of "hierarchy" seems best to describe particular behaviors involved in learning a segment of subject matter, not the general arrangement of instructional tasks. Williams (1977) has suggested the term *typology* for instructional task classification schemas that do not make presumptions about task difficulty, task prerequisites, or transfer of training from one task to another.

The fifth problem with current strategies for classifying instructional tasks is an error of omission rather than commission. All discussions of task classification schemas focus exclusively on the qualitative features of behavior, to the neglect of fundamental temporal characteristics. *Behavior's pace is as important as its quality* (Haughton, 1980; Note 2). While behavior rates indicative of "competence" undoubtedly differ across topographies and disciplines, empirical procedures for determining fluency criteria are an essential component of the procedures for using any typology of instructional tasks.

In summary, instructional task classification schemas offer a promising solution to the definition of relevant goals for high school and higher education classrooms and professional or inservice training programs. Such schemas can function as effective prompts for writing instructional tasks that teach and evaluate both simple and complex behaviors characteristic of the behavior of a professional within a discipline; and can standardize terms, definitions, and communications regarding instruction. However, some current schemas classify instructional tasks on the basis of inferred mental operations. The definitions of such mental operations are unclear, the generality of the inferences across differing subjects is suspect, and the classification of tasks into ambiguous categories is difficult. Instructional task classification schemas should employ categories of overt learner behavior that are based not only on the topography of the desired performance, but also on the conditions under which the performance will occur, and the relation between such conditions and those that prevailed during instruction. Further, the authors of a good task classification schema should not make assumptions about task hierarchies without empirical demonstrations of transfer of training and knowledge of the student's prior experience with the subject matter. The term *typology* rather than *taxonomy* best reflects the design and use of a good instructional task classification schema. Finally, programs describing the use of an instructional task classification schema should include procedures for determining proficiency criteria for each task category.

A FUNCTIONAL CLASSIFICATION OF VERBAL BEHAVIOR

What should a classification schema that includes the range of important goals for adult learners, yet avoids the five deficiencies we presented above, look like? Its set of general categories would be *devoid* of inference to mental operations, and should exhaust the range of observable verbal behavior that illustrated professional competence. In particular, the categories should encompass all of the relations between stimulus conditions and verbal performance. The categories should also make no assumptions about hierarchies, and should be applicable across the range of subject matters taught in high school and higher education classes and professional and inservice training programs. The categories should also differentiate between elementary and extended performance and would be amenable to empirical determination and proficiency standards.

Skinner's (1957) verbal behavior classification system meets each of these requirements. It describes all of the reciprocal influences between speaking and writing and the environments in which they occur, including reading, composing, copying, conversing, and identifying. Each verbal relation is labeled, described, and compared to the others, in non-hierarchical fashion and without reference to mentalistic terms.

Figure 1 illustrates our typology of functional verbal relations. The typology classifies instructional tasks according to the general verbal relation they illustrate (e.g., intraverbal, tact), the specific behavior they require (e.g., definition, original example), and the student's prior contact with the task, defining the task as either elementary (prememorized) or conceptual (extended).

Elementary instructional tasks require memorized performance, the opposite of

FIGURE 1

Typology of Verbal Instructional Tasks

Elementary[1] and Conceptual[2] Tasks	*Examples*
Echoic	Correctly repeat the following lines from Shakespeare's *Hamlet*. Be sure to copy my intonation closely.
Textual	Correctly pronounce the following medical terms:
Transcriptive	
Copying from text	Correctly copy the following Chinese letters:
Taking dictation	Correctly spell the following names for laboratory equipment as I say them:
Intraverbal	
Define/Describe	Define reinforcement.
Example Identification	Say which of the following written scenarios is an example of positive reinforcement:
Example-request	Give an example of reinforcement.
Tact	
Example Description	Describe the technical properties of the plant specimens on the laboratory test table.
Example Identification	Say whether each of the following videotaped scenarios illustrates assertive or aggressive behavior:
Example Component Analysis	Identify at least three distinctive features of each of the wines in the goblets in front of you.
Combinations	Any two or more of the above tasks. Includes tasks requiring mands. See text for stems that begin combination tasks.

[1]Require fixed verbal behavior
[2]Require flexible, extended verbal behavior

generalization or extension. Conceptual tasks require extension. Let us take a closer look at the concept *extension*. Skinner (1957) describes it this way

> 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 (or more) such features may evoke a response (p. 91).

When novel stimuli evoke a response, the response is an extension. In this paper we concern ourselves with one of the four kinds of extension that Skinner discusses in his book: *generic extension.*[4] When a previously learned performance occurs in the presence of a novel stimulus that contains all of the properties upon which a verbal community makes reinforcement contingent, the performance illustrates generic extension. Said more colloquially, generic extension occurs when a speaker correctly labels a novel object or event the same way that a particular verbal community does. The basis for the agreement between the speaker and his verbal community is stimulus control by one or more properties of the novel object or event. Such stimulus control develops through a history of reinforcement for responses in the presence of "critical" properties

[4]Skinner (1957) identifies four kinds of extension in his discussion of the tact. In addition to generic extension, he discusses metaphorical extension, metonymical extension, and solecistic extension, a discussion of which is beyond the scope of the present paper. The interested reader should refer to pages 92-102 of *Verbal Behavior* (1957) for Skinner's treatment of these important processes.

embedded in a set of properties that varies from instance to instance. By "critical" we mean those properties that control a verbal community's reinforcement practices. In sum, generic extension occurs when a particular performance occurs in the presence of a novel stimulus that embodies features that must be present for a verbal community to supply reinforcement.

If a student has previously encountered a completed task during instruction, or has completed the task herself, her subsequent completions of the task illustrate elementary, memorized, nonconceptual behavior, not extension. The same task may be elementary or conceptual, no matter whether the task occurs during instruction or testing. Extension is determined by the *relation* between instruction and later behavior, not by the particular content, structure or wording of the task.[5]

Let us look at each class of behavior in Figure 1. *Echoic behavior* is a vocal performance that has *point-to-point* correspondence with a vocal performance that immediately precedes it: the first part of the performance matches the first part of the antecedent stimulus, the second part of the performance matches the second part of the antecedent stimulus, and so on. Echoic behavior also has *formal correspondence* with its antecedent stimulus: both occur in the same modality (i.e., vocal). For example, if a speaker said, "Parlez-vous francais?," an echoic reply would be "Parlez-vous francais?"

Textual behavior is a vocal performance that has *point-to-point* correspondence with a nonauditory stimulus. Since this paper is concerned with the development of verbal instructional materials, "nonauditory stimuli" will usually refer to written or printed materials, such as texts and overhead projectuals. Textual behavior resembles the "decoding" component of reading behavior.

There are two kinds of *transcriptive behavior.* In *copying from text,* both the antecedent stimulus and verbal performance are written. There is also a point-to-point correspondence between antecedent stimulus and performance. In *taking dictation* (verbatim), the antecedent stimulus is vocal and the performance is written. There is also point-to-point correspondence between the antecedent stimulus and performance, although, like textual behavior and unlike echoic behavior, there is no formal correspondence.

There are two ways in which echoic, textual, and transcriptive behavior can be conceptual. The first is in the more trivial sense (at least trivial for experienced learners) of being extended, as when an echoic response is evoked by "the same word" spoken in the past, only now the antecedent stimulus or response is in a different pitch, at a different intensity, in a different accent, or different in some other irrelevant way. Likewise, a textual response illustrates extension when it occurs as a component of a new word. Transcriptive behavior is extended when the text or dictation from which symbols are copied differs in some irrelevant way such as size, color or texture, from previous presentations. Echoic, textual, and transcriptive behaviors are *also* conceptual when there is a new combination of previously learned behaviors in the presence of new stimuli. For example, when a speaker echoes an antecedent vocal stimulus for the first time, we call his echoic behavior conceptual. Likewise, when a person correctly decodes a word she never read before, we call her textual behavior conceptual. When symbols copied from text or dictation have never been copied before, the resulting transcriptive behavior is conceptual. Notice that these examples involve extension *plus* a restructuring of echoic, textual, or transcriptive repertoires.

Conceptual echoic, textual, and transcriptive behaviors are often important to teach in foreign language courses;

[5]Use of our typology will often lead to liberal judgments of student performance. Some performances called conceptual will really be elementary. This error will occur whenever the student has previously encountered the instructional task, either outside of the classroom or during previous classroom instruction, without the teacher's awareness.

in courses in which vocal intonation is critical, as in theatre and debating courses; and when difficult technical pronunciations or written performances are required, as in physiology and medical courses. In most other courses, however, experienced learners do not usually need direct instruction in such relations since all the relevant echoic, textual, and transcriptive extensions are already part of their repertoires.

Intraverbal behavior defines a vocal or written performance that follows a vocal or written antecedent stimulus. Unlike the verbal relations previously described, however, the antecedent stimulus has a different form or topography from the performance it occasions, and *lacks* point-to-point correspondence with it. The antecedent and performance components of an intraverbal may be as short as one word, or may contain many words, phrases, or sentences. Translating a sentence, saying the alphabet, paraphrasing statements heard from a tape-recorder, recalling a definition, and reciting a poem are all examples of intraverbals.

Intraverbals may be emitted by one person or may involve two or more people. A teacher may initiate a two-person intraverbal by requesting a student to define or describe a concept. The student's answer, be it vocal or written, completes the intraverbal relation. As the student is answering the question, a one-person intraverbal chain occurs: each word, phrase, or sentence sets the occasion for subsequent verbal performance. The "comprehension" component of reading behavior is intraverbal: a person "comprehends" a text when he can describe it in different words. Intraverbals can be quite complex, as in a three-person philosophical debate on epistemology, which includes multiple sources of private and public intraverbal stimulation.

Elementary intraverbal tasks are *fixed:* the forms of the antecedent and performance components do not vary from instance to instance. The specific variety (see Figure 1) includes tasks requiring (a) memorized definitions, lists, or descriptions (Define/Describe tasks), (b) repeated discriminations among a specific set of examples and non-examples of a concept, illustrated by matching, marking, or labeling behavior (Example Identification tasks), and (c) Example-request tasks, in which the example, be it prose illustration, drawing, or map, was previously supplied by the student or instructor.

All three subclasses of intraverbals may be extensions, and thus conceptual. Either the task stimulus, the student's performance, or both may vary from those that occurred during previous instruction. The novelty of the antecedent stimulus or performance component of an intraverbal extension may involve equivalent but topographically different word(s) or phrases, or variations in word sequence. Extended intraverbals are *flexible,* in contrast to fixed intraverbals whose antecedent and performance components never vary from the first instance (Johnson & Chase, Note 3, Note 4; Johnson, Chase, & Keenan, Note 5). Intraverbals vary in their degree of "fixedness" or "flexibleness." These two features in fact define a continuum along which intraverbals may be rank ordered. For example, one text (Vargas, 1977) defines the term, motivation as

> (1) The contingencies for responding—roughly speaking, the "reasons" for working; (2) the degree to which an individual has been deprived or satiated with a particular reinforcer; (3) the extent to which a student's behavior is controlled by the natural consequences of behaving rather than by artificial reinforcers introduced by others—that is, how much enjoyment the student gets out of working (p. 246).

One student's performance to the Define/Describe intraverbal task, "Define motivation," is verbatim from the text; it is obviously at the fixed end of the continuum, thus falling into the elementary task category of the typology. A second student's performance is as follows:

> The term motivation refers to at least three different phenomena that we may observe. In the first case, a person may be more motivated as the time since his last encounter with a particular reinforcer increases. Conversely, a person may be less motivated if he very recently made contact with a certain reinforcer. These processes are termed, respectively, deprivation and satiation. Motivation may also refer to the strength of the contingencies that control a person's behavior. If the contingencies

are very strong, a person will be very motivated and is often said to be highly goal directed or purposive. Finally, motivation may also refer to the extent to which consequences of a person's behavior can be found in his own, natural environment. When reinforcers are arbitrarily selected and delivered in such a way that the person will not behave in a certain way unless he is in this artificial environment, we would probably not say that the person was very motivated.

This performance is obviously at the flexible end of the continuum, clearly falling into the conceptual category of the typology. It has a word order and topography that is quite different from the textbook definition. The three kinds of motivation are also presented in an order that is different from the order in the text.[6]

Many intraverbals straddle the fence between conceptual and memorized (elementary), however. For example, a third student's answer to the teacher's task, "Define motivation," follows:

(1) the response contingencies or "reasons" for behaving; (2) the degree to which a student's peformance is controlled by natural rather than by artificial reinforcers introduced by others—the student's enjoyment for working; (3) the extent to which a person has been satiated or deprived of a certain reinforcer.

Is this performance conceptual or memorized? It's hard to say—most of the words in the textbook definition appear, and in the same order. There is, however, an occasional synonym for the textbook word, and the second and third kinds of motivation are reversed. This *might* simply indicate a weak elementary intraverbal performance, however. We would probe this student further before we were confident that she "really understood" what motivation was.

We might be more confident that the third student's performance was conceptual if the antecedent stimulus that occasioned the student's definition was different from "Define motivation." For example, if the teacher asked the student to comment upon the fact that the high school dropout rate was steadily increasing (a fact never discussed in the text), her near-verbatim definition of motivation might very well indicate that she "really understood" the term, even though her answer sounded like the textbook author's definition.

Both Example Identification tasks and Example-request tasks are also intraverbal and hence may vary in their degree of flexibleness. In Example Identification tasks, the scenario presented for classification may be very similar to or very different from the scenarios presented in earlier instruction. Likewise, the student's example in an Example-request task may be very similar to (or very different from) those presented during instruction. As with Define/Describe intraverbal tasks, our confidence in conceptual learning increases to the extent that Example Identification task stimuli are significantly different from those presented in instruction. Likewise, student examples should be "truly original." An instructional passage followed by an illustration of each of these conceptual intraverbal tasks appears in Figure 2.

Instructors may think that some of their instructional tasks will teach intraverbal extension, but in fact the tasks may evoke transcriptive or copy behavior. Most often this will occur when the tasks use words or sequences of words taken directly from the text. For instance, if a text states that "Punishment is defined as . . . " the student may very well simply copy the sentence from the text to answer the task, "Define punishment." Likewise, if a segment of text states

There can be several reasons why an applied behavior analysis program does not achieve its stated objective: the objective, contingencies, or selected procedures may be inappropriate . . .

The following tasks will encourage copying from text:

1. List several reasons why an applied behavior analysis program may not achieve its stated objective.

[6]Actually, two processes operate to produce flexible intraverbals. The first, intraverbal extension, we have discussed at length. The second process is responsible for the particular words and word order that occurs. Skinner calls such grammatical, syntactical, and compositional effects *autoclitic* processes, a discussion of which is beyond the scope of the present paper. We refer the interested reader to chapters 12-14 of *Verbal Behavior* (1957) for a description of these important processes.

FIGURE 2

A Conceptual Intraverbal Program For Teaching The Constructional Approach*

The constructional approach is a relatively new way by which we can deal with the problem behavior of an individual. Currently, most methods for dealing with problem behaviors focus on eliminating a distressing behavior. However, since all behavior, including distressing behavior is maintained by consequences that are desirable to the individual, it is possible to employ these desirable consequences to strengthen other behavior that is not distressing. The constructional approach focuses on changing problem behavior by teaching or suggesting other behaviors that are followed by desirable outcomes or consequences. First, the constructional therapist observes/interviews the client to determine the behavior or class of behaviors that are disturbing to the client or others. In addition, the constructional therapist determines the desirable outcomes that maintain the problem behavior in spite of other disturbing outcomes. Then, alternative behaviors that are maintained by the same critical, desirable outcomes as the distressing behavior, but are accompanied by satisfaction rather than distress are taught or suggested. In addition, the client learns to perform the satisfying behavior in the same situations that the distressing behavior currently occurs. This approach can be used by professionals with behavioral, psychoanalytic, or other therapy orientations. Through self-observation and analysis an individual can also use this approach to change his own behavior.

1. Define the constructional approach in your own words. (Define/Describe task)
2. Which of the following is an example of the constructional approach? (Example Identification task):
   a. Greg was mentally retarded and participated in a workshop to learn to assemble transistor radio parts. He spent much of his time distracting other members of the workshop. They often enjoyed the distraction, and kidded around with him. This caused the supervisor to believe that the kidding around supported Greg's distracting behavior. The supervisor decided that Greg should only be allowed to kid around with the other participants if he was on-task for 15 minutes. This proved to be much better for all concerned, as Greg quickly learned to work diligently for 15 minutes and kid around for 5 minutes.
   b. Georgia, a three-year-old attending a local preschool, had a history of whining when things didn't go her way. For example, one day when she was building a house out of blocks, she accidently knocked it over. She immediately started whining and her teacher came right over. The teacher wondered if her coming over to Georgia when she whined helped support this behavior. To find out, the teacher told Georgia to raise her hand and ask for help if she was having any trouble. Otherwise, Georgia would not get any help. This system worked fine: Georgia does not whine, and the whole classroom atmosphere is much better.
3. Give an original example of the constructional approach. (Example-request task).

* adapted from Goldiamond, 1974.

2. There can be several reasons why an applied behavior analysis program does not achieve its stated objective: The ______, ______, or selected ______ may be ______...

For the same segment of text, a task that would not encourage copy behavior follows below:

Behavioral programs may fail in a number of situations. Summarize the possible ways in your own words.

Note that the form of the noncopy task differs from the form stated in the text, and the item asks the student to summarize in his own words.

Copy tasks are greatly overused and often to no real advantage. Unless textual material is very novel or complex, a copy task is probably superfluous. Most often they are an insult to the student. Remember, copy tasks only assure that the student will copy what is requested. Any grammar school student with appropriate motor skills can copy. Copy tasks require no real understanding of what is copied. Their use should be restricted to very *complex* material, and as the *first step* towards programming objectives that target *memorization* (i.e., elementary intraverbal behavior).

Our subclasses of flexible intraverbals by no means exhaust the range of conceptual intraverbal behavior in which competent professionals engage. Specific curricula and classroom settings may require other topographical indicators of flexible intraverbal behavior. For example, intraverbal tasks in mathematics and statistics are not explicitly identified by any of our subclasses. Many performances emphasized in lists of objectives for children are also not identified by name.

One advantage of our typology is that it provides observable, general categories from which instructors can design relevant subclasses of tasks for their specific courses, in contrast to the unobservable general categories of other classification systems. Indeed, discipline-specific instructional task types designed from a set of general observable categories may provide a better model for instructional design than attempts to design classification systems that contain "universal" task subclasses.

A tact is a vocal or written performance that follows a *nonverbal* antecedent stimulus. The nonverbal antecedent stimulus may be visual, auditory, gustatory, tactile, or olfactory. Describing a new car to a friend as you view it through the showcase window, identifying an example of a triangular shape in a room, naming the kind of leaf that has fallen in front of you, saying when a parent has reinforced a child and when he has punished her as you watch scenes from a videotape, and taking notes at the scene of an accident are all examples of tacts initiated by nonverbal visual antecedents. Naming the key in which a song is sung, the person whose voice you hear in the distance, the flavor of a restaurant's house dressing, a fabric by its texture, or a candle by its scent are all examples of tacts initiated by other nonvisual sensations.[7]

Elementary tact tasks include repeated vocal or written performances to a specific set of nonverbal stimuli, as when the learner labels a piece of equipment he or the teacher has already named. Conceptual tact tasks include vocal or written performances to nonverbal stimuli that the learner has never named or described before. Figure 1 lists and illustrates three useful tact tasks.

It is important to understand the experimental-analytic nature of Skinner's classification system. Observation alone may not be sufficient for correct classification of a verbal relation because some of the controlling variables may be part of the person's history—what the learner brings to the situation that is being observed. What looks like a tact relation may be part intraverbal, as when someone says "Those candy eggs really laid me out flat!," and as when Robert Young tastes Sanka coffee and says "It leaves no grounds for complaint!" Verbal relations may also be multiply-controlled by textual and intraverbal stimulation (the latter not currently observable), as when we read an article on a topic we know much faster than an article about something that is new to us. One can know the correct classification of verbal behavior with certainty only by manipulating each of its antecedents or consequences and measuring changes in the performance. Teachers who use our typology of functional relations must be careful to note all possible influences on a student's response to an instructional task, and experimentally determine their influence when feasible. When experimentation is not possible, the teacher should select another task that provides less ambiguous evidence that the student has mastered the specific verbal relation.

Our typology of functional relations also includes combination tasks, which are any two or more of the task types, such as identifying an illustration as an example or nonexample (Example Identification task) and justifying the answer (Define/Describe task). Combination tasks can also be elementary or conceptual. Elementary combinations may require subtle elementary behavior sequences such as correcting a mispronunciation (Example Identification plus Define/Describe tasks). Conceptual combinations often involve what is traditionally described as problem-solving. For example, consider writing a combination

[7]In prior versions of our functional typology (Johnson & Chase, Note 3, Note 4), Example Identification tasks were given a category of their own, called the approximate tact, to emphasize their similarity to tacts. Notice that Example Identification intraverbal tasks differ from Example Identification tact tasks only in that the antecedent is a pure and neutral verbal description of the nonverbal antecedent for the tact. In our latest version of the typology, we have decided to remain true to Skinner's definitions and system and include Example Identification tasks among both tacts and intraverbals. Research remains to demonstrate the facilitative effect upon the learning of tacts.

task for a text that discusses the relations among the demographics of the people in a voting precinct, the kinds of political candidates that have been elected in the precinct, and the probabilities of new candidates being elected when they have various perspectives on issues like the economy, energy consumption, and foreign military policy (Williams, 1977). One possibility is illustrated below:

Below are biographical sketches of the residents in three precincts. Accompanying each sketch is a detailed description of successful and unsuccessful candidates in prior elections. Describe the candidate whom you would predict would be the most likely to win an upcoming election. Say why you have chosen such a candidate. (Imagine the "sketches"!)

Notice that the student must engage in these subclasses of behavior in order to complete this combination task: (a) he must discriminate political trends from nonpolitical trends (Example Identification); (b) he must describe the characteristics of a candidate most likely to win (Example-request); and (c) he must justify his descriptions in terms of the general rules of political relations discussed in the text (Define/Describe). The following is a generic sample of the kinds of stems that begin combination tasks:

a. Predict the outcome of the following . . . and justify your answer.
b. If the following passage is an example of . . . then justify your answer. If it is not, then rewrite the passage to make it illustrate . . .
c. Change the nonexamples in the following scenarios to examples of . . .
d. Change the examples in the following scenarios to nonexamples of . . .
e. In the following illustrations, identify the examples of . . . and justify your choices by keying the components of the definition to the components of the illustrations:
f. Write an essay in which you describe the relation between . . . and . . . Illustrate your relation with examples and nonexamples.
g. Record the following behavior, graph it, and answer the following questions:

Note that most combination tasks are not simple arbitrary sequences of unitary verbal relations, but rather require "responding to classes of objects or events with classes of relations," reminiscent of Gagné's (1977) most complex intellectual skill, rule-using. For example, in the task, "If the above passage is an example of . . .,then justify your answer. If it is not, then rewrite the passage to make it illustrate . . .," the student is not simply engaging in a unitary, albeit conceptual, performance like identifying the illustration as an example or nonexample. Rather, the student is responding to the illustration with another verbal relation, either Define/Describe, or Example-request behavior. Likewise, a combination task that asks the student to change a nonexample to an example requires rule-using to arrange for a desired outcome. Other combination tasks require behavior characteristic of "prediction" and "evaluation." Instructors should strive to design combination tasks that require conceptual rule-governed behavior.

Combination tasks may also require the student to mand. A *mand* is a verbal performance initiated by *establishing operations* (Peterson, 1978; Michael, Note 6). Establishing operations heighten the reinforcing effectiveness of some stimulus or event. Some establishing operations, such as changing conditions of food, liquid, or heat deprivation; or aversive stimulation of sensory receptors, may affect the speaker due to her phylogenic history. Requesting water or a meal, and asking someone to close the window in the dead of winter or turn down an excruciatingly loud stereo are all examples of mands controlled by establishing operations of a phylogenic nature. Some establishing operations affect the individual due to his reinforcement history as a member of a particular culture. A request to hand you a hammer when you are on top of a ladder, or a request for information you need to solve a problem, are examples of mands controlled by establishing operations of an ontogenic nature. Some mands may be multiply-controlled by both kinds of establishing operations, as in a request to have the snow shoveled so that you can go to the grocery store, buy dinner, and eat. A combination task for describing a particular kind of fossil might require a mand for its location in rock sediment. Similarly, to answer a combination task that asks for the ramifications of a particular therapeutic intervention, the student may need to question different people in the client's living and working environments. Combination tasks may also require self-mands to check written sources.

So far we have discussed two dimensions of our typology: antecedent-performance relations, and their elementary or conceptual nature. The third dimension of our classification system is the selection of proficiency standards for completing a terminal task. Van Houten (1979) has described a two-stage process that we recommend. First, normative data on the performance of those individuals identified as "truly competent" are gathered. Independent judges may also be used to subjectively rate the degree of competence demonstrated by those labeled "competent." For example, one could measure the frequency with which highly competent graduate students or faculty members in a discipline can correctly identify novel examples and nonexamples of a concept, or fill in blanks in Define/Describe tasks used in undergraduate courses (Johnson & Pennypacker, 1971). Second, the normative range of performance demonstrated by competent individuals is subjected to experimental analysis. For example, one could compare the degree of retention, extension, and transfer that results when students are trained to different frequency criteria within the range of performance demonstrated by those labeled "competent." Training a student to complete a minimum of five Example Identification tasks per minute, for example, may lead to the greatest extended performance on new Example Identification tasks and combination tasks that require Example Identification behavior. This minimum rate would be optimal if it increased the likelihood that the student could also demonstrate proficient example-request behavior and define/describe behavior with little or no instruction. Other derivatives of frequency, such as latency and duration, may be useful in the development of proficiency criteria. Proficiency criteria derived from such experimentation will greatly improve maximum future learning.

Procedures for establishing proficiency criteria represent very recent advances in the development of instructional design. Most often, statements of optimal proficiency ranges are not available (but see Haughton, 1972; 1980; Van Houten, 1979; White & Haring, 1980; Wood, Burke, Kunzelmann & Koenig, 1978). However, a lack of advanced technology and information is not an argument against necessity. No behavior occurs in a temporal vacuum; all behavior should be quantified in terms of its temporal units. Some teachers have trouble with these notions because they identify complex performances as *one* behavior, and then try to measure "it" in time. "Inventing a new instrument," "writing about a new theory," and "getting married" are not "its;" they consist of many behaviors, each of which can be expressed in temporal units. Especially in teaching, we should be interested in building the behavioral components of what constitutes complex events like inventions and life-long harmonic relationships between two people.

TEACHING TERMINAL TASKS SELECTED FROM THE TYPOLOGY

Figure 3 illustrates a sequence of terminal instructional tasks for teaching the concept *tau effect* in a college course (Johnson & Chase, Note 4; Johnson, Chase & Kenan, Note 5; Johnson & Chase, Note 7; Chase, Note 8).[8] The sequence includes the three major varieties of conceptual intraverbal tasks and some combination tasks. Accurate performance on these tasks would be followed by a fluency building phase, in which the students would practice until they could define the tau effect, and compare and contrast the tau and kappa effects in one minute or less, classify a minimum of five scenarios per minute as examples and nonexamples, give at least one original example in a one-minute timing, and answer at least two combination tasks in a five-minute sample. These proficiency criteria

[8]Note that our version of the psychophysics concept, tau effect, is greatly expanded from its original definition (e.g., Helson & King, 1931; Bill & Teft, 1969).

are only examples and problably vary from discipline to discipline. Successful completion of a proficiency training program occurs when student rates of correct performance on novel tasks match those rates generated by individuals labeled competent professionals.

Our illustration of terminal tasks in Figure 3 was designed for typical college classroom instruction. However, the typology is not limited to typical paper-and-pencil application. Instructional programs, especially inservice training, should teach a wider range of tasks than are usually found in advanced classrooms. For example, a teacher training curriculum could include tasks that require trainees to identify instances of reinforcement and punishment during observations of trained teachers (conceptual tact task: Example Identification), and comment on the adequacy of modeling procedures used by peers in the training program (Combination task: Example Identification tact, plus Define/Describe intraverbal, and possibly some Example-request intraverbal). We encourage college instructors to incorporate a wide range of tasks in their instructional design.

Instructional programs for experienced learners should focus upon sequences of conceptual tasks. In order to guarantee conceptual performance, fixed intraverbal performance and tasks that promote it must be avoided: Define/Describe tasks should not use word sequences taken directly from the text and should ask the student to answer in his own words. Example Identification tasks should contain illustrations that are maximally unlike those presented in previous instruction. Finally, Example-request tasks should specifically request an original example of each feature of a concept.

Teacher selection and specification of

FIGURE 3

Exemplary Study Program for the Concept, *tau effect.*

1. Define the *tau effect* in your own words.
2. Say how the *tau effect* differs from the kappa effect.
3. Say which of the following are examples of the "*tau effect*":
   a. Mary and Rod went to see "The Sting," starring Robert Redford. The next day they went to see "Butch Cassidy and the Sundance Kid." Rod pointed out that Robert Redford was in both movies. Three months later, they went to see "All the President's Men," which also starred Robert Redford. Mary asked, "Isn't that Robert Redford?" Rod replied, "Nah, that's Paul Newman."
   b. Teddy likes to buy Crackerjacks. He gets the prizes and then gives them away to his friends. Once he got two blue secret decoder rings in the same box. He went running to his mother and told her that he got the same prize twice. He gave one of the rings to his friend Joe. Three weeks later, he was visiting Joe and asked him where he got the blue secret decoder ring. Joe told Ted that he had given it to him. Joe said, "I thought that I had given you a red one."
   c. For one homework problem, Lisa had to factor the equation $4X^2 + 6X + 4$. In class the next day, the students had a quiz on which that problem was included. She solved the problem, and thanked the teacher for putting the homework problem on the quiz. Two weeks later, the same problem appeared again on an exam. After the exam was over, the teacher laughingly asked Lisa whether any of the problems looked familiar. Lisa said that she didn't think so.
4. Give an original example of the *tau effect.*
5. Illustrate how the *tau effect* and the kappa effect differ. Be original.
6. Change the nonexamples of the tau effect in #3 above to examples.
7. Jacques learned to name the painting, "Crows Over a Wheatfield" by Van Gogh, in his Art History class. Do you think he would be *more likely* to name it if he saw it in *Newsweek* the following week, or if he saw it in the Lincoln Center a month later? Justify your answer.
8. Kim was reading the newspaper the other day and noticed a little blurb about Carter's energy policy. The next day, she saw another article on Carter's energy policy, and told her friend Carl that there had been two separate articles in two days about Carter's energy policy. A month later, in a State-of-the-Union address, Carter expounded further on his energy policy. Kim told Carl how she was glad to hear that Carter had expanded his energy policy.

Say whether the above is an example of the kappa effect or the tau effect. If it is one of these two concepts, justify your answer. If it is not one of these two concepts, rewrite the passage to make it illustrate the concept to which it is closest. Then justify the changes that you made.

terminal tasks and proficiency criteria may indeed be sufficient for guaranteeing proficient performance from above-average college and graduate students. However, program tryout may reveal the need for presenting a longer sequence of tasks that incorporate instructional procedures like prompting, fading, and shaping. Discussion of the design of such longer sequences of tasks is beyond the scope of this paper.

We are currently in the process of designing a manual that will detail use of the typology in designing instructional materials for experienced learners (Johnson, Chase, & Keenan, Note 5). The worktext will include detailed descriptions of goals that are important for experienced learners, the definition of conceptual behavior, and Skinner's classification system. Also included will be a chapter devoted to each class of verbal behavior in the typology, and chapters on prompting and sequencing tasks and other techniques of effective instructional design. The interested reader may request a copy of the latest version of our worktext that we used in our typology workshop at the 1981 Association for Behavior Analysis convention. The interested reader should also consult excellent progressive design texts like Tiemann and Markle (1978), Markle (1978); Becker, Engelmann, and Thomas (1975); and Engelmann and Carnine (Note 9).

A growing number of high school and college students and professionals in training programs are weak in prerequisite learning behaviors characteristic of *elementary* task performance. It is highly likely that the pace at which students can engage in elementary prerequisite tasks such as reading, memorizing words, definitions, and examples, and copying from text will determine their success in meeting quality and pace standards for conceptual tasks. For example, Van Houten (1979) found that increasing the frequency of completing basic, single-digit multiplication facts improved the quality and pace of completing long multiplication and long division tasks. Van Houten also noted that students' single-digit multiplication was error-free before fluency building. Thus, if the usual instructional diagnosis based solely on accuracy had been made, the additional practice on single-digit multiplication that improved the fluency and accuracy of long division and multiplication would not have been provided. Haughton (1972; 1980) has also suggested that similar relations exist between the frequency of saying and writing morphemes, words, and the alphabet; and the accuracy and rate of more complex tasks like spelling, reading, and composition. For students weak in elementary prerequisite task proficiency, we recommend including a dose of elementary tasks in programs and on tests. Practice with explicitly stated elementary tasks, usually assumed to be in the repertoires of experienced learners at proficient rates, may significantly increase accurate and fluent conceptual task performance.

VALIDATION OF THE TYPOLOGY

Can other content experts correctly sort specific instructional tasks into the subclasses of the typology? Does the typology cover the range of instructional tasks that define the goals of all advanced instruction? How much training do potential users need in order to accurately and fluently use the typology? (Williams, 1977). The answers to these questions should tell us something about the *clarity, generality,* and *utility* of the typology for people involved in instruction.

In order to answer these questions, Chase (Note 8) conducted an experimental test of the typology. Ten students studied a program on the typology and then sorted ten tasks from our own instructional materials and ten tasks from commercially available Educational and Introductory Psychology study guides and test item files. Table 2 presents the results of our empirical intraverbal extension test. As you can see, we agreed with the students' classifications 90% of the time. We are pleased with the results of our first study. None of the other five classification schemata produce anywhere near such agreement among classifiers, the closest being 46% agreement between

TABLE 2

Agreement Between Students and Typology Designer In Sorting Tasks Into Classes of the Functional Typology

	Percent Agreement										Median
	Graduate Students								Undergraduate Students		
	1	2	3	4	5	6	7	8	1	2	
Our Tasks	90	90	90	100	100	90	100	100	100	90	95
Commercial Tasks	90	100	90	80	80	90	80	60	80	60	80
All 20 Tasks	90	95	90	90	90	90	90	80	90	75	90
	Minutes										
Reading Duration	23	18	26	27	21	15	16	25	25	23	23
Sorting Duration	—	25	—	26	20	24	43	26	32	23	26
Sorting Frequency (Count/minute)	—	.8	—	.77	1.00	.83	.47	.77	.63	.87	.82

Williams (1977) and his subjects. We plan further validation studies with faculty participation.

CONCLUSION

While we are satisfied with the results of our initial validation, expanded tryout and revision should help make our typology a standard vehicle of current instructional practice, increasing communication and broadening the range of instructional tasks included in higher education.

A standard typology will also facilitate progress in instructional research by making interstudy comparisons possible. It can also be used to determine the most efficient instructional programs. For example, our transfer of training research has been designed to determine how learning each class of instructional tasks transfers to a variety of other instructional tasks (Johnson & Chase, Note 7; Chase, Note 8; Chase & Johnson, Note 10; Chase, Johnson, & Sulzer-Azaroff, Note 11). It asks whether it is necessary to teach each class of instructional tasks specified in a typology. Perhaps students will be able to demonstrate all of the verbal skills after direct instruction on only some of them. Perhaps the frequency with which classes of instructional tasks can be completed partially determines the extent or degree of transfer to other verbal tasks. Perhaps prose content and style interact with the kinds and amounts of tasks that are needed. Once the nature of transfer across classes of verbal tasks is known, instructional materials that guarantee complex learning can be designed in an efficient and effective manner. Such instructional materials would include only those tasks and proficiency criteria that facilitate transfer to the full range of "cognitive behaviors." Further research could also determine the most efficient sequence of instructional tasks within and across curricula, and help answer questions raised by traditional verbal transfer research (Faw & Waller, 1976; Rickards, 1979; Keenan & Grant, Note 12).

A standard typology with an accompanying instructional program may also supplement existing study skills training programs by teaching students to generate their own study tasks from the typology. Few, if any, study skills programs focus upon this feature of student learning (Gall, 1970).

Finally, a standard typology should also clarify the positive relation between instructional goals and the effectiveness of other behavioral instruction procedures, such as mastery criteria, review tests, study questions, and unit assignment length (Johnson & Ruskin, 1977). We predict that the kinds of instructional tasks an instructor uses correlates strongly with the degree to which a particular behavioral procedure or even a whole system of instruction is effective.

Cognitive psychologists should not be so quick to bury behavioral influences in instructional design under a "cognitive revolution," as some have called it (e.g., Anderson & Biddle, 1975; Faw & Waller, 1976; Rickards, 1979; Wittrock & Lumsdaine, 1977). This paper has depended heavily upon the functional analysis presented in Skinner's *Verbal Behavior*. Behavior analysts have only scratched the surface of that book.[9] It may yet spawn another "behavioral revolution" in instruction!

[9]Most fruitfully in the area of supplementary stimulation (e.g., prompting and probing; Markle, 1969; 1978).

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