A Descriptive Notation System for Contingency Diagramming in Behavior Analysis

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We describe a notation system for diagramming behavioral contingencies. The system is descriptive. Stimulus functions are not represented with special symbols, such as S^R , S^D , or UCS, but are simply described in terms of the relation between behavior and stimulus change, and the resulting outcome. The system is atheoretical, self-explanatory, and easy to use. Our goal is to provide an approach to contingency diagramming for the student that represents directly the exact relations and outcomes involved in operant and respondent processes.

Key words: notation, behavioral contingencies, diagrams, education

Behavior analysis involves two things: the identification of contingencies that underlie observed behavior and the application of contingencies to change behavior. The former represents the literal meaning of behavior analysis. It might be argued that the ability to apply contingencies without a shrewd ability to analyze contingencies is at best incomplete and at worst risky. Moreover, the value of discerning and describing behavioral contingencies is consistent with the recent emphasis on functional analysis in applied behavior analysis (e.g., Comunidad Los Horcones, 1989; Iwata, Pace, Cowdery, & Miltenberger, 1994).

Those of us who teach students to analyze behavior spend a great deal of time diagramming contingencies on blackboards, overhead projectors, and paper (Goldwater & Acker, 1993; Malott, 1992). A graphic depiction of observed events as they occur over time provides the student with a concrete representation of contingencies. Interestingly, there are no generally accepted and widely adopted conventions for illustrating contingencies this way.

Skinner's *The Behavior of Organisms* (1938) included a brief but explicit section titled "A System of Notation" (p. 51). Millenson and Leslie's

(1979) text, *Principles of Behavioral Analysis*, now out of print, employed diagrams and symbols to represent operant contingencies. More recent textbooks have not emulated this practice to any significant extent (e.g., Catania, 1992; Cooper, Heron, & Heward, 1987; Ferster & Culbertson, 1982; Malott, Whaley, & Malott, 1993; Martin & Pear, 1988; Miller, 1980). Chaining is the only topic in these texts for which diagrams are commonly used, although not all texts do so. Even Holland and Skinner's (1961) classic programmed text, *The Analysis of Behavior*, failed to diagram contingencies.

Our purpose here is to outline a detailed system for diagramming contingencies and their behavioral outcomes. We do not claim originality; there is probably little here that most behavior analysts are not already using in a similar but varied and inconsistent form. Our hope, however, is that our colleagues will be stimulated to discuss our proposals and suggest changes, so that we might ultimately arrive at some overall consensus or standard. A formal notation system has been proposed by others (Mechner, 1959; Snapper, Kadden, & Inglis, 1982; Woods, 1974), but these seem to us to be either too difficult to understand or awkward to use, at least on a keyboard; possibly for these reasons, none of these proposals has been widely adopted. More recently, Hummel, Kaeck, Bowes, and Rit-

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tenhouse (1994) described a system in which reinforcement and punishment or conditions are represented by the addition (+) or subtraction (−) of a positive or negative reinforcer, and the outcome of these operations—(+) for strengthening and (−) for weakening behavior—follows multiplicative laws [e.g., $R + (+) = +$; $R + (-) = -$]. As will be evident in what follows, we have deliberately and systematically adopted a more descriptive and comprehensive approach than that of Hummel et al.

CHARACTERISTICS AND UNDERLYING ASSUMPTIONS OF THE NOTATION SYSTEM

We have tried to make our notation graphically simple, easily recordable by hand or via keyboard, and, above all, as self-explanatory as possible. It was in part for the latter reason that we strove for a purely descriptive system. Stimulus events are represented simply in terms of their presentation, removal, or withholding, with no categorization of their functional (e.g., reinforcing or punishing) properties. Thus, for example, the positive reinforcement contingency is represented by a behavior being followed by a *stimulus*, rather than by a *reinforcing stimulus*; the reinforcement function is captured by specifying, in addition, the contingency's outcome—an increase in the probability of the behavior. One of the advantages of this descriptive approach is that it may be employed in the context of different assumptions and conventions regarding, for example, the characterization of stimulus functions. Thus, for example, punishment is represented in terms of a behavior producing a stimulus with the result that the probability of behavior decreases. The notation applies whether one prefers to characterize the stimulus as a negative reinforcer or as a punishing stimulus. Similarly, the notation system distinguishes between antecedent conditions associated with varying probabilities of reinforcement and

those associated with differences in reinforcer effectiveness. Although we have noted the technical terms generally attached to each contingency, the individual instructor is not bound to these terms should he or she wish to attach other labels, whether for theoretical, professional, or pedagogical reasons.

We have made one significant break with conventional usage. We have chosen to represent all behavior with the letter B. We did so for political as well as pedagogical reasons. Radical behaviorism is all too often misrepresented as connectionistic stimulus–response (S-R) psychology. We felt that using B instead of R might be of some small help in immunizing our students, as well as our colleagues, against this misconception. The case against the term *response* has been made by Malott (1992); he suggests that the term *response* tends to be interpreted as “reaction to.” Ferster and Culbertson (1982) solved the problem by using the letter p for operant performance; we thought it preferable, however, to avoid departing to this extent from general usage, particularly because *performance* is suggestive of the unfortunate historical distinction between learning and performance. (Of course, individual instructors who are not swayed by this argument would be free to substitute R for B in using the notation system.)

Contingencies are represented in parentheses, followed by their behavioral outcome. Representations of contingencies are to be interpreted strictly descriptively. For example, (B ----- S) should be read as “a behavior is followed by a stimulus.” No inferences about causality are implied, and we deliberately rejected the use of an arrow (--->) to avoid any such connotations. No assumptions are made regarding the causal relation between behavior and stimulus (i.e., whether it is a true or real contingency), as opposed to a relation that merely involves temporal contiguity. Antecedent stimuli or conditions are represented by a preced-

ing S. All that is implied is a temporal relation between the antecedent stimulus and behavior. The notation is purposely silent as to the causal nature of the relation. An arrow with a double-dashed stem ($\Rightarrow$) represents change in behavior as the result of a contingency; this arrow *is* to be interpreted as showing a causal relation. The outcome $B\uparrow$ implies that the contingency functions to increase or maintain the probability (or rate, magnitude, etc.) of a behavior above baseline levels. (The up arrow is Character 23 in Word-Perfect 5.1 Character Set 6; alternatively, one could either employ $\wedge$, using backslash and slash, or create an up arrow using a graphics program.) Following each symbolic representation of a contingency and an outcome, a brief verbal description is provided, along with any technical terms that may conventionally be associated with it.

Our emphasis on a descriptive approach is in no way intended to ignore the importance of causal inference in behavior analysis. It simply recognizes the fundamental distinction between the role of observation and the role of causal analysis in a science of behavior. The use of this notation system makes this distinction explicit. This careful differentiation between data and inference seems to be a familiar and appropriate approach to a science of human behavior.

There is one potential problem for the reader that arises as a consequence of any attempt to adhere scrupulously to a descriptive approach. This is a problem not with the notation system itself but with the verbal description of the contingencies they represent. These descriptions may sometimes be more cumbersome than a causal analysis of these same contingencies. (Students of behavior analysis will recognize this as a common difficulty with precise descriptions of behavioral contingencies that, for example, are often much more difficult to convey than more conventional mentalistic accounts.) Two points should be emphasized here:

First, although our descriptive analysis is clumsier than a causal analysis, it is, as mentioned above, intended to be theoretically neutral. It does not preclude the individual instructor from using a causal analysis. Second, it is not the descriptive notation system itself that is cumbersome here, only the verbal account of it. In fact, once readers get past the verbal description, they should appreciate the relative simplicity of the notation.

THE NOTATION SYSTEM

To make things a bit easier for the reader, we have grouped the contingencies under a few general headings. We do not mean to suggest that the terms in these headings are to be preferred over alternative possibilities, nor should the reader infer any theoretical implications from the particular way we have grouped the contingencies. Figure 1 provides a summary of the notation system; numbering corresponds to that in the text.

Reinforcement and Punishment

This section deals with two-term contingencies. They are included for pedagogical reasons; students should, we believe, master simple ($B-----S$) contingencies before attempting more complex three-term contingencies. Whether two-term contingencies exist in nature or are merely analytic abstractions need not concern us.

1. ($B-----S$) $\Rightarrow B\uparrow$

Description. A behavior (B) is followed by ($-----$) a stimulus (S), with the result ($\Rightarrow$) that the probability (or rate, magnitude, etc.) of the behavior increases ($B\uparrow$).

Technical terms and implications. Positive reinforcement. S is a positive reinforcer.

2. ($B_1-----S$) $\Rightarrow B_2\uparrow$

Description. A behavior (B_1) is followed by the occurrence of a stimulus, with the result that (in addition to $B_1\uparrow$), the probability of a second behavior (B_2) increases.

CONTINGENCY NAME	TWO-TERM CONTINGENCY	STIMULUS CONTROL	ESTABLISHING EVENT
Positive Reinforcement	1. (B----S) $\Rightarrow$ B $\uparrow$	10. (S ₁ : B----S) $\Rightarrow$ S ₁ : B $\uparrow$	18. S ₁ :{(B----S) $\Rightarrow$ B $\uparrow$ }
Response Generalization	2. (B ₁ ----S) $\Rightarrow$ B ₂ $\uparrow$	(refer jointly to nos. 2 and 10)	(not generally considered)
Stimulus Generalization	(not applicable)	11. (S ₁ : B----S) $\Rightarrow$ S ₂ : B $\uparrow$	(not generally considered)
Operant Extinction	3. (B--/-S) $\Rightarrow$ B $\downarrow$	12. (S ₁ : B--/-S) $\Rightarrow$ S ₁ : B $\downarrow$	(not generally considered)
Escape	4. (B----\$) $\Rightarrow$ B $\uparrow$	13. (S ₁ : B----\$) $\Rightarrow$ S ₁ : B $\uparrow$	19. S ₁ :{(B----\$) $\Rightarrow$ B $\uparrow$ }
Operant Extinction	5. (B--/-)\$ $\Rightarrow$ B $\downarrow$	(refer jointly to nos. 5 and 13)	(not generally considered)
Avoidance	6. (B--\S) $\Rightarrow$ B $\uparrow$	14. (S ₁ : B--\S) $\Rightarrow$ S ₁ : B $\uparrow$	20. S ₁ : {(B--\S) $\Rightarrow$ B $\uparrow$ }
Operant Extinction	7. (B-/-\S) $\Rightarrow$ B $\downarrow$	(refer jointly to nos. 7 and 14)	(not generally considered)
Positive Punishment	8. (B----S) $\Rightarrow$ B $\downarrow$	15. (S ₁ : B----S) $\Rightarrow$ S ₁ : B $\downarrow$	21. S ₁ :{(B----S) $\Rightarrow$ B $\downarrow$ }
Negative Punishment	9. (B----\$) $\Rightarrow$ B $\downarrow$	16. (S ₁ : B----\$) $\Rightarrow$ S ₁ : B $\downarrow$	22. S ₁ :{(B----\$) $\Rightarrow$ B $\downarrow$ }
Chain	(not applicable)	17. (S ₁ : B ₁ ----S ₂ : B ₂ ----S) $\Rightarrow$ S ₁ : B ₁ $\uparrow$; S ₂ : B ₂ $\uparrow$	(not generally considered)
Respondent Conditioning	23. (S ₁ ----[S ₂ --B]) $\Rightarrow$ S ₁ : B $\uparrow$	(not generally considered)	(not generally considered)
Respondent Extinction	24. (S ₁ --/[S ₂ --B]) $\Rightarrow$ S ₁ : B $\downarrow$	(not generally considered)	(not generally considered)

Figure 1. Summary of notation system.

Technical terms and implications. Called response induction or response generalization.

3. (B -- / -- S) $\Rightarrow$ B $\downarrow$

Description. A behavior is no longer followed by a stimulus, with the result that the probability of the behavior decreases.

Technical terms and implications. Operant extinction: the termination of a (B -----S) contingency. S is a positive reinforcer. (Note: The down arrow is Character 24 in WordPerfect 5.1 Character Set 6. An alternative would be to use V, using the backslash and slash, or to create a down arrow with a graphics program.)

4. (B ----- \$) $\Rightarrow$ B $\uparrow$

Description. A behavior is followed by the termination of a stimulus, with the result that the probability of the behavior increases.

Technical terms and implications. Negative reinforcement (escape). S is called a negative reinforcer or aversive stimulus. (Note: WordPerfect's overstrike feature will produce \$. Alternatively, the strikeout or red line feature can be used with the Macintosh.)

5. (B -- / -- \$) $\Rightarrow$ B $\downarrow$

Description. A behavior is no longer followed by the termination of a stimulus, with the result that the probability of the behavior decreases.

Technical terms and implications. Operant extinction: the termination of

a (B -----S) contingency. S is called a negative reinforcer or aversive stimulus.

6. (B $\neg$ S) ==> B $\uparrow$

Description. A behavior is not followed by a stimulus that had previously occurred in the absence of that behavior, with the result that the probability of the behavior increases. (Note: We used subscript for the $\neg$ and advance left 0.1 inch in WordPerfect 5.1 to align the line directly under the S, but simpler approximations undoubtedly exist.)

Technical terms and implications. Negative reinforcement. B is an avoidance behavior. S is called a negative reinforcer or aversive stimulus. Note the difference between avoidance and operant extinction (3) above. In both cases, there is no stimulus change after the behavior; the distinction is based on prior events. In the case of extinction, the behavior had previously been followed by a stimulus; thus the notation B -- / -- S to connote the removal of this contingency. In the case of avoidance, on the other hand, the stimulus had previously occurred, but in the absence of the avoidance behavior. The stimulus fails to occur only when the avoidance behavior is emitted. The B $\neg$ S notation was chosen because it graphically suggests getting around or circumventing the stimulus.

7. (B - / $\neg$ S) ==> B $\downarrow$

Description. A behavior no longer avoids a stimulus, with the result that the probability of the behavior decreases.

Technical terms and implications. Operant extinction: termination of a (B $\neg$ S) contingency. S is called a negative reinforcer or aversive stimulus.

8. (B -----S) ==> B $\downarrow$

Description. A behavior is followed by a stimulus, with the result that the probability of the behavior decreases.

Technical terms and implications. Punishment. This is called positive punishment or punishment by hurt. S

is called a positive punisher, a negative reinforcer, or an aversive stimulus.

9. (B -----S) ==> B $\downarrow$

Description. A behavior is followed by the termination of a stimulus, with the result that the probability of the behavior decreases.

Technical terms and implications. Punishment. This is sometimes called negative punishment, punishment by loss, or penalty. S is called a negative punisher or positive reinforcer.

Stimulus Control

10. (S₁: B -----S) ==> S₁: B $\uparrow$

Description. In the presence of an antecedent stimulus S₁, behavior is followed by a stimulus, with the result that the probability of the behavior increases in the presence of S₁.

Technical terms and implications. Stimulus control through a three-term reinforcement contingency; S₁ is called a discriminative stimulus, S^D.

11. (S₁: B -----S) ==> S₂: B $\uparrow$

Description. In the presence of an antecedent stimulus S₁, a behavior is followed by the occurrence of a stimulus S, with the result that (in addition to S₁: B $\uparrow$) the probability of the behavior increases in the presence of a different antecedent stimulus, S₂.

Technical terms and implications. Stimulus generalization.

12. (S₁: B - - / - -S) ==> S₁: B $\downarrow$

Description. In the presence of an antecedent stimulus S₁, a behavior is no longer followed by a stimulus, with the result that the probability of the behavior decreases in the presence of S₁.

Technical terms and implications. Stimulus control through a three-term extinction contingency; S₁ is termed an S-delta, S^Δ.

13. (S₁: B -----S) ==> S₁: B $\uparrow$

Description. In the presence of an antecedent stimulus S₁, a behavior is followed by termination of a stimulus, with the result that the probability of the behavior increases in the presence of S₁.

Technical terms and implications. Stimulus-controlled escape; S_1 is a discriminative stimulus, S^D .

14. $(S_1: B \neg S) ==> S_1: B\uparrow$

Description. In the presence of an antecedent stimulus S_1 , a behavior is not followed by a stimulus that had previously occurred in the absence of that behavior, with the result that the probability of the behavior increases in the presence of S_1 .

Technical terms and implications. Stimulus-controlled avoidance; S_1 is a discriminative stimulus, S^D .

15. $(S_1: B \neg \neg \neg \neg S) ==> S_1: B\downarrow$

Description. In the presence of an antecedent stimulus S_1 , a behavior is followed by a stimulus S , with the result that the probability of the behavior decreases in the presence of S_1 .

Technical terms and implications. Stimulus control through a three-term punishment contingency; S_1 is a discriminative stimulus, S^D .

16. $(S_1: B \neg \neg \neg \neg \S) ==> S_1: B\downarrow$

Description. In the presence of an antecedent stimulus S_1 , a behavior is followed by the termination of a stimulus S , with the result that the probability of the behavior decreases in the presence of S_1 .

Technical terms and implications. Stimulus control through a three-term punishment contingency; S_1 is an S^D .

17. $(S_1: B_1 \neg \neg \neg \neg S_2: B_2 \neg \neg \neg \neg S) ==> S_1: B_1\uparrow; S_2: B_2\uparrow$

Description. A series of stimuli and kinds of behavior occurs. In the presence of each stimulus, in turn, emission of the appropriate behavior is followed by the next stimulus, until the last stimulus in the series. As a result, each behavior in turn becomes more likely to occur in the presence of its antecedent stimulus.

Technical terms and implications. Behavioral chain. Each stimulus that intervenes between each behavior is a reinforcer for the preceding behavior and an S^D for the succeeding behavior.

Establishing Events

18. $S_1: \{(B \neg \neg \neg \neg S) ==> B\uparrow\}$

Description. Positive reinforcement (i.e., the $B \neg \neg \neg \neg S$ contingency produces its behavioral outcome) dependent upon the antecedent condition S_1 .

Technical terms and implications. S_1 is called an establishing operation or an establishing stimulus (Michael, 1982), or a setting event (Bijou & Baer, 1961). Note the difference between the representation of establishing operation or establishing stimulus, as opposed to that of stimulus control in 10 above: In stimulus control, the contingency ($S_1: B \neg \neg \neg \neg S$) includes S_1 ; in establishing events, the $(B \neg \neg \neg \neg S)$ contingency is independent of S_1 (S_1 lies outside the parentheses), but the relation between contingency and outcome (i.e., positive reinforcement, in this case), defined within the brackets, depends on S_1 .

19. $S_1: \{(B \neg \neg \neg \neg \S) ==> B\uparrow\}$

Description. Negative reinforcement, involving an escape contingency, dependent upon the antecedent condition S_1 .

Technical terms and implications. S_1 has been termed an establishing operation/stimulus or a setting event. (Contrast with 13 above.)

20. $S_1: \{(B \neg S) ==> B\uparrow\}$

Description. Negative reinforcement, involving an avoidance contingency, dependent on the antecedent condition S_1 .

Technical terms and implications. S_1 is called an establishing operation/stimulus or a setting event. (Contrast with 14 above.)

21. $S_1: \{(B \neg \neg \neg \neg S) ==> B\downarrow\}$

Description. Positive punishment dependent upon the antecedent condition S_1 .

Technical terms and implications. S_1 is called an establishing operation/stimulus or a setting event. (Contrast with 15 above.)

22. $S_1: \{(B \neg \neg \neg \neg \S) ==> B\downarrow\}$

Description. Negative punishment

dependent upon the antecedent condition S_1 .

Technical terms and implications. S_1 is called an establishing operation/stimulus or a setting event. (Contrast with 16 above.)

Respondent Conditioning

23. $(S_1 - - - - - [S_2 - - B]) ==> S_1; B \uparrow$

Description. An antecedent stimulus S_1 is followed by a stimulus S_2 , along with its elicited behavior, with the result that the probability (or magnitude) of the behavior increases in the presence of S_1 .

Technical terms and implications. Respondent, classical, or Pavlovian conditioning. S_2 is typically an unconditioned stimulus, and the behavior it elicits is an unconditioned response, although they may be, as in the case of higher order conditioning, a conditioned stimulus and a conditioned response. S_1 is a conditioned stimulus, and the behavior it comes to elicit is a conditioned response.

Note that a notation system that represents both respondents and operants with the same symbol B may raise considerable controversy, but there are some compelling arguments to justify the practice. First, research on operant conditioning of autonomic behavior (including salivation, the prototypical conditioned response) and on classical conditioning of skeletal behavior (including key pecking via autoshaping) has demonstrated that the operant or respondent character of a behavior is an issue of functional analysis, *not* an inherent property of the behavior. Second, from a pedagogical point of view, a notation system that distinguishes operants and respondents purely on the basis of the contingencies that control them directs the attention of the student to precisely those variables that they should be using to analyze and categorize behavioral processes. By the same token, representing the outcome of both classical conditioning and differential operant conditioning as $S: B \uparrow$

emphasizes the communality of stimulus control that results from both contingencies. (In this context, see, e.g., the unified theory of reinforcement of Donahoe & Palmer, 1994, and their argument that both classical and operant procedures result in the selection of environment-behavior relations.)

24. $(S_1 - - / - - [S_2 - B]) ==> S_1; B \downarrow$

Description. An antecedent stimulus S_1 is no longer followed by a stimulus S_2 (along with its elicited behavior), with the result that the probability (or magnitude) of the behavior decreases.

Technical terms and implications. Respondent extinction: the termination of a $(S_1 - - - - - [S_2 - B])$ contingency.

USING THE NOTATION SYSTEM

The present system is the evolutionary product of years of teaching behavior analysis and of informally identifying the nature and sources of our students' errors. It has been our experience with these students that has impressed us with the merits of a descriptive approach. Thus, for example, discussing the increase in the misbehavior of a child as the result of misbehavior being followed by a positive reinforcer in the form of a spanking often generates confusion in students, whose natural tendency is to categorize spanking as aversive. When trained to analyze such a contingency simply as "a behavior that is followed by a stimulus with the result that the behavior increases," however, our students seem less likely to be misled by their own preconceptions. The descriptive approach encourages the student to first categorize events as either behavior or stimulus, and then to simply describe the relations among these events and their behavioral outcome. This, it seems to us, is the core skill involved in the analysis of behavior.

We have used the descriptive notation system in diagramming contingencies inside and outside the classroom. We use it in diagramming on the blackboard to represent behavioral contin-

gencies discussed in lecture or text material. We use it in diagrams to guide our students' analysis of exemplars assigned as part of in-class exercises. We encourage our students to use it in diagramming behavioral contingencies as an aid on examinations and in term papers requiring behavior analysis. We use it to provide corrective feedback to students on their exams and term papers. In all these cases, students have repeatedly told us that they find these contingency diagrams to be helpful. The diagrams seem to enhance the stimulus control that pertinent behavioral/environmental events and contingencies have over the student's analytic behavior. Graduate students in our seminars and tutorials report that the demand to diagram behavioral contingencies on the blackboard serves to enhance their sensitivity to the critical events and relations involved. Finally, these diagrams could be useful as a component in fill-in examination questions, as in the following example:

Fill in the blanks:

(B -----) ==> B₋ (Escape)

Other instructional contexts or objectives may give rise to other types of application.

CONCLUSION

The above notation system is not exhaustive. In the interests of brevity, we included only one example of operant stimulus and response generalization. We also did not, for example, include conditional discrimination, or generalization or differential conditioning of respondents. We had additional reasons for not including schedules of reinforcement or concurrent schedules. In our opinion, the feature that makes our system particularly valuable—the fact that it *directly* represents the observed events and relations that form each behavioral contingency—cannot be extrapolated as effectively or efficiently to reinforcement schedules. For example, we could have represented an interval schedule as (t: B -----S), where t stands for time, and a ratio

schedule as (#: B -----S), where # represents the number of occurrences of the behavior preceding reinforcement. Similarly, a concurrent schedule could be represented, for example, as two simultaneous (one above the other) interval contingencies, (t: B₁ -----S) and (t: B₂ -----S). But to begin to specify the exact schedules involved would detract from the simplicity of the present approach. More important, the representation of reinforcement schedules by means of hypothetical cumulative records is not only a deeply entrenched convention, but, in our opinion, a pedagogically more useful approach. Cumulative records allow time, number of responses, and the occurrence of reinforcement (via hatch marks) to be represented within a simple graphic, in which both the schedule and its outcome are readily apparent.

The present account, we hope, is comprehensive enough to thoroughly illustrate the basic characteristics of the proposed notation system. The reader may also appreciate the potential of this notation system to easily represent more complex contingencies. Thus, for example, (B - \$) ==> B↓ would represent what Malott et al. call “punishment by the prevention of the removal of an aversive condition” (1993, p. 257). Other contingencies, documented or hypothetical, could be readily derived; these might present interesting formal, pedagogical, or empirical implications.

The contingency notation system described here does more than provide a convenient and concise system for use in the classroom, although it does this in what we hope is a consistent and clear manner. It also allows students to directly, and with minimal assumptions, represent the behavioral contingencies that they confront either in examples provided in class or in their own observations of the world around them.

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