Doctoral Training in Behavior Analysis: Training Generalized Problem-Solving Skills

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This essay provides guidelines for designing a doctoral program in behavior analysis. First, we propose a general accomplishment for all behavior analytic doctoral students: that they be able to solve problems concerning individual behavior within a range of environments. Second, in order to achieve this goal, we propose that students be trained in conceptual and experimental analysis of behavior, the application of behavioral principles and the administration of behavioral programs. This training should include class work, but it should emphasize the immersion of students in a variety of environments in which they are required to use behavior analytic strategies. Third, we provide an example of a hypothetical graduate program that involves the proposed training. Finally, an evaluation plan is suggested for determining whether a training program is in fact producing students who are generalized problem-solvers. At each step, we justify our point of view from a perspective that combines principles from behavior analysis and educational systems design.

Four articles have appeared recently in *The Behavior Analyst* that address the kinds of training that are needed for behavior analytic students (Baer, 1981; Edelstein, 1982; Malott, 1981; Michael, 1980). Michael (1980) claimed that training in behavior analysis needs to become more intensive in the training of basic, applied, and conceptual analyses, and in the packaging of a number of related areas essential to the survival of individual analysts. In contrast, Baer (1981) indicated that behaviorists were already successfully training their students and, therefore, need only continue what they are doing. Both Malott (1981) and Edelstein (1982) suggested a middle ground between Michael (1980) and Baer (1981). Although illuminating, these articles fail to specify the behavior analysis that was conducted to arrive at these points of view. A more detailed analysis of graduate training is needed.

A cursory glance at the behavior analytic model (e.g., Sulzer-Azaroff & May-

er, 1977) would suggest that a behavior analysis of graduate training will require a general statement of the accomplishments of a training program (goals and objectives), a detailed list of specific skills that result in the general accomplishments (task analysis), a program for teaching these skills, and an evaluation system for determining the success of the program. In addition, because the training of behavior analysts is a problem of social significance and thus a problem in applied behavior analysis, we might usefully adhere to the dimensions outlined by Baer, Wolf, and Risley (1968).¹ In other words, a description of graduate training needs to specify the behaviors that are to be changed (i.e., trained), demonstrate the events responsible for the change, describe these events precisely enough to be repeated by others, describe the analysis in terms of the concepts of behavior analysis, and specify the expected effect and the expected generality of the effect. These would seem to be the minimal requirements for a behavior analysis of graduate training.

The purpose of this paper is to suggest a behavior analysis of graduate training that is based on a behavioral problem-solving model. The program is not ex-

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¹ We wish to thank Ed Morris for suggesting this general theme to us. It clarifies much that was "muddy" in a previous draft.

perimentally derived, yet has within it descriptions of how an experimental analysis might be conducted. In addition, the program includes components that have been derived from experiments on instruction and learning.

GOALS AND OBJECTIVES

Gilbert (1978) suggested that training programs need to be looked at as performance systems. A performance system defines its goals in terms of accomplishments. If behavior analysts do *not* define what it is that they want their graduates to accomplish, then they will never know whether they have been successful trainers or not. Thus, in what follows, an accomplishment based method is used to describe the goals and objectives of a behavioral graduate program.

One goal of doctoral level training is to produce individuals who engage in problem-solving behavior under a variety of situations. This objective involves two separate components: Not only should behavior analysts be trained to solve problems, but also to solve those problems in a range of environments.

With respect to the general training in problem-solving, we have found little disagreement with our colleagues that a trained behavior analyst should be able to solve problems concerning behavior by using a scientific, behavioral model. The exact nature of the problem-solving behaviors, however, is agreed upon less. Therefore, a major portion of this paper, the Task Analysis section, is devoted to defining the skills that we consider essential for a behavioral problem-solver. These skills have some data-based support. For instance, some are listed in the results of Sulzer-Azaroff, Thaw, and Thomas's (1975) survey of requisite skills as described by exemplary behavior analysts. Let it suffice at this point to define a behavioral problem-solver as one who answers questions concerning behavior through a rigorous, systematic, performance based, evaluative method (Sulzer-Azaroff & Mayer, 1977).

With respect to the generalized nature of these problem-solving skills, consen-

sus in less easily reached. In suggesting that students be trained to be generalists, we are flying in the face of current trends toward specialization. The basic reason for advising against specialized training is critical: In a dynamic field where career paths are difficult to predict, students will be best equipped if they can perform as behavior analysts in a range of environments. The data in support of this argument seem self-apparent. How many readers who have received their doctorates are working in the same environment in which they received their master's degree? Many have changed environments drastically, going from laboratories to school settings to industrial settings. Others have changed less drastically, perhaps from solving problems concerning schedules of reinforcement with animals to solving problems concerning complex stimulus control with humans. In addition, we agree with Naisbitt (1984) that if one specializes too much, one may find the speciality becoming obsolete. A simple look at the job market as one factor that affects career decisions supports this conclusion. For example, fewer job opportunities are available for people with training as pure experimental analysts (basic laboratory researchers) today than there were ten years ago.

If one agrees with this analysis of changing employment conditions, then the next question is whether specialist training or generalization training leads to better performance under changing conditions. As far as we know, this question has not been answered by data collected under experimental conditions. Nonetheless, sufficient evidence exists to suggest strongly that generalization of a particular response in the presence of different environments does not occur without explicit training (Stokes & Baer, 1977). In addition, other data indicate that behavior that is adaptive under one set of conditions, occurs under new conditions regardless of whether it is adaptive or not (Baron, Kaufman, & Stauber, 1969; Buskist, Bennett, & Miller, 1981; Catania, Matthews, & Shimoff, 1982; LeFrancois & Chase, 1985). These find-

TABLE 1

A task analysis of general conceptual skills

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- A. Identifies ethical issues, designs programs/research consistent with ethical standards, and responds to critiques by review boards.
  - B. Discusses conceptual issues logically and with relevant citations from the literature.
  - C. Relates current discussions of issues to historical and philosophical roots.
  - D. Compares philosophy and science.
  - E. Compares psychology with other sciences.
  - F. Compares behavioral psychology with other models of psychology.
  - G. Describes methods for analyzing psychological events that are difficult to analyze from a behavioral perspective.
  - H. Pinpoints relations among seemingly disparate events.
  - I. Pinpoints critical factors within complex and variable situations.
-

ings imply that if students are to be successful in novel situations, they need to acquire behaviors that are generally adaptive across situations. Presently, the only model available that makes this likely is a variety of training model (Duncan, 1958; LeFrancois & Chase, 1985).

In summary, unless one is particularly good at predicting job market trends in scientific inquiry and other factors controlling the specific environments within which behavior analysts work, then training behavior analytic students to engage in behavioral problem-solving in a variety of different environments is the best solution for survival in a changing environment.

TASK ANALYSIS

The second level of analysis is to specify the skills that comprise the general accomplishments of behavior analysis training. Continuing with Gilbert's (1978) suggestions for designing a performance system, we need to define the skills that an exemplary behavior problem-solver emits. We have divided these skills into five general areas: conceptual skills, experimental skills, applied skills, communication skills, and administrative skills, each of which is analyzed into subskills. These subskills could be divided further by individual programs. At the doctoral level we believe that exemplary behavior analysts should emit all of these behaviors.

General Conceptual Skills

Table 1 presents the general conceptual skills required of an exemplary behavioral problem-solver. These skills were derived from three sources. First, the ethical skills were borrowed from Sulzer-Azaroff et al.'s (1975) survey of editors and authors from four behavioral journals (*Journal of Applied Behavior Analysis*, *Behavior Research and Therapy*, *Behavior Therapy and Experimental Psychiatry*, and *Behavior Therapy*). These particular skills were identified as necessary for behavior analysts by over 80% of the 92 responders. Second, we have discussed philosophical and conceptual courses with a number of faculty at West Virginia University, St. Cloud State University, and the University of Massachusetts. Items B–G were derived from these sources. Third, we reflected on the skills that we have observed exhibited by people we consider exemplary behavior analysts. Items H and I were added to the list after this reflection.

The need for conceptual skills may not be evident, especially to those engaged in purely applied pursuits. Therefore, let us try to justify their inclusion in all behavioral training programs. Baer et al. (1968) claimed that the field of behavior analysis would advance best if analysts tied the specific procedures that they used to relevant principles. Michael (1980) criticized behavior analysts for the failure to relate specific procedures to basic behavioral concepts and for superficially ana-

TABLE 2

A task analysis of general experimental skills

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- A. Identifies trends and integrates findings from literature relevant to a particular problem/question.
  - B. Analyzes conceptual issues relevant to a particular problem/question (see Table 1).
  - C. Specifies questions that have not been addressed in the literature.
  - D. Specifies experimental logic/methodology for answering questions (e.g., compares intrasubject and intersubject designs and justifies the use of specific designs on the basis of experimental logic).
  - E. Designs apparatus, materials, and measurement systems to conduct research.
  - F. Conducts research.
  - G. Interprets and analyzes data.
  - H. Discusses results in relation to literature, and future directions or questions that might be addressed.
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lyzing specific events as examples of behavior principles. Branch and Malagodi (1980) added that the lack of philosophical training contributes to inconsistencies exhibited by behavior analysts who work within nonbehavioral organizations. In order to adhere to Baer et al.'s (1968) advice, answer Michael's (1980) criticisms, and address Branch and Malagodi's (1980) dilemma, behavioral students need to be taught the relations among contemporary behavior analysis, alternative psychological models, and the history of psychology and philosophical schools of thought. If students do not learn to relate specific procedures, treatments, and independent variables to general principles, concepts, and rules, the resulting knowledge will not systematically accumulate to form a science or a technology of human behavior. If students do not learn the relations between behavior analysis and other conceptual points of view, they may not be able to maintain a consistent behavioral point of view. Behavior analysts will not be able to relate concepts and discuss the relations between behavior analysis and other models if they have not been explicitly trained to do so.

General Experimental Skills

Table 2 presents a list of experimental skills required of an exemplary behavioral problem-solver. The skills were derived by analyzing the tasks necessary to conduct an experimental analysis. In addition, a number of these skills, items A, D, E, and F were identified as being necessary by over 75% of the responders to

the Sulzer-Azaroff et al.'s (1975) survey. The complete list of skills is applicable to rigorous experimental studies conducted in laboratories, but in many circumstances also applicable in applied settings.

In justifying the need for training these skills, we again refer the reader to Baer et al. (1968) and Michael (1980) for detailed justification of learning the relations among general concepts and principles and specific instances of these relations. Many of these general concepts and principles are methodological. Much of what behavior analysts do to solve problems is derived from rigorous experimental analyses, hence graduate students need rigorous and explicit training in the general experimental analysis of behavior.

We would also add two other points in support of experimental training. First, problems still exist that require the rigor and the control of the laboratory. Behavior analysts must not forget that much of the technology used today is built upon principles derived from the laboratory. When faced with problems that seem insurmountable, a worthwhile strategy is to break these problems into their components, to test these components, and then begin to piece the components back together. To do this systematically and empirically often requires laboratory or analog settings. Therefore, behavioral students should be taught the usefulness of the laboratory in solving problems. Second, in order to facilitate the integration of basic and applied behavior analysis, students should have common ex-

TABLE 3

A task analysis of general applied skills

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- A. Specifies goals, objectives and task analyses for an applied problem.
  - B. Assesses relevant entering skills of clients.
  - C. Designs programs to bring clients from entering level of skills to skills specified in goals and objectives.
  - D. Designs experimental evaluation system to determine whether the program is working.
  - E. Implements program and evaluation system.
  - F. Analyzes data to determine changes that should be made in the program.
  - G. Changes programs based on data/evaluation outcomes.
  - H. Conducts experimental analyses of unknown relations revealed by program changes (see Table 2).
-

periences and skills. The more that people with applied interests are influenced by laboratory findings, the sooner basic principles can be tried out to test their robustness and generality to human affairs. The more people who are trained to integrate experimental analyses with applied analyses, the shorter the wait for syntheses such as Goldiamond's (1975) translation of work on concurrent schedules of reinforcement into the applied strategies of systemic intervention, or Dziadosz and Tustin's (1982) integration of the matching law and self-control in retarded people, or Epling and Pierce's (1983) general statement of the relevance of the matching law to applied problems. If this type of integration is to continue, behavioral students need to have common skills, one set of which is the experimental, methodological skills of the basic behavioral scientist.

The final point to be made here is that the conceptual skills be explicitly related to experimental skills. Item B in Table 2 specifies that a thorough experimental analysis requires a thorough conceptual and historical analysis. All too often, for instance, experimental reports seem to indicate that the authors have discovered something new and worthwhile, while actually the problem or discovery has been described previously. This suggests a lack of conceptual, historical scholarship on the part of the authors.

General Applied Skills

Table 3 presents the applied skills that are needed for a competent behavioral problem-solver. This list of skills does

not stand alone, but instead represents additional skills needed to conduct applied analyses. The list was derived from two related sources: the Sulzer-Azaroff et al. (1975) survey and the applied behavior analysis model presented in Sulzer-Azaroff and Mayer (1977). The general model has also been described as an educational systems model (Glaser, 1962). In addition, we added Item G to relate applied behavior analysis explicitly to the experimental analysis of behavior. This relation is consistent with the distinction between science and technology presented by Deitz (1978).

Although the justification for training applied skills seems more evident than for some of the other skills, we will describe our reasons.

First, some of the skills necessary within applied settings are not likely to be learned from or found in the laboratory. Azrin (1977) made this point very clear with examples from the applied literature. Such skills as the use of observational techniques, writing behavioral definitions, designing task analyses, and concept analyses do not seem relevant to most laboratory settings. Thus, if behavioral students are to learn the full range of behavior analytic strategies, then these additional skills must be taught.

Second, society needs people to solve its immediate problems. But if society does not learn that a scientific analysis of human affairs works, then behavior analysts will soon be out of business, and some of these problems will not be solved.

Third, applied training is needed to facilitate the integration of applied and experimental analyses of behavior. As we

TABLE 4

A task analysis of general communication skills

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- A. Writes literature reviews and/or theoretical papers that use conceptual skills (see Table 1).
  - B. Writes research reports that use experimental skills (see Table 2).
  - C. Writes applied project reports that use applied skills (see Table 3).
  - D. Presents posters that abstract critical, experimental or applied findings.
  - E. Presents symposium papers that address conceptual issues or summarize related experimental or applied findings.
  - F. Does A–E according to current community standards (e.g., publishes written work, has oral work accepted for presentation at national and international conferences).
  - G. Reviews and edits others writings.
  - H. Discusses experimental, applied, and conceptual papers and posters with others.
-

argued for experimental training for applied students, so we argue for applied training for experimental students. The field needs this common training in order to communicate with one another, and hence foster a closer relation between basic experimentation and nonacademic contingencies. We would not argue that all basic scientists need to be under more “real-world” contingencies. The place and need for the scientist who is completely immersed in laboratory settings still exists. Yet the field does need those who are trying to bridge the gap between basic and applied science. Behavior analysts need to promote investigations that span the continuum from the lab to the applied setting, and vice versa. This integration will not be fostered unless behavioral students are exposed to both applied and basic training.

General Communication Skills

Table 4 presents a list of communication skills that should be integrated with the skills discussed thus far. These skills were also derived from Sulzer-Azaroff et al. (1975) and personal experience. Skills A–F reflect the kinds of outcomes by which conceptual, experimental, and applied skills are judged by the field. Without the products implicit in this list, other behavior analysts have few ways by which to judge the quality of another’s behavior analytic skills. This is the primary, pragmatic justification for their inclusion in this task analysis. The inclusion of items G and H suggests a secondary justification: Systematic knowledge of the human

condition only becomes apparent through scientific communication. Science is a self-correcting approach to the acquisition of knowledge, but can only be so when scientists communicate. This communication requires both written and presented works, as well as critiques, reviews, and discussion of these works.

General Administrative Skills

Table 5 presents the final list of skills that we have found exhibited by exemplary behavior analysts. Items A–C were derived from Sulzer-Azaroff et al. (1975). Items D–G were obtained from Prue and Frederiksen (1982) in a chapter outlining the skills needed to overcome resistance to change within organizations. Finally, item H was suggested by a number of colleagues. Once again, these skills can be subdivided into more specific behaviors. In fact, items D–G have been divided into 28 actions for the administration of behavior management projects (Prue & Frederiksen, 1982).

The skills listed in Table 5 are the management skills required of any behavior analyst who directs others in the conduct of behavior analysis. It is difficult to imagine any behavior analyst for whom these are not necessary skills. Whether behavior analysts consult with several organizations, apply behavior principles within one organization, or conduct basic research, their work requires that they interact with others. Because many of these others have not been trained as behavior analysts, behavior analysts need to be able to direct these others in the use

TABLE 5

A task analysis of general administrative skills

-
- A. Trains others in the attainment of conceptual, experimental, and/or applied skills.
  - B. Manages others in the practice of conceptual, experimental, and/or applied skills.
  - C. Defines systems that need to be administered.
  - D. Enters systems to be administered.
  - E. Prepares systems for interventions.
  - F. Initiates interventions within systems.
  - G. Maintains changes brought about by interventions within systems.
  - H. Obtains grants and/or other support from systems outside current operating system.
-

of behavior principles, which requires teaching, management, and administrative skills, thus the necessity of skills outlined in Table 5.

PROGRAMMING

Once a set of skills has been selected, the next step is to set up a program to teach the skills. In most cases, the training program needs to be flexible enough to allow for individual differences. The degree of flexibility required is partially a function of the entry level skills of the students, hence the first step in programming is to design an evaluation of entry skills. The second step is to specify the range of activities that are available to transfer the skills described in the task analysis from the teachers' repertoires to the students'. These two programming steps are described below.

Entering Skills

Many undergraduate institutions train students in behavior analysis, and many master's programs extend this training, hence not all doctoral students will need to be taught all of the skills specified in the task analyses. In order to select among the skills to be taught in individual cases, a number of different methods will be needed to evaluate the students' entering repertoires. Of course, the faculty can peruse the students' transcripts and work records, but more detailed information is needed in order to determine what skills will have to be taught.

One way more detail can be obtained is to develop a form that asks the students' previous advisors and/or super-

visors specific questions about the students' experiences. This form could be sent to the students' previous advisor to fill out or it could be used as a protocol for a telephone conversation. Programs might also find the use of the Graduate Record Exams (GRE's) helpful for evaluating specific skills. Although not enough is known about the relations between GRE performance and the kinds of skills specified in the task analyses, the verbal and the quantitative components of the GRE's can be used to indicate deficiencies in these two important skill areas. Low quantitative scores indicate that the students may need more instruction, perhaps specially programmed instruction, in mathematics. Because mathematical skills are generally assumed necessary to conduct experimental analyses, students with low quantitative scores could be required to take additional mathematics courses. Similarly, low verbal scores indicate that the students need to improve their vocabulary and reading comprehension skills. Because these verbal skills are generally assumed to be important for writing and critical reading, students with low verbal scores could be required to study vocabulary building and reading comprehension.

Finally, in order to determine more about students' verbal competencies, paper and pencil exams on general behavioral concepts and principles should be encouraged. Although the perfect exam has yet to be found, some models, such as the Association for Behavior Analysis' general certification exam, might be useful. In addition, specific course entry exams might be developed for the required courses of a training program.

Generalization Training

As previously indicated, one of the defining features of the graduate program being proposed is its emphasis on generalized behavioral problem-solving skills. Therefore, teaching methods should adhere to what is currently known about generalization training. The following is a list of such methods derived from the literature on programming conceptual learning, that is, generalization to complex stimuli (Carnine, 1980; Chase, 1985; Engelmann & Carnine, 1982; Johnson & Chase, 1981; Merrill & Tenyson, 1977; Miller & Weaver, 1976):

1. Define the behavior that students should emit.
2. Define the range of conditions under which the behavior might occur.
3. Generate a range of examples and nonexamples of these conditions.
4. Teach the student the general rules and definitions concerning the relations between their behavior and environmental conditions.
5. Teach the student to respond to the examples and nonexamples.
6. Deliver specific corrective and confirmative consequences when the student responds.

These rules may not be complete, but they are a starting place for designing a program for behavior analytic problem-solving skills. If behavior analytic students are to become generalized problem-solvers, the program should at least do these things, systematically and deliberately.

Programming for generalization interacts with the task analysis of behavioral problem-solving skills in a number of critical ways. First, the task analysis defines the behaviors we wish students to emit. Second, the combination of conceptual, experimental, applied, communication and administrative skills implies a range of environments from which examples and conditions can be derived. For instance, some of the best examples of behavioral principles and scientific analysis, those that clearly show the relations between behavior and environmental events or that clearly show the processes of science, are laboratory examples. These examples can be developed easily from the experimental literature and from students' interacting with

specific examples in real laboratories. A specific example of this is the clear illustration of the concepts of shaping and chaining found in the Barnabus demonstrations (Terman & Cook, 1980).

Applied settings also provide a rich source of examples and nonexamples of behavior principles and scientific processes. Some applied examples overlap with the beginning student's entering repertoire. For instance, students often see the relevance of behavior principles when put in the context of personal relationships or school related examples (cf. Miller, 1982). Applied settings also provide the extreme conditions under which behavior principles have been applied that help extend generalization training to the widest range of possible conditions. Thus, these examples and related nonexamples are good teaching devices for defining the range of conditions under which behavioral problem-solving occurs. When combined with the teaching strategies defined below, these conditions should foster generalization of behavioral problem-solving skills.

Three general teaching components of the program being proposed, in combination with the task analysis, should foster generalization: course requirements, practicum requirements, and outcome requirements. Course requirements are probably the most efficient method for teaching the general rules and principles related to problem-solving skills. The practicum requirements are designed to provide structured learning experiences in a range of environments. Finally, the outcome requirements are designed to provide a consistent method of evaluating the quality of the student's progress in the program.

Course requirements. The courses for this program are divided into those required to teach the general rules and principles involved in the five task analyses and those provided to supply supplementary stimulation and advanced treatment of subject matter in various areas of behavior analysis. As stated before, behavior analytic students are expected to engage in all of the behaviors specified in the task analyses; however, different

TABLE 6

Courses for a behavior analytic graduate program**Required:**

- A. Introduction to the Experimental Analysis of Behavior (1)
- B. Introduction to Applied Behavior Analysis (1)
- C. Introduction to Systems and Ecological Analyses (1)
- D. Conceptual Foundations of Behavior Analysis (1)
- E. Methodological Foundations of Behavior Analysis (2)
- F. Control by Consequences (1)
- G. Control by Antecedents (1)

Optional:

- A. Verbal Behavior
- B. Experimental Analyses of Human Behavior
- C. Children's Behavior
- D. Philosophy of Science
- E. History of Psychology
- F. Inferential Statistics
- G. Computer Science
- H. Developmental Disabilities
- I. Consultation
- J. Organizational Behavior Analysis
- K. Behavioral Instruction

students might be expected to be particularly strong in different areas of behavior analysis. The advanced or optional courses might foster this kind of specialization.

The top section of Table 6 presents the required courses for this behavior analysis program. The length of these courses is undetermined; however, the expected number of semesters that it will take to learn the skills are indicated in the parentheses. Although the skills addressed in each course should be obvious from the course titles, courses F and G do not obviously seem to cover the principles introduced in the other courses in an advanced and unified manner. The concept of reinforcement, for instance, will have been introduced from different points of view in courses A through D. The advanced treatment of reinforcement (course F) will then cover such topics as its relation to economic principles or the controversies involving behavior regulation (Timberlake, 1984), as well as a synthetic treatment of reinforcement, for example the relations among theoretical, experimental, and applied developments in the matching law.

The bottom section of Table 6 presents a range of topical courses that would be taught at an advanced level. The list is not meant to be exhaustive, but simply a set of illustrative courses that might provide additional training in areas of interest to the students and particular faculty.

Practicum requirements. The classroom courses cannot teach all of the skills specified in the five task analyses. Therefore, other activities need to be programmed. One set of activities is a sequence of practica in settings in which the students will learn and practice behavioral problem-solving skills. A number of authors, including Goldiamond, Dyrud, and Miller (1965) and Ferster (1979), have proposed that one is best fit to conduct fine-grained analyses of an environmental-behavioral relation when one has had extended contact with the contingencies operating in that environment. For example, teachers have the most insightful things to say about schools, clinicians make the best predictions about their clients, and assembly line workers can best describe rate-busting techniques. These people "know"

their environments, and they "know" them because they have spent time interacting under the unique contingencies of each.

We would like to assure that our behavioral students "know" the unique contingencies of a range of specific environments. To some this might sound like an argument for specialization; however, we think not. If students can be immersed for six months to a year in a variety of environments, they should learn the specific contingencies of each. If these experiences are combined with seminars designed to pinpoint the commonalities among environments, then students will be provided with generalization as well as discrimination training.

Three kinds of practica should be set up: a basic experimental lab, an applied lab, and one other lab, either teaching or administrative. Each lab will be programmed according to five requirements: (1) student placement in settings supervised by behaviorally trained professionals, (2) placement of beginning students in settings in which they work with advanced students, (3) gradual increases in the difficulty, especially in terms of the number of people managed, and the independence of the projects that students conduct, (4) completion of written and oral reports from both the students and their supervisors on the progress and the outcomes of projects, and (5) participation of students and faculty in at least one ongoing seminar related to each practicum learning laboratory. These requirements should allow the faculty to manage the kinds of skills that will be learned through the practica.

A pyramidal management structure could facilitate operation of these labs. For example, a faculty member might establish three sites for conducting research on training within organizations. On-site managers would be selected on the basis of supervision skills or trained in supervision strategies. One or more advanced students, interested in research in organizations, are placed in each setting to conduct research. The advanced students have one or more novice students working with them on specific aspects of the

research. Finally, the faculty member and all the students meet once a week in a seminar to discuss the three projects, problems that have arisen, the general principles and rules derived from behavior analysis that might solve some of the problems, new research to solve other problems, similar research of others, and to critique each other's reports. The on-site supervisors could also be invited to these meetings, although their attendance would not be necessary. If the on-site supervisors did not attend the meetings, then the faculty supervisor would need to schedule periodic meetings with them. A similar, but logistically easier system could be set up for experimental and teaching labs. They would be easier because the on-site supervisor and the faculty member would be the same person.

By organizing the experiential learning programs in this manner, the skills specified in the task analysis are likely to be learned. Students could be required to have at least one practicum in each of these types of learning laboratories. They could also have the opportunity to discuss the relations among the behaviors that occur in the laboratories and the verbal repertoires they are learning in their courses. An additional requirement could be that each student supervise another student in at least one practicum learning lab. This would be a natural progression related to the students' interests and research, and would require the student to learn administrative skills, including finding sources of support to fund the project they are supervising.

The practicum learning laboratories should also help facilitate generalization. First, the three kinds of laboratories define a general range of conditions under which behavioral skills might be applied. Second, within each laboratory seminar the students would be exposed to a greater range of conditions by interacting with other students about their experiences. Third, the laboratories and seminars allow the faculty the opportunity to set up a variety of contingencies and frequent opportunity to provide consequences for student behavior.

TABLE 7

A list of outcome requirements

A. Master's thesis (1)
B. Experimental proposal (1)
C. Applied proposal and project report (1)
D. Conceptual paper (1)
E. Dissertation and proposal (1)
F. Grant written and submitted (1)
G. Papers published (2, any combination of conceptual, experimental and/or applied)
H. Paper presented in a symposium at a national or international conference (1)
I. Poster presented at a national or international conference (1)
J. Papers reviewed (3, one each from or preferably for conceptual, experimental and applied journals)
K. Discussant in a symposium at a national or international conference (1)

Outcome requirements. Because many of the behaviors specified in the task analysis are stated in terms of outcome, the process requirements described so far are not complete. The specific outcomes used to determine whether the graduate students have learned the exemplary skills need to be described.

Table 7 presents a list of outcome requirements proposed for this program. The numbers in parentheses indicate the minimum number of each outcome that would be expected of all students who receive their doctorates. Most of these outcomes are directly related to one or more skills specified in Tables 1–5. Items A–E, however, require some elaboration.

The master's thesis will serve as a beginning level examination of the analytic and synthetic skills of the students. We propose that theses be prompted and instructed, and that they require an integration of conceptual, methodological, and experimental skills. We prefer that student originality be deemphasized for the thesis because other, more basic skills of behavior analysis and science need to be practiced at this level. A completed thesis should be presented to a committee and should reveal whether the student has learned the skills specified in Table 2 and Item B from Table 4.

The preliminary or comprehensive exams (items B–D from Table 7) will serve as intermediate level examinations of the students' experimental, applied, and conceptual skills. These project-type exams should reveal the skills indicated in Table

1, Table 2 (items A–D), Table 3, and Table 4 (items A–C). In addition, the applied preliminary exam will most likely reveal skills described in Table 5. All three exams would be separate from the research carried out for the students' dissertations in order to expand the range of conditions under which the students respond.

The dissertation and dissertation proposal will serve as the advanced level examination of the students' behavior analytic skills. Dissertations should be publishable, experimental analyses of some problem for which the students have taken primary responsibility for designing, implementing, and communicating (both written and oral communication). This responsibility will require using the skills specified in Tables 1, 2, 4, and 5 (items A–G), and sometimes in Table 3. Dissertations should be evaluated by both behavior analysts and nonbehavior analysts and should be presented as a publishable work or series of publishable works. If students can successfully convince the committee that they have acquired the required number and range of behavioral skills, then the students should be awarded their doctorates.

AN EXAMPLE

A specific example of how a particular student would be integrated into and proceed through this program might be useful at this point. Table 8 presents a plan of studies for a hypothetical student who

TABLE 8

An example plan of studies

First Semester	Second Semester
Introduction to Experimental	Introduction to Systems and Eco.
Introduction to Applied	Conceptual Foundations
Methodological Foundations I	Methodological Foundations II
Applied Laboratory—10 hours (heavily supervised)	Teaching Laboratory—10 hours (heavily supervised with seminar)
Experimental Laboratory—10 hours (heavily supervised)	Experimental Laboratory—10 hours (heavily supervised with seminar)
	Attend Association for Behavior Analysis Conference (ABA)
Third Semester	Fourth Semester
Control by Consequences	Control by Antecedents
Experimental Laboratory—20 hours	Experimental Laboratory—30 hours
Elective	Finish thesis in Experimental Laboratory
Start thesis in Experimental Laboratory	Present poster of thesis at ABA
Fifth Semester	Sixth Semester
Applied Preliminary Exam (proposal developed over summer)	Conceptual Preliminary Exam
Electives	Electives
Present paper at other conferences (e.g., American Psychological Association, APA, or Association for the Advancement of Behavior Therapy, AABT)	Submit thesis for publication
	Present paper at ABA
Seventh Semester	Eighth Semester
Experimental Preliminary Exam (grant written and submitted to National Science Foundation)	Start dissertation
Electives	Submit conceptual prelim. for publication
	Organize symposium at ABA; participate as discussant
Ninth Semester	Tenth Semester
Continue dissertation	Finish dissertation
	Present dissertation at ABA or APA

has expressed interest in experimental work.

An analysis of this hypothetical student's entering skills reveals little experimental experience, and one behavior analysis course. She does not think she learned enough in this course to pass a qualifying exam in any of the program required courses. Her verbal and quantitative scores are above the average for experimental psychology students (Stroup & Benjamin, 1982). Thus, it is not deemed necessary for her to take any additional mathematics or English courses.

As can be seen in Table 8, before finishing her master's thesis, this student would take all of her required courses, conduct 300 hours of applied and teaching practica (15 weeks $\times$ 20 hours of practica) and 1,050 hours of experimen-

tal research. The two practica would occur in different settings and, if logistics allowed, her experimental work would occur in two different laboratories the first year. At the end of her first year, she would choose one of these laboratories to conduct her thesis. Preliminary work on the thesis could begin in the summer between the second and third semesters. Both practica and laboratories would be heavily supervised during the first year. Most likely, she would work with an advanced student or faculty member on their research. An experimental, applied and teaching seminar would accompany these activities. The second year experimental laboratory would be more independent, and might include supervising another student, but would still be supervised closely by a faculty member.

The second year experimental lab would be the setting for her thesis.

After the student has finished her master's thesis, the program becomes more individualized. First, the student would continue with her coursework. Then, she would complete her three preliminary exams. Each exam would take approximately a semester to complete. Finally, during the 8th–10th semesters, she would finish her dissertation. While making progress toward the dissertation, she would also complete some of the other program requirements. Posters and papers describing experimental and applied projects would be presented at conferences, papers would be submitted for publication, a grant would be written and submitted in conjunction with her experimental preliminary exam, and papers would be reviewed in her seminars and courses. Her administrative competencies would be demonstrated in the laboratory, especially while conducting her dissertation when she would have a number of novice graduate students and undergraduate students working with her. To facilitate this process, we recommend a weekly meeting with her supervisor that partially concentrates on the administration of her research. Such a progression would allow this student the practice and consequences needed to obtain the skills that were outlined in the task analyses.

EVALUATION

The final consideration in establishing a behavior analytic training system is evaluation. As Baer (1983) has pointed out, the methods of evaluation used are critical to the design of a program. In addition, the evaluation system should be designed so that it is sensitive to individual changes as well as program changes. At the individual level, we want to know whether students are reaching the goals of the program and whether they exhibit the skills outlined in the task analyses. At the program level, an evaluation should tell how the proposed program compares to other programs. Thus, data should be collected on both changes in individual behavior and changes in the

groups of individuals who comprise a program. If the behavioral community approaches the data with sufficient philosophic doubt (Deitz, 1982), then two kinds of information will be gained: accountability to our students and society, and the avoidance of a static, status quo system.

Individual and Within Program Evaluation

The evaluation of entering skills has been described earlier in this paper. These entry evaluations will be used as a source of comparison to the process and outcome data collected on each student. As such, they form a baseline for observing changes within individuals. In addition, the entry data are the first level of process evaluation. If we find, for example, that a large number of students are prepared adequately for the introductory experimental, applied, and systems courses, these courses will be either modified or the selection criteria will be changed.

Process evaluations other than entry data will take place at each level of the program. At the course, practicum, and laboratory level, tests and checklists will be developed from the task analyses to show whether students are learning the skills considered necessary. If these skills are not being covered in the program, then either the list of skills or the program needs to be changed. The latter would be necessary if other programs were achieving the goal of teaching these skills.

The comprehensive or preliminary exams will also evaluate the success of the program and/or point to revisions that should be made. For example, the performance of students who were evaluated as having certain competencies upon entering the program can be compared to the performance of students who have been explicitly trained by the program. This comparison may be useful for evaluating the sensitivity of the entry assessment for identifying acceptable competencies, or the reverse, determining whether the program is training these skills as well as other programs. Some undergraduate programs may very well

TABLE 9

A list of cost and benefit data to be collected on behavioral graduate programs**Costs:**

Faculty and support personnel
 Number
 Approximate salaries and benefits
 Travel
 Number of credit hours taught
 Approximate number of hours per year devoted to program

Students

Number
 Stipends (fellowships and assistantships)
 Travel

Physical plant

Square footage
 Classroom
 Office
 Laboratory
 Other (clinics, day care, etc.)

Equipment budget**Supply budget****Benefits:**

Number of graduates
 Length of time to complete doctorates
 Number of papers published by faculty and graduates
 Number of grants funded to faculty and graduates
 Amount of grants funded
 Number of sources of income
 Amount of income
 Number of programs developed (e.g., schools, day care, behavioral treatment programs, consulting services)
 Scores on Association of Behavior Analysis General Certification Exam
 Self-report data from survey of graduates
 Performance data from survey of graduates
 Significant contributions to behavior analysis from survey of members

Between-Program Evaluation

Given that we are not proposing "the" behavior analysis training model, we expect that alternative models will be developed and tested. In order to compare different models, however, a set of agreed upon data has to be collected by all programs. The following describes what some of these data might be.

The final product of any behavior analytic program is a trained behavior analyst. In order to analyze training in production terms, a cost benefit analysis might be useful. Table 9 presents the kinds of data that will be needed to conduct a cost benefit analysis. Most of these data are self-explanatory; however, we would like to address the three surveys and the certifying exam.

One survey would ask former students how employable they were, how adequately they were trained, and how the training program should change. A second survey would also be developed to sample the actual competencies demonstrated by graduates in their work. This survey would require sampling a graduate's repertoire for a short period of time after graduation. This could be achieved by preparing a file of permanent records of the individual's work and/or evaluations of their work. A training program could then assess whether or not the former student is actually employing the competencies that were considered part of the training program. A third survey would be conducted from time to time to measure the potential effect of training programs on the behavior analytic community. A certain subpopulation of the behavior analytic community (e.g., the members of ABA or editors of behavioral publications) would be asked to (a) list the ten recent graduates who have made the most significant contributions to the field of behavior analysis in the past five years and (b) to specify the accomplishments or contributions of these ten people. We would then trace the training of these individuals to see where they received their training (i.e., the continuum from undergraduate to doctorate training), with whom they worked, and how

be training some skills better than some graduate programs.

The individual outcome data will consist of the outcomes specified in Table 7. These outcomes will be examined in two ways: Are they being accomplished within the time limits specified, and do they convincingly demonstrate the acquisition of all the skills outlined in the task analyses? Answers to these questions will provide the impetus for change or maintenance of the training program.

their training might be related to their accomplishments. We believe such an analysis of exemplary performance would be invaluable to revising current training programs and designing new training programs (Gilbert, 1978).

A second evaluation of former students would be to encourage people to take the ABA certifying exam upon graduation from a doctoral program. This exam yields scores in the conceptual, basic, and applied areas, and might be useful for determining whether students have acquired at least the verbal skills each program is trying to teach. Although this verbal behavior is insufficient by itself to evaluate former students' behavioral repertoires, when combined with the data collected from the three surveys and the rest of the cost-benefit analysis, we should have adequate information on the quality of our training programs.

SOME LOGISTICAL AND PRAGMATIC CONCERNS

Michael (1983) has expressed concern over two aspects of the general plan outlined. First, he questioned the contingencies that would allow faculty to spend the time making up forms, designing standardized tests, creating check-lists of competencies, and supervising students in a variety of laboratories and applied settings. Second, even if such contingencies existed, he doubted whether the resultant bureaucracy would turn out well trained students. Both of these are legitimate problems to which we might add the problem of conducting the cost benefit analysis proposed. Each of these potential problems ought to be addressed.

First, if the contingencies do not already exist for developing better training programs, then they need to be procured. The standard operation in academia is to release people from teaching responsibilities in exchange for administrative/service duties. We recommend that one person, the program director, be released from one course in order to manage the operation of the kind of program proposed. In addition, we recommend adopting either a release-time program

or a supervisory seminar program for faculty supervising laboratories and practica. In the former, faculty would receive a course credit for every x number of students supervised per semester. A recent survey of sample clinical programs in the U.S. and Canada revealed that approximately 85% of the programs gave course credit or some form of release-time for clinical supervision (Nelson, 1983). Actually, however, we prefer the development of supervisory seminars, as they are one of the activities designed to teach the behaviors in our task analyses. Each semester, faculty members would teach a course labelled Behavioral Practica or Behavioral Laboratory. Their responsibility would be to set students up in labs or in applied settings, to meet with all the students once a week in a seminar to discuss problems, ideas, and so forth, and to evaluate what the students have accomplished at two or three intervals throughout the semester. This plan is similar to how practica are organized at many institutions. For laboratories, we can imagine either an ongoing student laboratory or a rotation system in which each semester students work in a different laboratory. The increased research and scholarly activity that this would engender would be one benefit derived from this structure.

In addition to these considerations for the faculty, an assistantship might be created for a graduate student to work with the program director. This could be considered an administration practicum in which the student develops a system for collecting and managing the cost-benefit data for a program. These data could be arranged for annual presentation at the poster session on graduate training of the Association for Behavior Analysis.

A second rejoinder to the contingency problem is that many parts of the system do *not* need to be developed from scratch. Such components as competency lists, standardized test items, supervisor check-lists, and so forth have already been designed and simply need to be adapted to specific programs. Thus, we only need to secure the contingencies for faculty to

communicate with one another to obtain existing materials.

Third, whether the program proposed here is more time consuming than other programs is an empirical question. If the cost-benefit data are collected, the behavioral community should be able to answer this question. How many years does it take to have students finish a program? How many hours a week or a month are spent discussing problems, designing plans of study, figuring out how to provide consequences for our students? How many hours are spent bringing students into a program, teaching them for a year or two, and then having them leave because the program is not what they thought it was going to be? We do not expect a detailed system to eliminate all of these time consuming activities, but we wonder whether having a detailed written plan might alleviate some of these burdens. Planning always adds responses in the short run, but pays off when it reduces responses in the long run.

Finally, the behavioral community may need to be convinced that collecting the data described here is worth the effort. The question is: Why should those who have already been trained care whether behavioral training programs are improved or the quality maintained? The answer lies in the apprentice system of training.² If master craftsmen make knives that are labelled with a particular brand name and they train apprentices to make the same knives, the masters are bound by their guild not to allow their students to become masters until they have met certain standards. This is a self-protection measure. The masters do not want someone producing substandard knives that will tarnish the reputation of the brand. Behavior analysts should be affected by similar consequences. If the quality of training and the quality of the analyses students conduct are improved, then the reputation of behavior analysis

improves in the community. Such improvement should benefit all behavior analysts.

An additional argument could be made for expecting students in behavioral programs to cooperate with the process of data collection. Part of behavior analysis training should demonstrate to students that behaving in ways that benefit society also benefits them. This is an implicit part of applied training. If the students are convinced that improving the training system is a socially valuable activity, a good response return to the surveys might be obtained.

Our hope is that the arguments above will assuage those concerned with the contingencies necessary to establish a training system. The final related question is whether setting up such a system will produce a bureaucracy that interferes with training students, which is another way of asking whether the training program proposed is beneficial. The question is an empirical one: Can a system be designed that accomplishes its goals and is not too costly? Bureaucracies *per se* are not bad. It is only when the cost of running a system outweighs the benefits derived from it that problems ensue.

CONCLUSION

This paper provided a rationale for the general goals of a behavior analytic training program; it described a plan of studies and how this plan might be evaluated; and it proposed that doctoral training should concentrate on generalized problem-solving skills, to be accomplished through the acquisition of specific areas: conceptual, experimental, applied, communication, and administrative skills, as well as through immersion in a range of environmental situations. We have also described a training program that teaches these skills, that involves the evaluation of the students' entering repertoires, and that devises an individual course of studies that coordinates these entering repertoires with the skills necessary to become a behavioral problem-solver. Finally, we suggested a systematic evaluation procedure that would help revise

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² This example was derived from a lively discussion with Charlie Hamad and Dan Peterson at the Association for Behavior Analysis Conference, Nashville, TN, May 1984.

training programs to best assure a quality product.

We realize that this is a preliminary analysis of doctoral training and that many points in this proposal are open to discussion. For example, one question raised by our analysis is how many behavior analysts does it take to conduct such a training program? We know of a program that teaches most of these skills with two behavior analysts—one who concentrates on applied behavior analysis and one who teaches basic behavior analysis. These individuals, however, are both well-trained generalists who function as managers for their students. Thus, these faculty arrange for their students to work in various applied settings and on different experimental questions rather than having students work directly on applied and experimental questions of interest to the faculty. These faculty also create other training resources by finding nonbehavior analysis faculty who teach such skills as conceptual analysis and behaviorally inclined practioners who can extend the students' training to a variety of settings. In addition, we realize the need to develop the more specific competencies and skills required of behavior analysts that would become the substance of the programs. The purpose, however, is to help the field move toward more systematic training, and we believe that general analyses such as this one may help the field achieve this goal. The next step is to flesh out this general plan with the specific skills to be taught. When this is accomplished, then a testable system will be available. We hope that a variety of testable systems are developed in the next few years, and that the behavioral community will remain empirical enough to look at the data that are generated and to have these data direct our future behavior.

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