BEHAVIOR ANALYSIS FOR EFFECTIVE TEACHING

Third Edition

JULIE S. VARGAS

ROUTLEDGE

Behavior Analysis for Effective Teaching

Behavior Analysis for Effective Teaching is a clear, comprehensive book on the integration of non-aversive behavior analysis principles into classrooms and other school settings. Carefully revised and updated throughout, this third edition includes new content on precision teaching and a new chapter on how teachers can provide appropriate education for students with special disabilities who are included in their classrooms. Focused on merging behavior management with effective student instruction and illustrated with examples from real teachers' experiences, the book is an ideal primary resource for undergraduate and graduate courses in teacher education, special education, school psychology, and school counseling, as well as for preparation toward the BACB Credentialing Exam.

Julie S. Vargas is Chair of the Board of the B. F. Skinner Foundation. A former third and fourth grade teacher, she became Professor of Educational Psychology at West Virginia University, USA. There she taught undergraduate education majors and practicing teachers for over 30 years. She is a past president of the Association for Behavior Analysis International and one of the founding editors of *The Behavior Analyst*.

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To my father and my husband,
without whom this book could not have been written.

BRIEF CONTENTS

CONTENTS

FIGURES

TABLES

PREFACE

Right after college, I was hired to teach third grade in a private school in New York City. I had only taken a summer course about teaching, but I thought I would be a good teacher. I soon found out that knowing what to teach, explaining clearly, and sincerely liking my students was not enough. I could not help all of my students succeed as well as they could. While I used a few behavioral techniques described in this book, I did not have a good understanding of how my students' behavior depended on my actions, nor of what they got out of the exercises I assigned. That lack was even more conspicuous in my next job, teaching fourth grade in a blue-collar neighborhood outside of Pittsburgh, Pennsylvania.

So I went back to graduate school where I took the only behavioral course available. After getting my education degree, I was hired by West Virginia University to teach behavior analysis to undergraduate education majors and practicing teachers. I soon discovered how critical the procedures I was teaching were for teachers to solve problems and to increase their students' academic performance.

I wrote this book to help teachers use the science discovered by B. F. Skinner. It shows how, by using contingencies of reinforcement, teachers can improve their students' behavior. If you work with others, no matter how well you already teach, there will be times when the performance of one or more of your students will disappoint you, disrupt your class, or even endanger others. Typically schools have relied on aversive procedures to control student misbehavior. But punitive procedures do not make school a better place for students or for you. Behavior analysis shows how better contingencies build appropriate behavior to replace undesirable actions. Each interaction you have with a student affects not only that student's immediate behavior, but also his or her future performance. When you reinforce actively participating, help a failing student succeed, or turn a bored reaction into excitement over mastering a subject, you provide opportunities not only for life in school, but for your student's future. That, in turn, helps build a better, more positive world for everyone.

ACKNOWLEDGEMENTS

Many people have contributed to this book. First of all, I thank the many practicing teachers who shared their problems and solutions that appear in this book. Secondly, for this 3rd edition, I asked a few colleagues to review what I'd written about their specialties. I greatly appreciate the following for taking the time to reply: Andy Bondy, Abigail Calkin, Alison Moors, George Sugai, and Vicci Tucci. The influence of many other professionals with whom I have interacted over many years shows throughout the book, among them: Per Holth, Theresa McKeon, Karen Pryor, Murray Sidman, Mark Sundberg, James T. Todd, Joyce C. Tu, Jerry Ulman, and Cathy Watkins. Special appreciation goes to David Roth who wrote an entire chapter to help teachers work productively with students with special disabilities when they are included in their classrooms. The ideas and science upon which this book is based come from my husband and my father who, without knowing it, indirectly wrote every single chapter.

TO THE INSTRUCTOR

Many of your students may plan to take one of the certification exams given by the Behavior Analysis Certification Board (BACB). Although this book was not written specifically for the tests, it does address most of the topics in the BACB task list.

If you would like your students to work on projects in schools, colleges, or other settings where people interact on a regular basis, you will find that project steps match well with the sequence of chapters in this book. If you would like access to books by B. F. Skinner, pdfs for many of them are available at bfskinner.org for free.

TO THE STUDENT

You can find additional materials related to this book on the B. F. Skinner Foundation website, bfskinner.org. It has relevant print, audio, and visual materials. The Foundation also offers a free magazine, *Operants*, that has articles about current issues and applications of the science that Skinner began.

1

ADDING SCIENCE TO THE ART OF TEACHING

Education … marks the most perfect and intimate union of science and art conceivable in human experience.

John Dewey

OVERVIEW

What is teaching? This chapter looks at what teaching consists of and how teachers can benefit from science as well as from their own experience.

OBJECTIVES

By the end of this chapter you should be able to:

A. Identify definitions of teaching consistent with behavior analysis.
B. Select features of behavior analysis as it is applied to teaching.
C. Complete definitions of "operant" and "contingencies" by supplying critical words.
D. Describe the different kinds of consequences you can use.

THE IMPORTANCE OF TEACHERS

If you were asked "What is the most important resource of a country?" what would you answer? It's not uranium or oil. It's not water or timber. It's not diamonds, or coal, or natural gas. The most critical resource of a country is its people, particularly its youth. The way the next generation behaves will determine a country's future more than any other resource within its borders. In the United States, the responsibility for producing the academic and social skills of the next generation of workers and leaders rests on its

educational system. Even at a local level, it is an awesome responsibility. Teachers can rescue a child from a life of misery, help students learn to handle conflict, and inspire them to accomplish things they never dreamed possible. On the other hand, a careless action by a teacher can make a student hate a subject or dislike education in general. Whatever teachers do affects student lives, often in significant ways.

The skills that students need in the twenty-first century differ from those needed in the past. Manufacturing jobs are going the way of agricultural jobs. In the eighteenth century, over ninety percent of working Americans were farmers. Today that number is below three percent. With the outsourcing of routine manufacturing jobs overseas, along with the increase in productivity per person and the replacement of assembly line workers with robotic systems, fewer Americans are needed to produce products. Increasingly, good jobs demand higher levels of literacy and technical skills. The burden of producing those skills falls on the schools, especially on teachers.

At the same time that teachers are expected to teach more, they are receiving students who are more difficult to teach. Today's teachers encounter students who do not speak English, who have special needs, or who arrive at school hungry or sleep deprived, or even high on drugs. Then, too, the twenty-first century presents new challenges. Several years ago, I visited an inner city elementary school in Chicago. When I arrived for my appointment, the teacher hurriedly suggested I look around the classroom, saying she had to leave for a "special activity." After a few moments, I looked out into the hallway to see what this "special activity" was. To my right the entire school was lined up from the playground doors to a table where two teachers sat. They were going through student backpacks. Other teachers stood around watching. To my left, a very young policeman surveyed the scene. When I asked him what was going on, he replied in a bored voice, "They're checking for firearms." So *that* was the "special activity"! Later, I was told that the teachers did find a gun. In an elementary school, no less! Teachers today are asked to look out for potential violence as well as to teach academic skills and appropriate social behavior. That is a very big job.

WHAT TEACHING IS AND IS NOT

Most people think of teaching as presenting information. This came home to me when I was teaching an undergraduate teacher education course in a major state university. It was a large course of nearly 500 prospective teachers. Early in the semester, each student was asked to teach a five-minute lesson to the other twenty or so students in his or her weekly section meetings. The students were asked to teach as if their peers were in the grade for which their lesson was designed. The other students were to act at the appropriate age level (though not to take the role of troublemakers). The students took the assignment seriously. They appeared nicely dressed, a bit nervous about their teaching. They gave lessons on elementary science, high school algebra, English literature, and an amazing variety of subjects that might be taught in a school system. The content of each lesson differed. But the way they "taught" did not. All but one of these future teachers *lectured* their entire five minutes. Teaching to them was presenting information.

If only it were that simple! Unfortunately, presenting is *not* teaching. It is not teaching even with adding moving graphics or videos illustrating actual procedures. A brilliant lecture could be presented to an empty room (see Figure 1.1). Inspiring internet videos could float in cyberspace with no one accessing them. Explaining and demonstrating is

Figure 1.1 Lecturer delivering a brilliant lecture – to an empty room

usually *part* of the teaching process, but without an effect on students, presenting is not teaching. That isn't to say that lectures can't have an impact on listeners. But what do your students gain from attendance? You don't even know whether students shown a movie are awake. Many students catch up on sleep during videos. Former generations did not have today's cell-phones or tablets or computers. What do you think is more appealing – attending to what a lecturer is presenting, or texting a friend or playing online games? Without checking on what your students have gained from a presentation, you cannot tell what, if anything, you have taught.

Preliminary Definition of Teaching

Any definition of teaching must include the effect on student behavior. Otherwise, all any of us would need in order to teach would be expertise in a subject matter. But knowing your subject is only a small part of teaching. In fact, you can define teaching without referring to content at all. When one person's actions affect what another person does or can do, teaching has occurred. Teaching consists of designing circumstances that change the way other individuals feel and behave.

Teaching is enabling students to acquire behaviors more efficiently than they would on their own.

Teaching deals with behavior. All behavior. Do you have students who disrupt class, making it difficult to teach others? Do you have students who complete work accurately and rapidly? Do some students come into class eager to learn while others slump in their seats as if to say, "See if you can get me to do anything"? However your students enter

your class, you are expected to provide an environment in which they acquire skills or interests that will be useful for their later life. Society places many demands on teachers, but until recently has not provided teachers with the tools to achieve them. Those tools come from the science of behavior.

THE SCIENCE OF BEHAVIOR

All science investigates relationships to find out how the world works. Science assumes that basic processes are orderly; that is, they do not operate one way in a New York laboratory, but a different way in a California supermarket. The principles that science reveals operate today the same way they did a thousand years ago. Science begins with description: Objects or phenomena are classified according to their properties. Not all properties are equally useful. Classifying elements by how they look, for example, does not help to tell you how they function in the world. Chemistry as a science originated when elements were identified according to atomic weight instead of by wetness, temperature, lightness or color. Science does more than describe, of course. It enables us to find out how certain properties relate to each other, and thus to predict. In physics, calculations from Newton's Universal Law of Gravitation enabled a French astronomer, Le Verrier, to predict the presence in the solar system of an object that no one had ever seen. He wrote to a fellow astronomer telling him where the object should be found. On September 23, 1846, the day of receiving Le Verrier's letter, Johann Gottfried Galle saw the planet that would be named Neptune.[1] He found it almost exactly where Le Verrier had predicted it should be visible.

The third aspect of science is control. Not all sciences try to change how the objects under study behave: Astronomers do not try to change Neptune's orbit. But many sciences have control as a goal. Newton's laws describing the relation between gravitational pull and centrifugal force made it possible to launch satellites that stay in orbit, and to land robotic rovers on Mars after eight months of traveling through space. That's an amazing feat!

Science is the systematic study of relations between phenomena, and the formulation of those relations into scientific laws that explain when and why events occur.

We live in three worlds, the physical world, the biological world, and the behavioral world. Each has its own science. Physics came first. By the seventeenth century, Galileo had, in addition to work in astronomy, conducted extensive experiments about motion. Even with Galileo's impressive law of "uniform motion"[2] and with the most advanced physics of today, physics cannot explain how biological species came about or how they evolve. That is a field that physics does not address. It is the provenance of biology. Biology, in turn, even with the latest in genetic research and brain-imaging techniques, will never be able to explain why one of your students walks over to the window instead of to the door when the lunch bell rings, or why a student wears a red shirt to school, or even such an important aspect of behavior as the language he or she speaks. For that, you need the science of behavior (see Chapter 3).

Of course, the phenomena the three sciences address are not independent. Physical properties of our world, like pollution, affect both biology and behavior. Similarly, genetic endowment determines much of what people do, such as moving on two

limbs instead of four or communicating by talking rather than with chemical scent (see Chapter 2 for the role of genetics). Interactions between different aspects of our universe are the rule, not the exception. They do not invalidate the scientific principles within each arena.

Two Kinds of Behavior

The science of behavior began with the work of Pavlov. Using dogs, Pavlov showed that physical reflexes like salivation, could be "conditioned."[3] That is, by pairing a clear "stimulus," such as the tick of a metronome with presentation of food, the dog would then salivate to the metronome alone. Any dog owner is familiar with the drooling resulting from the sound of a package of food being opened. That is Pavlovian conditioning.

Pavlov worked with reflexes and "respondent conditioning." Most human behavior, however, is not an automatic response to a stimulus. At the beginning of the twentieth century, people explained all behavior by looking at what comes just *before* an action. That applies to reflexes, but most human behavior is *not* a reaction to a stimulus. There is another kind of behavior, one that works in a different way. In the 1930s, B. F. Skinner discovered behavior that did not fit into Pavlov's respondent conditioning. The behavior he saw was not reflexive. It changed when the immediate *consequences* of actions were altered. The *postcedents* of individual actions, not their antecedents, determined how likely it was that an action would be repeated.

This kind of behavior differed from the reflex behavior that Pavlov documented. Skinner called it "operant" and the process "operant conditioning." What you teach is almost all operant behavior. Reading, writing, and arithmetic; all are examples of operant behavior. So is talking and thinking. Most of what you do today is operant, from dressing to driving to shopping. You may find yourself or your students also engaging in respondent behavior. Respondent conditioning enters into emotional behavior. The two processes work together. Between Skinner's operant conditioning and Pavlov's respondent conditioning, you have a science of behavior that explains why individuals behave the way they do.

Operant behavior is behavior that operates on the environment and is controlled by its immediate effects. In contrast, respondent behavior consists of reflexes controlled by a prior stimulus.

B. F. Skinner originally called the science he began "the Experimental Analysis of Behavior," abbreviated as EAB. By 1974, differences between traditional psychology and followers of Skinner's science resulted in the formation of what became the Association of Behavior Analysis International. By 1998, the Behavior Analyst Certification Board began credentialing behavior analyst practitioners. Today, most professionals working within the "Skinnerian" framework call their field "behavior analysis," although "behaviorology" more precisely identifies the underlying science.[4] Whatever the name, the practices of operant conditioning have spread to all areas of behavior including animal training, business, clinical work, health, and teaching. These practices have kept the science alive. That would have pleased Skinner immensely. He always said that the true test of a science was the practical applications it would foster.

Behavior Analysis is a discipline based on the science first developed by B. F. Skinner.

Operant Behavior and Operant Conditioning

All sciences adopt special vocabularies. Ordinary terms carry misleading connotations and new terms are needed for new concepts. Behavior analysis is no exception. To understand the science and its applications, you need to learn a special vocabulary. Two of the primary terms are **operant** and **contingency**.

Skinner coined the term **operant** to distinguish behavior that "operates" on the environment from the respondent behavior that Pavlov studied. You can explain a *respondent* eye-blink by identifying the stimulus that preceded it: "Joe blinked because dust hit his eye." Operant behavior differs. If you tell a student, "Blink," he or she may or may not blink. You cannot explain an operant blink by the stimulus preceding it. You must look at the consequences your student has encountered in the past for doing what you asked.

Most actions are primarily operant. Their causes lie in individual interactions within their constantly shifting environments. Not everything a person does is repeated. Patterns of actions adjust to the kinds of effects they produce. Only some operants are "selected" by consequences, in the process called operant conditioning, to become stronger and more likely to become part of a person's usual behavior. Operant conditioning goes on all the time. By the time a child is born, behavior has already begun its constant evolution through the interplay of genetic and environmental factors.

How patterns of behavior come about in the first place, how they change or why they stay the same constitute the laws of behavior. These laws, like the basic laws of biology, apply to the behavior of all animals, including human beings. Skinner used rats for most of his experiments, but he was not studying rats. He was studying properties of behavior that are universal in the animal kingdom.

Most reasons for behavior occur in the open where they can be observed. Behavior analysts avoid appealing to "inner agencies" as causes of behavior. A youngster does not hit because he *is a bully* (see Chapter Two). He hits as a result of consequences that have strengthened hitting over better ways of interacting with others. That's good news, because consequences can be changed.

Contingencies of Reinforcement

The relations between features of operant behavior and its surrounding events are called "contingencies." The activities you design, the kind of feedback you give, the procedures and rules in your classroom or school, your lesson materials and exercises, even informal peer interactions all contribute to the reasons for your students' behavior. To understand why behavior occurs or does not occur, you must identify the responsible contingencies.

Contingencies of reinforcement are relations between properties of operant behavior and features of the environment that affect the likelihood of their occurring in the future.

The contingencies that teachers address start with two terms and their relationship – clearly defined actions and what follows those actions (their **postcedents**). Turning on a cell-phone results in something lighting up (the postcedent). Touching or talking makes things happen on the screen. Of course, all actions occur within a particular setting. The antecedent situation in which behavior-postcedent pairings usually occur must also be considered. Behavior analysts examine a three-term contingency (antecedent-behavior-postcedent, or ABP).[5] You cannot touch icons without having a phone. Selecting different icons also produces different results. Soon, consequences become

paired with specific icons. Taps to particular icons that produce "reinforcing" effects will occur more frequently than taps on other icons. Still, the primary relation is between the frequency of taps and immediate effects, not between icon and tap. If the results from tapping a particular icon change, behavior will change, even though the icon stays the same.

Because many postcedents are consequences of behavior, most behavior analysts write C for the last term, making the letters ABC (Antecedent-Behavior-Consequence). The term "consequence" means **the result of** an action. Until you have determined that a postcedent is a consequence of behavior, ABP (antecedent-behavior-postcedent), though a less appealing acronym, provides a more accurate analysis.

The **three-term contingency** consists of the relationship between an operant, what results from or follows it, and the antecedent situation in which that behavior-postcedent pairing usually occurs.

A contingency analysis, like force or acceleration in physics, deals with *processes*: You can identify the component parts and see their sequencing in time, but you can only infer causal relationships. You can, however, see improvement in behavior when contingencies are changed (see especially Chapter 7).

Teaching is arranging contingencies to change the behavior of students.

Teachers teach by setting up or changing contingencies in the classroom. Those instructional contingencies then result in changes in what students do. As B. F. Skinner put it, "Teaching is simply the arrangement of contingencies."[6] Of course, teaching is not "simple." But given the repertoires your students already have, they are all you, as a teacher, have to work with.

Not all contingencies produce positive changes. Both "good" and "bad" actions are taught, along with their accompanying emotions. A teacher's procedures may be responsible for a student loving math, but teachers' actions have also resulted in the opposite. Many adults can trace interest or dislike of a particular subject to the actions of a particular teacher. Regardless of whether you plan it or not, whatever effect you have on your students is what you have taught them. That makes it critical to understand how contingencies work.

The basic analysis, though following simple principles, becomes complex in the school. Actions and their idiosyncrasies are always in flux, always adapting to momentary changes in the hundreds of contingencies in any individual's day. Human behavior is sensitive to very subtle aspects of its immediate environment including sensations inside one's own body. Analyzing the most conspicuous contingencies will not always provide quick answers for why a student behaves a particular way, nor will it give a cookbook procedure that works with all students. A contingency analysis will, however, help you discover factors responsible for the behavior you observe. It is up to you, then, to design procedures tailored to your particular setting and individual students. If you hit upon critical contingencies, some simple changes may surprise you with how quickly behavior improves.

Sometimes we think of improvement as getting rid of a particular behavior. But teaching is about building skills. The best way to eliminate undesirable actions is to produce better ones. The only postcedents that build behavior are positive ones, and they are the ones recommended in this book. Positive consequences, in turn, produce student enthusiasm as well as success, and that, in turn, encourages teachers to spend the time and effort that good teaching demands.