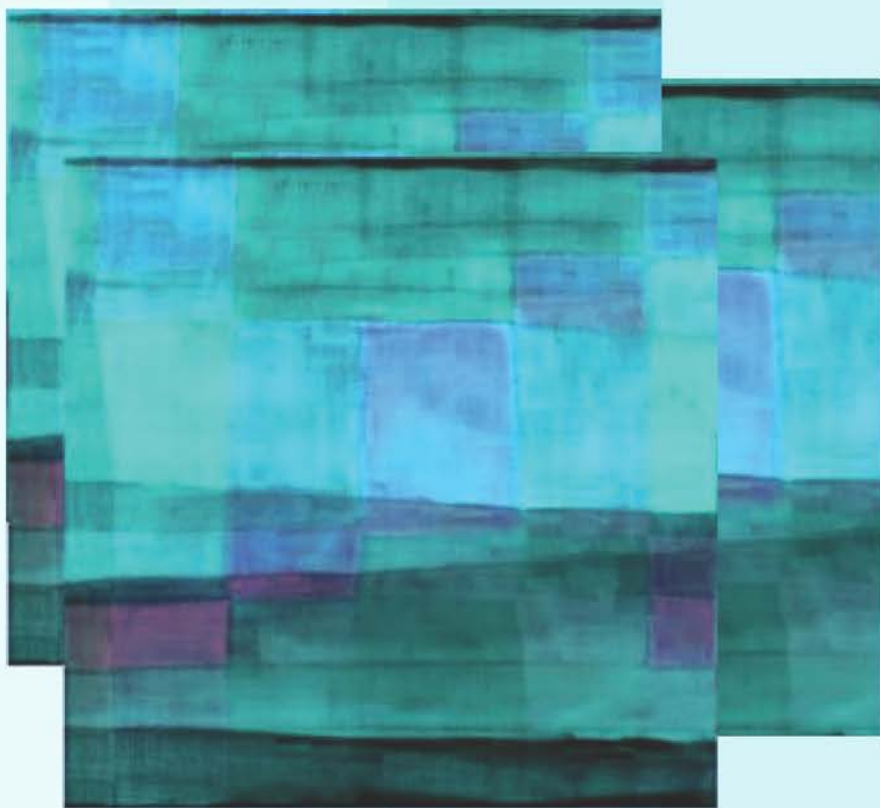


Second Edition

Behavior Analysis for Effective Teaching



Julie S. Vargas

Behavior Analysis for Effective Teaching

Second Edition

“This book is outstanding in several ways, including its clarity of presentation. It differs from most educational texts by stressing not what is to be taught, but instead how to teach effectively, no matter what the curriculum. It derives a practical teaching technology from a basic science of behavior and shows teachers how to use that technology creatively. The book also demonstrates how a scientific analysis leads directly to a teaching methodology that provides students with positive consequences for learning rather than negative consequences for failing to learn.”

—Murray Sidman, author of *Coercion and its Fallout*

“Julie S. Vargas has written the first modern book that really teaches you how to TEACH. Teaching smoothly, happily, and humanely is not a skill we’re born with, but it can be learned. From her unique position as a distinguished behavioral scientist, a parent, and a former elementary school teacher, Vargas shows you how to run a rambunctious classroom without yelling, and how to reinforce the behavior you want instead of constantly battling the behavior you don’t want. It seems our educational system too often throws new teachers into the classroom to figure it all out for themselves—and some never do. Here’s the answer: a clear and rewarding book about teaching that will painlessly give you the behavioral skills you need for success.”

—Karen Pryor, author of *Reaching the Animal Mind: Clicker Training and What it Teaches Us About All Animals*

This book shows teachers and other human service professionals working in school settings how to employ non-aversive, behavior analysis principles in classrooms and other school settings. Marked by its clear writing and multitude of real-classroom examples, this book is appropriate for undergraduate and graduate courses in teacher education, special education, school psychology, and school counseling. *Behavior Analysis for Effective Teaching* makes a perfect text for one of the required courses for the Credentialing Exam of the Behavior Analysis Certification Board (BACB). Outstanding features include:

- A classroom focus that seamlessly integrates behavior management with effective classroom instruction.
- Up-to-date research covering topics such as tag teaching, precision teaching, verbal behavior, autism, and computer-aided instruction.
- Pedagogical strategies including in-chapter quizzes and problem-solving exercises.
- A companion website featuring instructor test banks, illustrative videos, and further resources.

Julie S. Vargas, Ph.D., is a former third and fourth grade teacher. She taught behavior analysis to undergraduate education majors and practicing teachers for over 30 years. She is past president of the Association for Behavior Analysis International and one of the founding editors of *The Behavior Analyst*. Dr. Vargas has written three books and many chapters and articles on educational practices. She is currently President of the B. F. Skinner Foundation.

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Julie S. Vargas

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Typeset in Minion

by Swales & Willis, Exeter, Devon, UK

To my grandchildren
Zoie, Emma, Ethan, and Tristan

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PREFACE

Many writers have pointed out that of all the professions, education has least benefited from scientific advances. Where a physician or electrical engineer from a hundred years ago would be lost in a contemporary setting, they say that a teacher from a prior century would fit right in. How hard is it to lecture?

However true that position may have been at one time, the situation has changed and none too soon. The challenges facing today's teachers differ from those of even a few years ago. Modern teachers work with an increasingly diverse population, often including students with special needs or language difficulties. How would a time-warp teacher handle a mainstreamed child with autism, or a playground bully, or a student who tries but cannot master a simple concept, even after repeated explanations and demonstrations? Without understanding the basic science of behavior, a teacher has little to fall back on other than exhortation to try harder or punishment for failure. But punishment usually makes a situation worse, not better. Moreover, laws such as the Individuals with Disabilities in Education Act (IDEA) increasingly restrict the use of punitive techniques. Today's teachers need behavioral solutions based on behaviorological science. Without them, even enthusiasm and a genuine love of students are not enough.

When I was in seventh grade I decided I wanted to become a teacher. Why, I do not know. I was not a good student: I spent afternoons riding my bike, playing tetherball, and practicing basketball shots at a friend's house instead of doing homework. My report cards stated that I "needed to work harder." I remember handing those reports to my father. He would look briefly at what I handed him, mumble "Uh Huh," and hand the report back without further comment. "What," he would ask whenever I talked about school, "did you *learn*?" Judging from my grades, not much. My highest grade in junior high was a B in mathematics.

I was rescued from academic failure by the small boarding school I attended from 10th through 12th grade in Putney, Vermont. Classes were small and discussions intense. I decided that college wasn't such a bad idea after all! In college I majored in music. I still planned to teach, so I took a summer preparatory program in education. With that one course, I headed to New York City to teach third grade in a private girls' school.

I thought I would be a good elementary school teacher. I loved kids and was enthusiastic about every subject except history. I even loved math! That, I thought, was enough. I soon found out that knowing what to teach, explaining clearly, and liking students was not enough to help all of my students succeed as well as I was sure 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 adapted to what I did in class, and I had little idea 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 back to graduate school. My one behavioral course solidified my behavioral leanings. After graduating, I continued reading and discussing behavioral theory and principles with colleagues, graduate students, and my husband. But it was the years of interacting with undergraduate education majors and practicing teachers that showed how necessary positive procedures were for solving behavioral problems and improving student achievement in schools.

I wrote this book to help teachers understand the science that relates their actions to their students' behavior. If you are a teacher, no matter how good you already are, there will be times when the performance of one or more of your students will be disappointing. What do you do then? If a specific technique has not worked, you need to find out why. Moreover you need to identify *where* to make changes. Behavior analysis shows what to adjust and how to create positive procedures to try. It lets you evaluate your own effectiveness in the progress of your students.

Each interaction with your students affects not only their immediate behavior, but also their future. When you embolden a shy student, rescue a failing student, or inspire a bored student you not only provide opportunities for a better life, you contribute to a better, more positive society for all.

ACKNOWLEDGMENTS

Many people contributed to this book over the years. I would like to thank the many practicing teachers who brought their problems and solutions to my university classes. Many professionals sent copies of studies or research that I encountered only in secondary sources, and I am grateful to them for sharing so readily. Other colleagues checked portions of the manuscript for accuracy and suggested improvements, especially Per Holth, Kent Johnson, Theresa McKeon, Murray Sidman, Mark Sundberg, James T. Todd, Joyce C. Tu, Jerry Ulman, and Cathy Watkins. Last, special appreciation goes to my editor, Lane Akers, and to my patient husband who, through discussions and editing of draft after draft of each chapter, co-wrote this book more than he realizes.

TO THE INSTRUCTOR

The sequence of chapters in this book is designed to combine readings with student projects. Chapters 4, 5, and 6 address the beginning steps for applying behavioral principles in schools, in college buildings, or in any setting where people interact. Guidelines for such projects are available on the website for this book: www.routledge.com/cw/vargas. Also planned for the website are:

For students:

1. Timed quizzes for the fluency objectives in some of the chapters.
2. Video clips illustrating some of the procedures.
3. Additional sample answers for some of the Analysis Problems.

For instructors:

1. Directions and evaluation checklists for student projects.
2. Guidelines and evaluation checklists for article abstracts.
3. Items for midterm and final exams.

Part I

Science and the Art of Teaching

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 art.

OBJECTIVES

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

- A. Identify definitions of teaching consistent with a behavioral analysis.
- B. Select features of behavior analysis as it is applied to teaching.
- C. Complete definitions of “operant” and “contingencies” by supplying critical words.

THE KEY ROLE 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 90 percent of working Americans were farmers. Today that number is below 3 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. Good jobs increasingly 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. A few 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 going through student backpacks. Other teachers stood around watching. To my left a very young policeman surveyed the scene. I asked him what was going on. "They're checking for firearms," he said in a bored voice. 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 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 20 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 and nervous, ready to teach. There were lessons on elementary science, high school algebra, English literature, and an amazing variety of subjects that might be taught in a school system. But although the content of each lesson differed, the way they "taught" did not. All but one of these future teachers *lectured* the entire five minutes. Teaching, they evidently thought, was presenting information.

If only it were that simple! Unfortunately, presenting is *not* teaching. You could present a brilliant lecture in an empty room (see Figure 1.1). Explaining and demonstrating is often *part* of the teaching process. Many a lecture has had an effect on those who have heard it. How much students will actually take away from any lecture, however, depends on many factors, including whether or not they are listening. While former generations



Fig. 1.1 Lecturer delivering a brilliant lecture—to an empty room
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may have caught up on sleep during films in darkened classrooms, they did not have the enticements of smart phones or tablet computers. What do you think is more appealing—learning what a lecturer is presenting, or texting a friend, taking or sharing photos or videos, or playing online games with others? Without checking on student achievement, you cannot tell what effect a lecture is having.

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. If one person's actions affect what another person does or can do, teaching has occurred. You can define teaching as designing circumstances that change the way other individuals feel and behave.

Teaching deals with behavior. All behavior. Do you have students who disrupt class, making it difficult to teach others? Do you have students who volunteer to help clean up? Have you ever encountered students who fail to do homework or leave in-class assignments half done? Do some students come into class eager to learn while others slump into chairs as if to say, “See if you can get me to do anything”? Why do students love or hate a subject? All these questions deal with behavior. Society places many demands on teachers, but until recently has not provided teachers with the tools to handle day-to-day problems. Those tools come from the science of behavior.

WHAT IS SCIENCE?

Science is the systematic study of relations between events, and the formulation of those relations into **scientific laws**. 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

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.

supermarket. Nor do they operate differently today than they did a thousand years ago. Science begins with *description*: objects and events are classified to make sense of how their properties differ. Modern chemistry originated when elements were sorted according to atomic weight instead of by wetness, temperature, lightness or darkness. *Explanations*, that is, statements of how properties relate to each other make up *scientific laws*. Scientific laws, in turn, permit

prediction. 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.¹ He wrote his colleagues telling them where the object should be found. On September 23, 1846, the day of receiving Le Verrier's letter, astronomers saw the planet that would be named Neptune, almost exactly where Le Verrier had said it should be. Scientific laws also facilitate *control*. When predictive factors can be arranged, outcomes can be determined. 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 five months of travel through space. That's an amazing feat!

Because science reflects humankind's description of how the world works, it changes as our understanding of nature changes. When new facts cannot be accounted for by existing laws, the laws are either refined or shown to operate only within specific parameters. Newton's basic laws are a case in point. While his three laws of motion still hold, Einstein saw that cosmological data accumulated after Newton's death could not be explained using Newton's concepts of *fixed* space and time. Only if space curved and time could be compressed or extended could cosmological observations of the universe be explained and predicted.

For behavioral science, "laws" not only describe and predict, but they also lead us to procedures for change. As Skinner put it, "When we have discovered the laws which govern a part of the world . . . we are then ready to deal effectively with that part of the world. By predicting the occurrence of an event, we are able to prepare for it. By arranging conditions in ways specified by the laws of a system, we not only predict, we control: we 'cause' an event to occur or to assume certain characteristics."² Learning positive ways to control behavior lets teachers design more humane procedures than the punitive sanctions commonly found in schools.

SCIENCE AND BEHAVIOR

We live in three worlds, the physical world, the biological world, and the behavioral world. Each has its own science. Physics is the oldest. Already by the seventeenth century Galileo had formulated laws about the physical motion of objects. But even with the advances in the succeeding centuries and 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 a science of behavior (see Chapter 3).

Of course, the phenomena the three sciences address are not independent. Physical properties of our world, such as 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 by 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.

The science of behavior began with the pioneering work of B. F. Skinner. Burrhus Frederic Skinner grew up in a small town in Pennsylvania and spent much time roaming hills and building contraptions like a cart on discarded roller skate wheels and a slide whose splinters ripped open his mother's feather pillows that he and his friends used as cushions. In high school the young Fred had a teacher, Miss Graves, to whom he would later dedicate his book *The Technology of Teaching*. Miss Graves gave the teenager a "love of literature and art."³ It was because of Miss Graves that the young Skinner read Francis Bacon and encountered the idea that the quality of a science is revealed by its practical utility. As Bacon put it, "Nature to be commanded must be obeyed." As an adult, Skinner would quote that statement often.



Fig. 1.2 B. F. Skinner around the time of his graduate school days

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After college, and two additional years living at home while trying (and failing) to write the “great American novel,” Skinner did what many young adults do when they don’t know what else to do: He went back to school. It was during his graduate student days that he made an extraordinary discovery (see Chapter 3 for more detail).

Before Skinner came along, people explained behavior by looking at what came before an action. Each action was explained as a response to a stimulus. The Russian physiologist Pavlov had already shown how you could make a dog salivate to the sound of a bell, and his book had just come out in an English translation when Skinner decided to go back to school. Skinner bought the translation of Pavlov’s book and wanted to extend Pavlov’s work. At Harvard, where Skinner enrolled, his research classes permitted him to tinker as he liked. He built contraption after contraption, trying to produce consistent behavior to an antecedent stimulus. After a year and a half, he made a discovery: most behavior is *not* the reaction to a stimulus. Most behavior depends upon its effect on the immediate environment. It was **consequences** of individual actions, not antecedent stimuli, that determined what his animals did. This kind of behavior differed from the reflex behavior Pavlov described. Skinner called it “operant.” Between the two processes, his operant conditioning and Pavlov’s respondent conditioning, all behavior could be explained.

After getting his doctorate, Skinner spent five years doing further research on operant conditioning, culminating in his 1938 book *The Behavior of Organisms*. 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

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

International. Today, most professionals working within a “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 practical applications have kept the science alive. That would have pleased Skinner immensely.

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

Operant behavior is behavior that operates on the environment and is controlled by its immediate effects, in contrast to **respondent behavior** that is controlled by a prior stimulus.

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* eyeblink 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 2). 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 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 contingencies over your students’ behavior. To understand why behavior occurs or does not occur, you must identify the responsible contingencies.

The contingencies that teachers address start with two terms and their relationship: clearly defined actions and what follows those actions (their **postcedents**). Turning on an iPhone results in a screen becoming visible (the postcedent). Tapping buttons 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, making a **three-term contingency** (antecedent–behavior–postcedent, or ABP). You cannot tap icons without holding a phone. Tapping different icons also produces different results. Soon a tap in a particular spot and its consequence becomes paired with the icon tapped. Taps to particular icons that produce “reinforcing” effects will occur more frequently than taps on other icons. Still, the primary relation is between tap and immediate effect, 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

Contingencies are relations between an operant and features of the environment that affect the likelihood of similar behavior occurring in the future.

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.

Teaching is the arrangement of contingencies to facilitate learning.

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.

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).

Teachers teach by designing or altering contingencies in the classroom. The instructional contingencies then result in changes in student actions. As B. F. Skinner put it, “Teaching is the arrangement of contingencies to facilitate learning.”⁵

Not all contingencies produce positive changes. Both “good” and “bad” behavior can be “taught” and both are, along with the emotions that contingencies generate. A teacher’s actions may be responsible for a student loving math, but teachers’ actions have also resulted in the opposite. Many adults can trace a dislike of math 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 setting because actions and their properties 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 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. 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 motivates spending the time and effort that good teaching demands.

BEHAVIOR ANALYSIS FOR A MORE HUMANE WORLD

A variety of behavioral technologies based on positive techniques can be found under names like **CABAS (the Comprehensive Application of Behavior Analysis to Schooling)**, **TAG Teaching**, **Positive Behavior Support**, **Precision Teaching**, **Natural Environment Teaching** and a whole host of others. These systems of instruction improve the way we deal with each other as well as with other species. They move us as a culture towards a more humane world. Here is an example of what needs to be changed:

Training of elephants: Traditional training techniques used over centuries with elephants include hitting or beating them when they do not obey. In this country, one of the country’s best zoos, the San Diego Zoo was fined following a 1988 incident in which it was charged that “five elephant keepers chained an elephant in a zoo, brought it to its knees and beat it severely with ax handles over two days.” The city attorney, in reviewing

the case, declared that the procedure “while seemingly cruel, was an accepted practice at zoos and circuses.”⁶

“*Seemingly* cruel?” Even though the investigation found that the keepers had been falsely charged, the training did follow “accepted practice” of “dominating” through force. The San Diego Zoo and Wildlife Park now use operant conditioning. Eight of their newer elephants have never felt a blow, including a baby born in the zoo. Behavior is controlled with the technique called “clicker training” (clickertraining.com).

Building new behavior, teaching the animal to respond only on cue, and to execute a complex series of actions requires more than can be explained here, but the basic process relies on operant conditioning. At the precise moment the animal executes an action to be strengthened an audible click is sounded, followed by food or tickling, or some other strengthening consequence. Complex behavior can be “shaped” in steps by clicking actions that come closer and closer to the final desired performance (see Chapter 7).

Animals in captivity need medical care. How do you get a big animal to hold still for such medical routines as inoculations or drawing blood? In the past, veterinarians have shot anesthetizing darts into animals when it was not practical to catch them and hold them down. That procedure itself was dangerous. Darts sometimes hit the wrong spot, damaging a foot or an eye, and the “darted” animals often hurt themselves as they staggered around and fell while under the influence of the drug. Today, through shaping techniques, animals co-operate with veterinarians. Elephants come to the railings of their enclosure and hold up their feet for inspection or treatment, and walruses stick their flippers out of their cages, and hold still while veterinarians draw blood. Such behavior can be shaped *only* with operant techniques. Punishment will not work. Replacing punishment with positive procedures is not only more ethical for animals, it holds promise for schools too.

FROM PUNISHING STUDENTS TO REINFORCING ACTIONS

For hundreds of years, teachers have used punishment as the main method of control to keep students from misbehaving. Pictures of teachers in old drawings often show them with a cane or switch or paddle. But people began to see this treatment as inhumane. In 1783, corporal punishment of students was abolished in Poland, followed in the nineteenth century by the Netherlands and six other European countries. The pace accelerated in the twentieth century with 19 more countries including China and Japan outlawing the practice. The United States and Canada have been slower to eliminate corporal punishment of students. Towards the end of the twentieth century, fresh out of a teacher education masters program, I was hired as a fourth grade teacher in Pennsylvania. The opening session for new teachers included talks and materials. I got a pile of books and a narrow wooden cutting board with a handle. I was puzzled by the board sitting on top of my books. How nice of them to give us a little gift. But why was the board so skinny? Even French bread was thicker than that! Were we supposed to use it to cut up snacks for indoor recess breaks? I soon found out that the wooden board was not for cutting bread. It was for paddling students! Did the school district expect me to *hit* students? I thought I was supposed to teach them.

By 2000, Canada, the United States, and Australia were the only remaining industrialized countries that had not totally abolished corporal punishment of students. As late as 2005, in the United States, a whipping tool called “The Rod” was selling a “few a week.”⁷ The

rod was a 22-inch flexible nylon rod with a safety tip and cushioned vinyl grip for the whipper's comfort. It was advertised as the "ideal tool for child training." Horrible.

But there is progress. In the United States, by 2007, 29 states had outlawed corporal punishment for students. (It was already illegal nationwide for people incarcerated in prisons). The number of students receiving corporal punishment has decreased over the years to fewer than a quarter of a million American children in the 2006–07 academic year.⁸ That is still way too many. Even one child is too many!

People punish others when they have lost control. When you can get students to work and learn with positive methods, there is no reason to punish. Behavior analysis provides those positive methods.

BEHAVIOR ANALYSIS IN ACTION

While paddling fortunately continues to go out of fashion in schools, other methods of punishment have not. For many students, school is still a place where they can expect to be humiliated, insulted, yelled at, placed in detention, or kicked out all together. How humane is that? When behavioral techniques replace traditional procedures of control, everyone benefits.

Example: TAG Teaching Gymnastics

One set of procedures derived from B. F. Skinner's original work is called **TAG Teaching** (Teaching with Acoustical Guidance). TAG Teaching incorporated sound to give the immediate feedback that Skinner had emphasized. TAG Teaching was first used for teaching dancing and gymnastics (see tagteach.com). One of the developers of TAG Teaching, Theresa McKeon, describes how her lessons were changed when she worked behavioral principles into her teaching. Here is her report:

A group of competitive gymnasts are trying to prepare for an important upcoming meet. If they do well, they will qualify for state championships, if not, their season is over. The importance of a clean routine is not lost on the athlete or her coach (me).

Each athlete's turn attempting each skill is scanned for possible errors by the coach creating a no-win environment for both. To be fair, this is how they are judged at competition. Four judges watch a routine and methodically tick away at the gymnast's performance with deductions for the slightest imperfections.

Nicki does a handstand. I call out, "Nicki, every time you go into your handstand your legs are bent. You're not going to get a qualifying score if every time you go into a handstand your legs are bent. Get them straight, and *please* point your toes in the handstand and for heavens sake smile. . . ."

To add to this critical atmosphere, voices in a gym are by necessity . . . loud. Coaches learn to speak above all the ambient noise with raised voices.

"Mary, your leg is bent."

"Lyndsay, I said arms up."

"Stacey, you're wobbly. Tighten up." I shout.

Students often complain of being "yelled at." Gym speak has evolved into a steady stream of "corrections," where the most an athlete can hope for is "That was better . . . but next time you need to. . . ."

TAG Teaching changed these procedures. TAGteach lessons follow behavior analytic principles and a systematic approach to shaping behavior. What students do wrong is replaced with a specific finite goal, a TAG *point*. “Don’t bend your knee” becomes “the TAG point is, *straight leg on the first step*.” With that one clear target the student executes the handstand. At the precise moment she straightens her legs she hears a clicker sound. The sharp click cuts through the ambient noise in the gym and communicates that her performance was correct. If her legs are not yet straight, nothing happens. The student does not get “yelled at” for bent legs. If necessary the TAG point is simplified, or if it is obtainable, the student tries again. The coach feels comfortable saying, “perfect!” and the students gain success on increasingly difficult targets.

Due to the yes or no nature of properly stated TAG points, students as young as four years old can TAG each other accurately. They thrive on this role reversal, as they become the person they so often want to please—the coach!

Needless to say, students much prefer TAG Teaching to traditional coaching. Yelling produces undesirable emotional reactions. Failure in general fosters insecurity and a tightening of muscles that hinders performance. With TAG Teaching, students avoid being yelled at, and when paired with peers they get more opportunities to practice. Coaches using TAG appreciate no longer having to shout. Instead of being deliverers of criticism, they become deliverers of approval.

For academic subjects, behavior analytic techniques hold similar advantages over traditional teaching practices.

Example: Replacing Loud Talking with Writing in a Second Grade

A second-grade class in a small elementary school in West Virginia began the school day at a decibel level that was conspicuous throughout the entire neighborhood. The teacher, trying to be heard, raised her voice, the children raised theirs, and the result was the same kind of escalation one gets in a crowded restaurant or bar. Enter the behavioral teacher. To start the day off quietly, she told the students they were going to do something new. When school began, no one would talk for five minutes. But they could pass a note to anyone they could reach without getting out of their seat.

“What if we don’t know how to spell a word?” a little girl asked.

“Write how you think it is spelled, and I’ll see if I can figure out what you mean.”

They started. No one spoke, but everyone started writing. Hands went up for help with spelling and the teacher wrote the correct spelling for the students. Some of the words that students requested were put silently on the board. At the end of the five minutes, the class was quiet and the school day began at a refreshing sound level. After several days of this (during which spelling and handwriting improved), one day the principal walked into the room and started talking to the teacher. She put her finger to her lips, went over to the blackboard and wrote, to the great delight of the students, “You can’t talk. You have to write.”

Example: Using Positive Procedures Instead of Paddling to Reduce Disruptive Behavior

The insistence on using only positive contingencies to improve behavior has been especially important with students who are often punished in school. All behavior, including “misbehavior” is being *supported* somehow or it wouldn’t continue. Think of it. How

A **functional assessment** is a procedure that identifies antecedents and postcedents of specific actions to locate factors likely to be related to the occurrence of a particular behavior.

unfair is that—to punish the very behavior the school environment, though unintentionally, is maintaining? The answer is “very unfair.” To locate the relevant contingencies over the “problem” behavior, behavior analysts do a **functional assessment**. With questionnaires or direct observation, the contingencies over the student’s specific actions are described and analyzed. Then appropriate changes are made.

The following case study involves a second-grade student, called Bob, who had received spankings about every three weeks before a functional assessment was started. Seven spankings were documented in the weeks preceding the study.⁹

Bob’s teacher recorded the antecedents and postcedents of Bob’s disruptions on a form provided by the behavior analyst. When Bob made noises so annoying that the teacher could not continue teaching, his peers laughed, the teacher talked to him (teacher attention), and he usually got removed from the classroom and did not have to continue working. Bob’s *appropriate* behavior rarely received any notice by the teacher.

The treatment involved catching Bob working. A timer was set to remind the teacher to check on what Bob was doing every five minutes or so. If he was working, he got a sticker on a card on his desk, and the teacher gave verbal approval. Cards with 80 percent of the blanks filled in could be exchanged at the end of each session for trinkets like pencils, erasers, and stamps. If Bob was successful, his peers got five minutes of free time. That encouraged them not to laugh at Bob’s antics.

After a few days, checking on Bob’s behavior was extended from five minutes to ten. In cases like this, procedures are usually faded out slowly. By gradually extending timings eventually no trinkets are needed. However, to maintain changes, teachers still need to provide attention and approval for appropriate behavior.

After the positive procedures were started, Bob did not get one spanking for the remaining weeks of the study. Punishment did not improve Bob’s behavior. Positive methods did.

Example: Increasing High School Attendance

Students who skip school usually receive some kind of punishment. In one school district, the punishment for too many missed days of high school was simple: expel the student. (The logic of removing students from school because they have already missed too many days escapes me, but that was the district’s policy.) Three assistant principals who were enrolled in a graduate research class picked truancy for their class project. They mentioned concern about a dozen seniors in their buildings who had missed so many days of school that they were in danger of being permanently suspended. They worried that their students might never obtain a high school degree. The students were “typical” kids, though several came from broken homes. Instead of holding individual conferences with each student, threatening them with the dire financial consequences of failing to graduate, each assistant principal took a positive approach. Every day, each assistant principal walked around his building, looking for his target students and saying things like, “Glad to see you here today, Rick,” using each student’s name. That was it. To the amazement of the assistant principals, most of their students’ attendance improved.

Not only that, but in one of the schools, a couple of the students began arriving early. They would pop into the central office, or wave at the assistant principal through the open door saying, “Hey Mr. Jones. Look. I’m here today.” All but two of the students graduated.

Greeting students also improved the time it took two high school students and one junior high student to get down to work. When greeted by name as they entered class the students started working in half the time they had taken before. Since the students disrupted others when not working, greeting them helped solve that problem, too.¹⁰

Example: Improving Note-Taking in a Large College Lecture Class

Although lectures are common in education, not all students always pay attention. My first college teaching assignment was the same class where 500 students “taught” their five-minute lessons by lecturing non-stop. In addition to those section meetings, students attended lectures given by . . . me. Like all new instructors, I wanted to do a good job. My first week I designed what I thought was a good presentation complete with practical examples, nice visuals, and a clear structure. Excited, I went to the large lecture hall. I began my carefully designed presentation, speaking clearly, varying my speed and tone for examples, presenting my visuals, some even with humor in them. It didn’t take long before I saw that I was losing a good part of my class. In the back, several males were rather conspicuously reading the student newspaper. I could hear the rustle as they turned the pages. Clearly something had to be done. Maybe I should use some of the principles I was teaching.

The next week as students entered the lecture room, they picked up what I called a **lecture fill-in sheet**. One page long, it contained an outline of the day’s lecture but with all the important parts missing. For example, Number 3 might read, “We define reinforcement as _____.” I began the lecture. On my visuals I had the same items as the students had on their sheets, but with the missing parts filled in. So I’d say, for example, “So you see, you can’t tell what will be reinforcement just by what you like. We define it as—this is Number 3 on your handout (and here I would reveal the definition)—any event immediately following an action that increases the strength or likelihood of that action’s occurring in the future.”

Eureka. Suddenly the missing words became important. Unlike the previous week, I could see students moving their heads to get a good view so they could fill in their blanks. If I moved on to the next visual too fast, students would protest. Best of all, the same students who had so blatantly been reading their newspaper the week before, now were craning their necks to get every word down. At the end of the lecture, one of them even came up to me saying, “Dr. Vargas, what was number 4a? I’m not sure I got it all.”

I won’t make any claims about whether or not my lecture fill-in sheets produced more achievement. But they solved my problem of rustling newspapers and inattentive students, both of which are rather distressing to a novice lecturer. My new procedure also had another salutary effect. Like most teachers, I had more to do than time to do it. Because I had to get my fill-in sheets to the secretaries at least three days before my lectures, I completed the lectures earlier than I had before. In the intervening days, I improved my presentations with better examples, more attractive graphics, and relevant news items.

FEATURES OF BEHAVIOR ANALYSIS

Why do these examples represent behavior analysis? First of all, a problem was identified and goals were stated as clearly measurable student actions. Procedures concentrated on

Applied Behavior Analysis (ABA) is the engineering side of the science of contingency relations. Behavior analysts analyze and adjust contingencies to improve behavior.

building student skills. Instead of attributing the cause of what students were doing to something inside them such as poor concentration, lack of coordination, inadequate intelligence, or low motivation, the teachers analyzed contingencies. Their procedures did not rely on telling students about the importance of behaving appropriately, but focused on the consequences of their actions and the settings in which trouble occurred. Instead of punishing

inappropriate actions, positive consequences were added for the actions desired. Although only in two cases were data kept, in all cases progress was clearly visible, and at least in the gym example, the next step depended on each student's performance on the last step. That, too, is a feature of behavior analysis—adjusting each teaching step according to each student's performance on his or her current task.

No doubt one could find aspects of each of these cases that are not perfect for an illustration of behavior analysis in action. The point is not to show the ideal, but rather the practical. Even a small amount of training often helps a teacher solve classroom problems. But it can also frustrate early efforts when subtleties are missed and the procedures that the science says *should* work aren't working. There is no guarantee that reproducing the procedures described above will lead to the same outcomes. That does not mean that the science is faulty. One does not blame physics when a spacecraft fails to perform as expected. One makes a more detailed analysis to find out what was responsible for the problem.

COMBINING ART WITH SCIENCE

Along with the underlying science, there is an art to teaching. Individual and creative ideas bring variety and interest to educational practices. What do you have that is special? Certainly your own interests and knowledge are unique. So are the interests of your students, and anything unusual about the setting of your school. Art involves taking advantage of those idiosyncrasies. Perhaps your old building has a lot of visible rust. What is rust? How does it occur? Does all metal rust? What percent of your students' lockers have rust inside? Finding questions to ask is part of the art in teaching.

The art of teaching also includes sensitivity to subtleties in student behavior. Why is Tricia's eye twitching today? What is Joe's special interest? What special talents does Omar have? What are the dynamics between individuals and between groups? Can you use activities your students enjoy outside class to clarify critical concepts or principles or to motivate activities such as reading? All unique features of your students, your school, parents, and your neighborhood offer creative opportunities.

This book addresses the contingencies involved in effective teaching. With more efficiency in teaching the skills needed for mandated testing, and with the reduction of "discipline" problems, you will be able to spend more time and energy doing what you entered your profession to do: helping students learn what they will need for happy and productive lives, and to learn more effectively and enjoyably than they would on their own.