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Behavior Analysis: No Defense Required

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Abstract

Many people, professional educators and others, criticize what they call behavior modification because they believe it applies only to animals or people with disabilities and represents little more than the application of good common sense. This paper argues that behavior modification, more accurately called behavior analysis, has produced many procedures that apply to the behavior of people with and without disabilities across a variety of settings. This paper examines 4 behavior analytic teaching strategies (Personalized System of Instruction, Programmed Instruction, Direct Instruction, and Precision Teaching) to illustrate the sophistication and wide application of behavior analysis. It concludes that such behavior analytic approaches to teaching apply to people of all abilities and that rather than reflecting mere common sense, they emanate from sound research that demonstrates their effectiveness.

Introduction

When colleagues ask me to defend what they call behavior modification, I hesitate. I do not believe such a defense is necessary. After all, I have worked in behavioral settings with people of all levels of cognitive ability, with and without so-called behavior problems, since I began my professional career in 1971. I have seen the principles of behavior and the many procedures they generate benefit countless people. I received my doctorate in special education with an emphasis in applied behavior analysis and learned much more about the highly effective behavioral tactics that positively impact students with and without disabilities. Why would practices so consistently documented to help so many people need a defense?

Behavior modification also known as behavior management or more accurately behavior analysis has received much criticism since its emergence as a discipline from the work of B. F. Skinner (See Cooper, Heron, & Heward, 1987 for a brief review of Skinner's influence on behavior analysis and Catania & Harnad, 1988 for a very interesting presentation of often heard criticisms of Skinner's published work and responses to each from Skinner). Many educators regularly criticize what they call behavioral approaches to teaching students with and without special needs (Heward & Cooper, 1992; Todd & Morris, 1992). I believe most of this criticism stems not so much from behavior analytic flaws, but from either ignorance of the true nature of behavior analysis or a misinterpretation of behavior analysis (See Todd & Morris, 1992 for a discussion of the way behaviorism is often misinterpreted). In this paper I will

(a) address two common misconceptions of behavior analysis I frequently encounter;
(b) briefly describe four effective behavior analytic approaches to teaching learners of all cognitive ability; and
(c) conclude with some discussion of the frustration many behavioral educators experience when procedures with demonstrated effectiveness are not widely adopted.

Two Often-Encountered Criticisms of Behavior Analysis

In The Behavior of Organisms: An Experimental Analysis (1938/1991), Burrhus Frederic Skinner described a natural scientific approach to the investigation of behavior. From this highly technical book and over many years, came the field we now know as applied behavior analysis (Baer, Wolf, & Risley, 1968; Baer, Wolf, & Risley, 1987). Expanding on Baer et al.'s 1968 paper Cooper et al. (1987) defined applied behavior analysis as –

the science in which procedures derived from the principles of behavior are systematically applied to improve socially significant behavior to a meaningful degree and to demonstrate experimentally that the procedures employed were responsible for the improvement in behavior. (p. 14)

Applied behavior analysis began as and remains a science that uses the methods and procedures of science to apply Skinner's behavioral principles to improve behavior that is important to learners and their significant others. As a science applied behavior analysis, like all other sciences, is largely self-correcting. Only procedures that show effectiveness (i.e., withstand study and verification) will endure. Many criticize applied behavior analysis on the mistaken belief that Skinner's experimental work applied to non-human species only and that relevance to the behavior of humans was minimal (Catania & Harnad, 1988; Skinner, 1974). On the contrary, Skinner thought about how what he called a science of behavior could be applied to the behavior of human beings very early in his career. In a concluding section of his 1938 opus Skinner wrote:

The reader will have noted that almost no extension to human behavior is made or suggested. This does not mean that he is expected to be interested in the behavior of the rat for its own sake. The importance of a science of behavior derives largely from the possibility of an eventual extension to human affairs. (p. 441)

Such an extension became a major focus of much of Skinner's later writing (e.g., 1945; 1948; 1953; 1957/1992; 1971; 1974). In About Behaviorism (1974) Skinner argued that behaviorism as a philosophy of the science of behavior could be separated into two areas: the experimental analysis of behavior and the applied analysis of behavior. In this book Skinner detailed 20 criticisms of behaviorism. All of them wrong he said! I encounter similar statements/criticisms in my teaching and professional careers. Two of the criticisms Skinner described and I most often face are (a) behavioral approaches apply only to nonhumans or to people with disabilities, and (b) the achievements of behaviorism could have come about from common sense alone. And as Skinner would state, both of these criticisms are wrong!

Criticism One: Behavioral Approaches Apply Only to Nonhumans or to People with Disabilities

I hear this criticism frequently when teaching my introductory courses in behavior management and during many of the trainings in behavioral strategies I have conducted. I often ask new students to list their impressions of behavior management. Inevitably, students note that behavior management works for people with disabilities or people with challenging behavior. Seldom do students believe behavior analysis has relevance to students without special needs. The research literature, however, contains hundreds of studies demonstrating the effectiveness of behavior analytic procedures across a wide variety of circumstances and with all kinds of people (Behavior Modification; Journal of Applied Behavior Analysis; Journal of Behavioral Education; Journal of Organizational Behavior Management; Journal of Precision Teaching; to name a few journals that regularly publish such accounts). It is simply not true that the science of behavior is limited to a narrow spectrum of humanity. Consider four teaching strategies that developed from or are closely related to behavior analysis: Personalized System of Instruction, Programmed Instruction, Direct Instruction, and Precision Teaching. Each has demonstrated efficacy with students of all abilities.

Personalized System of Instruction (PSI)

Keller and Schoenfeld (1950/1995) published the first text on the new science of behavior described by Skinner (1938/1991). Fred Simmons Keller was a graduate student with Skinner at Harvard University in the 1920's (Bjork, 1993; Heward & Dunne, 1993; Keller, 1996) and went on to an honored career as a university professor who influenced many renowned behavior analysts over the course of the next 60 years (Heward & Dunne, 1993; Michael, 1996). Keller began to apply Skinner's principles of behavior to teaching college level students shortly after Skinner's 1938 work (Keller, 1982). It was not until after World War II, however, that he began developing a systematic behavioral approach to teaching an introductory psychology course (Keller, 1982). Keller described his personal dissatisfaction as a college teacher. He noticed many of his students did not perform well in his introductory psychology course at Columbia University. He questioned the then current assumption that student performance must distribute along a normal curve. Why should so many students at Columbia, Keller wondered, receive such poor grades? Keller's Personalized System of Instruction (PSI) was one of the first attempts to apply Skinner's laboratory work with non-human species to the complex behavior of university undergraduate students (Keller & Sherman, 1974). PSI used Skinner's reinforcement theory and systematic instruction to effectively teach students so learning was positive and virtually assured (Heward & Dunne, 1993). Keller's plan redefined traditional college teaching practice by requiring student mastery of each part of a course before moving to more complex material and allowing students to move through course content at their own pace so long as they mastered each step along the way (Keller, 1968/1977). PSI also relied on written course materials and student proctors (Frederick, Deitz, Bryceland, & Hummel, 2000). Keller envisioned the lecture as a rather unimportant compliment (used as reinforcement) to his more systematic approach to teaching (Keller, 1968/1977; Keller, 1982).

For Keller's PSI system, establishing mastery criteria required the college instructor to carefully analyze course content and break it into systematic units (Keller, 1968/1977). Each unit built on the preceding one. Students taking a PSI course needed to master one unit of the course before moving to the next more complex unit, and Keller established mastery at 100 % (Keller, 1968/1977). To accomplish mastery, students moved through course content at their own pace and completed quizzes when they believed they could pass a unit quiz. PSI as envisioned by Keller required student proctors (students who had passed the course with superior competence) to give quizzes, coach students, and answer questions and the instructor who designed the course, oversaw the student proctors, and provided the occasional lecture as reinforcement for student attainment (Fredrick et al., 2000). This very structured approach to college teaching virtually ensured an A to all students who completed the course.

PSI began at Columbia in 1963 and spread to many universities across the country and in Brazil in a variety of disciplines (Heward & Dunne, 1993). Research indicated that this novel approach to teaching was successful whenever it was conducted appropriately (Fredrick et al., 2000; Keller, 1968/1977). As Keller noted, however, PSI flew in the face of many of the commonly held assumptions of the college system: the bell-shaped curve mentality of learning, administrative priorities to move students through the collegiate system at a predetermined rate, and the lecture style that gripped educational practice then and even today. Keller believed these factors limited PSI's wide-scale implementation. PSI achieved remarkable gains in student learning and held much promise for truly reforming the teaching process, however, it required more work by the course instructor, acceptance from college administration, and a new look at teaching (Heward & Dunne, 1993; Keller, 1968/1977).

PSI underwent considerable examination and application in the 1960s and 70s and is still used in several universities (Fredrick et al., 2000). Fredrick et al. summarized research support for PSI by noting that (a) PSI was more effective in raising final exam scores than other approaches; (b) PSI enhanced problem solving in such courses as engineering more than did traditional lecture-discussion format courses; and (c) PSI has been shown to more successfully yield higher achievement in complex courses than did traditional lecture-discussion formatted courses.

Programmed Instruction (PI)

Before PSI, Skinner examined how his brand of behaviorism could be applied to education. Programmed Instruction (PI) became Skinner's answer to what he viewed as a crisis in modern education (Skinner, 1954/1982). Following a visit he made to his daughter's fourth grade class in 1953, Skinner came to believe that much of the then current educational practices, stemmed less from a systematic examination of how people learn than from so-called common sense, platitudes that had little to do with how students could best master the complex material they needed to learn (Skinner, 1954/1982). Vargas and Vargas (1992) summarized Skinner's reaction to what he saw at his youngest daughter's classroom. Students sat at their desks solving a math problem written on the blackboard. As students did this the teacher walked around the room, commenting here and there on a few students' work. Some students finished the problem and sat with nothing to do, while others toiled away with little feedback from the teacher. Skinner saw two fundamental problems with this kind of teaching: The

students were not being told at once whether their work was right or wrong (a corrected paper seen 24 hours later could not act as a reinforcer), and they were all moving at the same pace regardless of preparation or ability. (As cited in Vargas & Vargas, 1992, p. 35)

Skinner believed advances in the science of behavior held great promise for vastly improving teaching and learning. In his 1954 paper he noted several problems with traditional teaching practice: dependency on aversive consequences (e.g., use of punishment that often caused students to stop responding to instruction or to avoid teacher contact), the absence of systematic reinforcement of appropriate student responding, and the lack of a systematic plan that moved the student to closer and closer approximations to the actual skills the teacher expected of the student. To Skinner, the most harmful deficit was "the relative infrequency of reinforcement" (1954/1982, p. 213).

In response to these inadequacies, Skinner developed Programmed Instruction and teaching machines that took learners through instructional content in a systematic manner, at their own pace, and that did not allow learners to advance until they had mastered critical course content (Vargas & Vargas, 1992). Skinner believed that automation was the only way to ensure the kind of immediate feedback and individualized attention students need to maximize learning (Vargas & Vargas). Teaching machines had existed before Skinner, but Skinner was the first to use such machines with carefully programmed instruction based on the principles of operant behavior (Vargas & Vargas).

Programmed Instruction focused on several key elements: (a) carefully planned instruction that moved learners through each step to mastery before they moved to more complex material; (b) immediate feedback on student response that functioned as reinforcement for correct responding; and (c) students moving at their own pace (Vargas & Vargas, 1992). Skinner (1954/1982) noted additional benefits of his teaching machine:

The device makes it possible to present carefully designed material in which one problem can depend upon the answer to the preceding problem and where, therefore, the most efficient progression to an eventually complex repertoire can be made. Provision has been made for recording the commonest mistakes so that the tapes can be modified as experience dictates. Additional steps can be inserted where pupils tend to have trouble, and ultimately the material will reach a point at which the answers of the average child will most always be right. (p. 218)

Vargas and Vargas noted that these two features, sequencing problems according to complexity and feedback that used learner data to improve only those ineffective parts of the sequence, made Skinner's programmed instruction unique. Over time Skinner's programming (sometimes called linear programming) became a major focus of programmed instruction (Vargas & Vargas). Linear programming used learners' imitative responses to cue/guarantee correct responses. Formal prompting continued as learners moved through increasingly more complex material (Vargas & Vargas).

Starting in 1954 and through the end of the 1960s, Programmed Instruction was commonly used in the military, business and industry and in education. "It appeared to be the instructional innovation of the decade" (Vargas & Vargas, 1992, p. 47). Vargas and Vargas summarized several studies that documented programmed instruction's enormous impact on education in the 1960s. Although it appeared that Programmed Instruction was to become a permanent instructional practice, it began to loose influence by the end of the 1960s (Vargas & Vargas)

Today the phrase programmed instruction is hardly in vogue. As Vargas and Vargas (1992) noted, "it would be hard to find anyone specifically teaching what they would call 'programmed Instruction.' But all of the principles and procedures are alive, some thriving in different forms, most continuing in subdued but persistent ways" (p. 50). Many behaviorally based procedures such as Personalized System of Instruction, Precision Teaching, and Direct Instruction focus on carefully structured instruction, high rates of responding, and precise measurement of student performance (Vargas & Vargas). Vargas and Vargas pointed out that PSI emphasized mastery and individual student pacing, features common to much of special education today. In addition, much of special education focuses on programmed notions of prompts, fading, and cueing student response. Traditional education adopted two aspects of Programmed Instruction, behavioral objectives (more commonly called performance objectives) and immediate reinforcement (now called feedback). From performance objectives came competency testing (Vargas & Vargas). Unfortunately, Skinner's carefully constructed lessons, immediate reinforcement, careful shaping of correct student response, mastery criteria, and individual pacing are rarely all combined in current permutations of programmed instruction (Vargas & Vargas).

Vargas and Vargas (1992) believed that although Programmed Instruction seemingly failed as an educational movement it did not fail as an effective instructional approach. Programmed Instruction properly structured and implemented according to Skinner's model works. Vargas and Vargas argued much of the research that reported less than positive Programmed Instruction results examined approaches that did not contain all the elements suggested by Skinner for effectiveness. A "something like it" approach, as Fred Keller called it, cannot work without all elements that comprise Programmed Instruction or Personalized System of Instruction (Heward & Dunne, 1993).

Direct Instruction (DI)

Direct Instruction (DI), though not strictly a behavioral technique uses a sophisticated analysis of the cognitive process to formulate highly structured ways to teach basic academic skills (Engelmann & Carnine, 1982). Bereiter and Engelmann developed this very systematic approach to instruction in the early 1960s (Becker, 1992). Their approach to teaching "merged with behavioral analysis through contact with Wesley Becker and Douglas Carnine…Direct Instruction stands as a systematic approach to the design and delivery of a range of procedures for building and maintaining basic cognitive skills" (Becker, 1992, p. 71).

According to Becker Direct Instruction combines several features:
(a) small group instruction that maximizes teaching in a minimum amount of time;
(b) frequent student responding and criterion referenced testing of student learning; and (c) pretested scripts that guide teachers and aids through very active lessons. Critical to Direct Instruction is the logical analysis of knowledge and teaching examples (Becker, 1992).

Engelmann was no Skinnerian according to Becker (1992), but he did understand the importance of reinforcement in learning and "knew the importance of dealing with observables demonstrated to

control learning outcomes" (pp. 88-89). Like Skinner, Engelmann viewed the teacher as a behavioral engineer who understood that learning takes place one step at a time and involves rules (Becker, 1992). For Engelmann, however, behaviorism did not go far enough. "With its laboratory origins in animal research it [Behaviorism], has relied too heavily on the empirical analysis of behavior and neglected the importance of the logical analysis of stimuli and, more generally knowledge" (Becker, 1992, p. 89). Combined with behavioral theory, Direct Instruction uses a sophisticated analysis of knowledge to teach in the most effective manner possible (Becker, 1992). Becker noted that Direct Instruction did not derive from any specific kind of research,

except perhaps in a general way from behavior theory. Rather, it grew initially from logical analysis of what was to be taught and how to teach it. The analyses were then used to generate lesson scripts which we tested to see if they were efficient. The ultimate test was whether the procedures produced the learning desired. This day-to-day testing and the analysis was the real research basis for DI. Again there is a parallel to Skinner's career. Skinner is often quoted as saying, "Let the pigeons teach you." Engelmann let the children teach him. (Becker, 1992, pp. 91-92)

Direct Instruction, however, is extensively supported by research (See Becker, 1988; Fredrick & Keel, 1996; Fredrick et al., 2000 for summaries of some of the research support for Direct Instruction). Probably no single research endeavor so convincingly demonstrated Direct Instruction's effectiveness (and yet so frustrates Direct Instruction and behavior analytic educators) than does the Project Follow Through experiment.

Project Follow Through consisted of a planned-variation field experiment funded by the Federal Office of Education from 1968 through 1976 (Becker, 1992; Watkins, 1988; 1997). Becker (1992) noted that almost all the major clinical and educational approaches of the day participated in this demonstration project. What was truly unique about the Follow Through study was its attempt to evaluate the most effective educational strategies of the day (Engelmann, S., 1992; Watkins, 1997). Each model implemented its respective approach in a variety of K through third grade classroom settings and trained and oversaw the operation of its approach throughout the experiment. The Direct Instruction model was the only model of the 22 that participated to show gains in all academic and affective domains assessed (Watkins, 1997). Controversy over the validity of some of the findings arose, but according to Becker (1992) most objective reviewers believed that the Direct Instruction model performed better than all the other models. The results of the Follow Through study, though clearly demonstrating the superior effect of the Direct Instruction model, have been largely ignored by mainstream education (Engelmann, 1992; Watkins, 1988; Watkins, 1997).

Precision Teaching

Ogden R. Lindsley, credited with founding Precision Teaching, applied his work with Skinner in the animal labs at Harvard University to classroom teaching and learning (Fredrick, et al., 2000; Potts, Eshleman, & Cooper, 1993). Precision Teaching is less a way of teaching than a specific method for determining the effectiveness of teaching and improving it based on careful measures of student

performance (Potts et al.). Expanding on Skinner's use of rate as a basic datum, Lindsley developed celeration as a way to measure student performance (Lindsley, 1992b; Potts et al., 1993). Celeration takes rate (or number per unit of time) one-step further (to number per unit of time per unit of time) (Brown, Dunne, & Cooper, 1996; Potts et al., 1993). This very precise measure of student performance allowed teachers to maintain direct and continuous contact with their students' performance. Such contact permitted teachers to use the most effective teaching strategies to ensure student performance. Lindsley asserted that Precision Teaching could work with almost "any curricular approach except those so antistructure that they cannot permit a counter, timer, or chart in the classroom" (1992b, p. 52).

Precision Teaching operates on the following principles: (a) use student performance to guide teaching strategies (precision teachers say the student is always right; (b) use direct and continuous measures of student performance of observable and repeatable behaviors to guide assessment of performance; (c) use rate of response (celeration) as the basic datum to measure performance; (d) chart performance on the standard celeration chart (a semi-log chart developed by Lindsley and his associates); (e) teach positively; and (f) use student performance to determine teaching effectiveness (Fredrick et al., 2000). Lindsley once described an interaction with Skinner when Lindsley was a Harvard graduate student. He told Skinner that the rat Lindsley was working with did not respond correctly according to Skinner's writings. Skinner told Lindsley, "in this case the book is wrong. The rat knows best. That's why we still have him in the experiment" (As cited in Fredrick, et al., pp. 79-80). For precision teachers, the student is always right. Precision teachers use student performance to determine the effectiveness of their instruction. As Binder and Watkins (1990) noted precision teachers assume "that learners behave in lawful ways to environmental variables and that if learners behave in an undesirable way it is the responsibility of teachers to alter those variables until they produce the desired results" (As cited in Fredrick, et al., p. 80).

Students in a Precision Teaching classroom stay actively engaged in their academic work while the teacher ensures that student performance is frequently measured so that instructional effect can be continuously assessed. Though not as frequently researched as the other three behavioral methods of instruction discussed in this paper, Precision Teaching has been demonstrated to be effective "with a wide range of students across various disciplines" (Fredrick et al., 2000, p. 84). Beck and Clement (1991) documented more than 15 years of effective teaching for K-12 general education students and students with special needs at the Great Falls, Montana Public Schools. Fredrick et al. summarized several studies that documented Precision Teaching's effectiveness with learners up to college level students.

Criticism Two: The Achievements of Behavioral Approaches Could Have Come about with Common Sense Alone

Many students and parents leave basic workshops in behavior management telling me that using positive reinforcement and punishment effectively requires nothing more than good common sense. Skinner (1974) often encountered critics who argued that behaviorism was nothing more than good

common sense and again he believed this criticism to be wrong. He noted that it was only with an experimental analysis of aversive and positive contingencies that we saw the many merits of influencing behavior with positive reinforcement rather than aversive contingencies. If positive reinforcement is nothing more than a matter of good common sense, why, Skinner asked, does the world still so routinely rely on punishment or aversive control? An experimental (i.e., behavior) analysis permitted an objective examination of events that can shape human behavior, how this shaping worked and what to expect during the process. This examination called for far more than mere common sense according to Skinner. In the concluding chapter of About Behaviorism (1974), Skinner wrote, The disastrous results of common sense in the management of human behavior are evident in every walk of life, from international affairs to the care of a baby, and we shall continue to be inept in all these fields until a scientific analysis clarifies the advantages of a more effective technology. It will then be obvious that the results are due to more than common sense. (p. 258)

The effective educational approaches I discussed in this paper emerged from years of empirical investigation and underwent changes as a result of such research. None occurred merely as a result of common sense. Programmed Instruction evolved from years of Skinner's basic research. He applied the principles derived from this research to student performance in his Programmed Instruction. Continuous study occurred until Skinner developed a system of instruction that reliably and repeatedly worked (Vargas & Vargas, 1992). Rather than a function of common sense, Programmed Instruction resulted from years of basic and applied work. Once applied, Programmed Instruction underwent extensive study that supported its effectiveness so long as it was applied as its originator had suggested (Vargas & Vargas, 1992).

Like Programmed Instruction, Keller's Personalized System of Instruction derived from Skinner's basic laboratory work and grew into a highly systematic method of ensuring student competence and learning. Keller's plan also underwent extensive study and change before it reached its final form. Until the time of his death, Keller believed that PSI was one of the most effective methods of ensuring students learning so long as it was properly implemented (Heward & Dunne, 1993; Keller, 1996).

Direct Instruction also evolved from basic study on how children learn and could best be taught. Again, rather than stemming from common sense, this highly sophisticated teaching strategy resulted from years of examination and study of what works and does not work to help students learn. What emerged was a highly successful and structured teaching methodology supported by extensive research over more than four decades (Fredrick et al., 2000).

Precision Teaching also evolved from research regarding how people learn and what ways can best accomplish this end. Lindsley's basic laboratory work with Skinner at Harvard in the 1950s provided the foundation for his application to student learning, particularly the precise measure of student performance. His Precision Teaching operates on the premise that the student knows best and that when students fail to effectively learn, it is a teaching rather than a learner disability. PT carefully measures student performance and uses these data to assess teaching effectiveness. If students do not adequately learn, teaching strategies change until students do learn.

Conclusion

I am a behaviorist. Many of my behavioral colleagues and I become frustrated when asked to defend a discipline that so frequently provides instructional methods demonstrated to work with people of all abilities and behaviors. In this paper I examined four teaching strategies that ethically and positively promote student performance in classrooms from preschool to college. All emerged from extensive research and used the results of ongoing research to improve their ultimate effectiveness. Most people think applied behavior analysis makes its most important impact on learners with disabilities. Undoubtedly behavior analysis has made major contributions in this area, but, in my experience, people seemed surprised that behavior analytic approaches have been successfully applied to teaching of students of all abilities.

Today we are faced with a bewildering array of teaching approaches, all of which claim to be effective. School systems often adopt the method du jour in their earnest attempt to help students learn. Behaviorists believe a number of techniques born of a science of human behavior already exist that have and will continue to effectively impact student performance in our nation's schools. They become frustrated because procedures that have been so extensively researched still do not dramatically affect mainstream educational practice (Lindsley, 1992a). Why aren't procedures demonstrated to be effective more commonly adopted? Though not an answer to this troubling question, Skinner (1984/1992) did offer a suggestion. He urged educators to continue giving students and teachers better reasons for learning and teaching. That is where the behavioral sciences can make a contribution. They can develop instructional practices so effective and so attractive in other ways that no one-student teacher, or administrator-will need to be coerced into using them. (p. 29)

Despite years of research that supports behavioral approaches to teaching, behavior analytic approaches do not significantly impact current educational practice. What will it take for "effective" to rule over "popular"? Behaviorists can only continue to develop, study, and implement effective teaching strategies that work for many people across a wide variety of settings and hope that as Skinner noted, the conditions will "force" society to make better decisions regarding how to teach our children. So I suppose behavior analysts, like it or not, necessary or not, will continue to defend their demonstrably effective procedures even if no defense is required.

References

Baer, D., Wolf, M. M., &Risely, T. (1968). Some current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 1, 91-97.

Baer, D., Wolf, M. M., & Risely, T. (1987). Some still-current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 20, 313-327.

Beck, R., Clement, R. (1991). The Great Falls Precision Teaching Project: An historical examination. Journal of Precision Teaching, 8, 8-12.

Becker, W. C. (1988). A summary of: Becoming a nation of readers: The report of the commission on reading. Prepared by Richard C. Anderson, Elfrieda G. Hiebert, Judith A. Scott, and Ian A. G. Wilkinson. Education and Treatment of Children, 11, 389-396.

Becker, W. C. (1992). Direct instruction: A twenty year review. In R. P. West & L. A. Hamerlynck (Eds.), Designs for excellence in education: The legacy of B. F. Skinner (pp. 71-112). Longmont, CO: Sopris West, Inc.

Bjork, D. W. (1993). B. F. Skinner: A life. New York: Basic Books.

Brown, S., Dunne, J. D., & Cooper, J.O. (1996). Immediate retelling's effect on student retention. Education and Treatment of Children, 19, 387-407.

Catania, A. C., & Harnad, S. (Eds.). (1988). The selection of behavior. The operant behavior of B. F. Skinner: Commentaries and consequences. New York: Cambridge University Press.

Cooper, J. O., Heron, T. E., & Heward, W. L. (1987). Applied behavior analysis. Columbus, OH: Merrill Publishing Co.

Engelmann, S. (1992). War against the school's academic child abuse. Portland, OR: Halcyon, House.

Engelmann, S., & Carnine, D. W. (1982). Theory of instruction: Principles and applications. New York: Irvington.

Fredrick, L. D., Deitz, S. M., Bryceland, J. A., & Hummel, J. H. (2000). Behavior analysis, education, and effective schooling. Reno, NV: Context Press.

Heward, W. L., & Cooper, J. O. (1992). Radical behaviorism: A productive and needed philosophy for education. Journal of Behavioral Education, 2, 345-365.

Heward, W. L., & Dunne, J. D. (1993). A teleconference with professor Fred S. Keller. The Behavior Analyst, 16, 341-345.

Keller, F. S. (1977). Goodbye teacher. In F. S. Keller's Summers and sabbaticals (pp. 107-123). Champaign, IL: Research Press Company. (Original work published 1968)

Keller, F. S. (1982). Pedagogue's progress. Lawrence, KS: TRI Publications.

Keller, F. S. (1996). Obituary: Fred S. Keller (1899-1996. The Behavior Analyst, 19, 7-9.

Keller, F. S., & Sherman, J. G. (1974). PSI: The Keller Plan handbook. Menlo Park, CA: W. A. Benjamin.

Keller, F. S., & Schoenfeld, W. N. (1995). Principles of psychology: A systematic text in the science of behavior. Cambridge, MA: B. F. Skinner Foundation. (Original work published 1950)

Lindsley, O. R. (1992a). Why aren't effective teaching tools widely accepted? Journal of Applied Behavior Analysis, 25, 21-26.

Lindsley, O. R. (1992b). Precision teaching: Discoveries and effects. Journal of Applied Behavior Analysis, 25, 51-57.

Michael, J. (1996). In memoriam: Fred S. Keller (1899-1996): Introduction. The Behavior Analyst, 19, 3-5.

Potts, L., Eshleman, J. W., & Cooper, J. O. (1993). Ogden R. Lindsley and the historical development of precision teaching. The Behavior Analyst, 16, 177-189.

Skinner, B. F. (1945). The operational analysis of psychological events. Psychological Review, 52, 270-277; 291-294.

Skinner, B. F. (1948). Walden two. New York: The Macmillan Company.

Skinner, B. F. (1953). Science and human behavior. New York: The Free Press.

Skinner, B. F. (1971). Beyond freedom and dignity. New York: Vintage Books.

Skinner, B. F. (1974). About behaviorism. New York: Alfred Knopf.

Skinner, B. F. (1982). The science of learning and the art of teaching. In R. Epstein (Ed.), Skinner for the classroom: Selected papers (pp. 207-222). Champaign, IL: Research Press. (Original work published 1954)

Skinner, B. F. (1991). The behavior of organisms: An experimental analysis.
Cambridge, MA: B. F. Skinner Foundation. (Original work published 1938)

Skinner, B. F. (1992a). Verbal behavior. Cambridge, MA: B. F. Skinner Foundation. (Original work published 1957)

Skinner, B. F. (1992b). The shame of American education. In R. P. West & L. A.
Hamerlynck (Eds.) Designs for excellence in education: The legacy of B. F. Skinner (pp. 15-30). Longmont, CO: Sopris West, Inc. (Original work published 1984)

Todd, J. T., & Morris, E. K. (1992). Case histories in the great power of misrepresentation. American Psychologist, 47, 1441-1453.

Vargas, E. A., & Vargas, J. S. (1992). Programmed instruction and teaching machines. In R. P. West & L. A. Hamerlynck (Eds.), Designs for excellence in education: The legacy of B. F. Skinner (pp. 33-69). Longmont, CO: Sopris West, Inc.

Watkins, C. L. (1988). Project Follow-Through: A story of the identification and neglect of effective instruction. Youth Policy, 10, 7-11.

Watkins, C. L. (1997). Project Follow Through: A case study of contingencies influencing instructional practices of the educational establishment. Cambridge, MA: Cambridge Center for Behavioral Studies.