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2004 FRED S. KELLER BEHAVIORAL EDUCATION AWARD

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LEARNING, TEACHING AND AN EVOLUTIONARY IMPERATIVE

When we learn something and then teach it to someone else, we potentially contribute to a collective repertoire that continues beyond us. If that collective repertoire adapts over time to our changing environment, it can improve our likelihood of survival. We know that selection by consequences can account for individual learning, cultural evolution, and biological evolution. It seems clear in the 21st century that our culture is evolving faster than our biology is. So passing on what we know is critical for survival, because growing evidence suggests that if we *don't* evolve culturally—in our socio-political, scientific, environmental and other types of collective behavior—it's possible that we won't survive this century.

Our science of behavior recognizes these things, and application of the science could make the difference between our survival and extinction. This understanding can create a higher purpose for us—integrating our personal and professional lives. For each of us, passing on what we've learned is *very* important. It comes down to each of us serving as both students and teachers. We have both the privilege and the obligation to learn as much as we can and to pass it on in order to make a difference.

I've had many great teachers. I attended Catholic elementary schools where the Dominican nuns devoted their lives to education and enabled me to learn and to love learning. In high school and college, I learned from Jesuits who taught critical thinking, communication, and analysis. By the time I was a junior in college, I'd decided to major in philosophy because I saw it as a vehicle for learning and teaching people how to think—a high calling.

Seattle University was relatively small, affording many hours with professors. During that time I read *Walden Two*

for a philosophy class, and I reacted with all the usual clichés, concluding that Skinner was advocating totalitarian mind control and so on. I don't recall the details, but my favorite history professor's wife, a doctoral student in behavior therapy at the University of Washington with Robert Kohlenberg, said something that led me to re-read the book. After a second reading, the light went on, and I became a passionate enthusiast. I understood simply that if we take a natural science approach to our own behavior, we can improve education, management, therapy, how we treat the environment, and potentially all of human culture. I realized that a natural science of behavior offers a means of *consciously* participating in our own evolution, potentially creating great leaps ahead by discovering principles and applications, and then *passing them on*.

This led me to write Dr. Skinner a letter of thanks, asking his advice. It was amazing to me that he wrote back within weeks. (I later was inspired by learning that he routinely reinforced curiosity by responding to those who expressed inter-

est.) Because I'd been accepted into a philosophy doctoral program at the University of Notre Dame, he suggested I go ahead but keep in touch with him. In my first semester I realized that I did *not* want to be a professional philosopher. The following summer I traveled to Harvard, took a chance and walked into Skinner's office. He astounded me by recalling our correspondence and graciously gave me over an hour of his time. He introduced me to Dick Herrnstein, who was also generous with his time, then to S.S. Stevens, the distinguished curmudgeon who still wielded ultimate power in that department. To make a long story short, I entered the Harvard Psychology doctoral program in September. To me it was a miracle, but it also said something about passionately pursuing one's interests, something I try to convey to students.

Skinner officially retired soon after I arrived, but he generously allowed me to study independently with him for the next 2 years. With most of my course work complete, I decided I wanted to work with humans rather than pigeons. Skinner called Dr. Joe Cautela at Boston College, then President of AABT. A "career-counseling" meeting with Joe led to Bea Barrett's lab; after meeting with her for several hours, she offered me a job.

I spent a decade at Bea's lab. She introduced me to senior colleagues including Og Lindsley, Hal Weiner, Jay Birnbrauer, Diane and Bill Bricker, Eric and Elizabeth Haughton, Owen White, and many others who became my teachers in various ways. I directed research in Bea's lab and classroom, consulted in schools, trained teachers in Master's Programs, published a newsletter, and participated in many projects with Bea. She was a great mentor because she encouraged me to follow my interests and, especially, my data.

I teamed with Bea to influence others,

a notable example being Kent Johnson who, as a fresh Ph.D., was unaware of precision teaching or and fluency-based instruction. Kent sought out Bea, and for 2 years we met weekly in Bea's office with Kent and others to share data, teach and learn. The ideas and data we shared enormously influenced all of our later contributions

I don't mean to bore you with my personal story, but what I learned from all these very busy yet generous people is that we *must* make ourselves available to pass on what we know, to share our data, to both learn from and teach one another. This is not just a *professional* obligation. *It is about our evolution and survival as a species*

Even Lindsley's design of the Standard Celeration Chart taught me and others about sharing and "giving credit." Lines at the bottom of the chart prompt us to record the names of the learner, the manager or teacher, the supervisor, any advisor, and others involved with collecting the data—recognizing all contributors. In Bea's lab we hosted monthly chart-sharing sessions which became part of our Precision Teaching culture. The practice of identifying "chart parents"—those who taught us to measure behavior frequencies and use the Standard Celeration chart—strengthened our habits of giving credit and sharing.

Without a doubt, we all engage in "passing it on," and I don't mean to claim anything special about myself. But if we put this process of sharing, learning and teaching into the larger context of evolution, we can see that it's not just a courteous practice. In our science, which holds the promise of accelerating our evolution as a species, I believe that it's an *evolutionary imperative* to pass on what we learn.

Let me mention one more recent example of how passing it on can have great and unexpected results. Several years ago I gave a talk at California ABA about behavioral fluency. A week later I received an email from a Master's student at the University of Nevada, Christine Kim, saying that she wanted to learn more about Precision Teaching and fluency. I suggested she contact Elizabeth Haughton, whose Precision Teaching center in Napa, California, I'd helped start and with whom I'd been col-

laborating for years. Christine contacted Elizabeth and, with fellow grad student Brian Gaunt, spent the summer learning about Precision Teaching and the tutoring business at Elizabeth's center. They returned to Reno and started a university-affiliated tutoring service which evolved over several years—even after Christine, Brian and Jim had left Reno—into the Center for Advanced Learning, now one of the most productive precision teaching research and training centers in the country. Little did I know that taking a few minutes to respond to Christine's email would have such an amazing result!

Last summer, my wife and business partner, Cynthia Riha, attended the Seattle Summer Institute at Kent Johnson's Morningside Academy, where she also met Kimberly Berens, now President of the Center for Advanced Learning in Reno. Adding Morningside's methodologies to the Precision Teaching tools she learned from me and Elizabeth Haughton, Cynthia is now home schooling our two sons. What comes around goes around — and one can never tell how or when. *We've got to pass it on.*

Let me turn briefly to the topic of behavioral fluency, to which I've devoted my career since the late 70s when I saw that by measuring and making instructional decisions using Skinner's rate measure rather than percentage correct we could achieve unprecedented improvements in teaching effectiveness because we can *see* differences and opportunities for improvement that we do not see when we ignore the time dimension of behavior. Skinner once said (Evans, 1968) that his most important contributions were rate of response and the cumulative response recorder. In the history of science it has most often been advances in *measurement* that have led to quantum leaps in scientific understanding. I believe the same is true in the scientific revolution that Skinner began. It was the power and sensitivity of rate, or behavior frequency that Skinner, Lindsley, Barrett, and Eric Haughton passed on to me. Vargas (1977) put it most simply when she

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Author's Note

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wrote: "Teaching is not only producing new behavior, it is also changing the likelihood that a student will respond in a certain way. Since we cannot see likelihood, we look instead at how frequently a student does something. We see how fast he can add. The student who does problems correctly at a higher rate is said to know addition facts **better** than one who does them at a lower rate" (p. 62).

Using response rate to measure behavior in instructional situations leads to different and better decisions than using percentage correct. This is completely separate from whatever methods or procedures we might use to increase those response rates, a point which I recently emphasized in an *In Response* commentary in *The Behavior Analyst* (Binder, 2004).

Perhaps the most telling data set, one that I and others have shared hundreds of times since we gathered them in Barrett's lab (Barrett, 1979; Binder, 2003), shows ranges of correct responses per minute on simple pre-academic component tasks that we were teaching adolescents then labeled "mentally retarded." We were also working with young elementary school students and a group of professional adults. In 11 of the 16 skills, all of the professional adults completed more correct per minute than all of the regular children and all of our handicapped students. These data reflect what you'd notice if you spent a few minutes with these people. *But if we only use percentage correct, as in most classrooms and training programs, we'd think these three groups performed exactly the same, because they were all 100% correct!*

We have to let this sink in. In my view, our educational and training programs fail to produce competence in large part because the measurement systems they use cannot discriminate between competence and incompetence. All of us have been trapped in the percentage correct box since childhood, unconsciously thinking that 100% is the best we can do. Rate of response shows us an entirely different picture that allows us to make better decisions. When we measure response rates in the

classroom, we can see that our discrete trials procedures often *prevent* students from performing at competent rates. Competent adults and children read at 150 to 250 words per minute, for example. Discrete trials occur at perhaps 12 per minute. If we only measure accuracy, we can't see the handicap that our procedures impose and we won't know to change the procedures to liberate students' behavior. When we provide so-called overlearning trials beyond the point of 100% accuracy with procedures that constrain response rates, and then remove the procedural constraints to allow free responding, the rates often increase *without any additional intervention*. The behavior rises to its natural frequency, freed from environmental constraints, now accessible to procedures designed to produce competent levels of performance.

If as scientist-practitioners we do *not* use the quantum leap in behavior measurement that Skinner passed on to us, we are in danger of failing to exploit the evolutionary advantage he left behind. Exploring and developing the implications of this contribution has been and will continue to be the focus of my professional career. And in the context of my earlier remarks, I personally believe that it is our evolutionary imperative to use rate of response when measuring human learning and teaching.

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BEHAVIORISM DIED TODAY, AGAIN!

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One of the reasons to participate in APA and to support the activities of Division 25 is that it permits contact with others who would not necessarily consider an organization such as ABA to be their primary home. One of my objectives during the next 3 years is to better publicize the activities and accomplishments of individuals who do interesting and important things in behavior analysis to the broader psychological community.

One such opportunity recently arose when I attended the APA Division Leadership Conference in January. As often happens in such settings, I was engaging in small talk with individuals from other divisions when one of them asked me what Division I was from. When I answered "Division 25, the Division for Behavior Analysis", his response was something like "Oh, so you are one of the last remnants". I am sure you have had similar experiences before, as have I. My response is typically that Behaviorism and Behavior Analysis is doing very well and to provide a brief description of the interesting things that we do. Usually, individuals listen politely and often respond that they were not aware of this work. But on this occasion, the individual happened to be the Editor of the Division 1 (General Psychology) newsletter, *The General Psychologist* and he asked if I would be willing to write a column along the lines of what my response was as he thought it would be interesting to the more than 2,000 members of Division 1. I indicated that I would. He asked that it be something that would be appropriate for members to read over morning coffee. He encouraged me to share the newsletter with members of Division 25.

Please see my column in *The General Psychologist* (pp 7-8) at:

<http://www.apa.org/divisions/div1/news/Spring2005/Spring05TGP.pdf> **BA**