

Skinner's Impact on Education

by

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B. F. Skinner received his Bachelor's degree in English in 1926 from Hamilton, and his Ph.D. in Experimental Psychology from Harvard in 1931. Even though completely researched and in final form, his dissertation was not accepted by the Psychology Department for over a year because of a hot debate over the appropriateness of its topic. Was it really Psychology, or should it instead be offered to the Biology Department?

During his early teaching career he was an Instructor from 1936 to 1937, an Assistant Professor from 1937 to 1939, and an Associate Professor from 1939 to 1945 at the University of Minnesota. While in Minneapolis he noticed the pigeons flying around the many elevators of the grain companies and decided they would be ideal to guide missiles and provide his contribution to the World War II effort. Fred along with two of his graduate students, Marion and Keller Breland, taught the pigeons to effectively guide missiles while strapped in a nose cone and pecking with their gold foil beaks on a glass image of a targeted enemy destroyer or U boat. This successful research was classified until the sixties under the code name "Pigeon in a Pelican."

The shaping methods developed to train the pigeons were successfully used in commercial animal training by the Brelands in Animal Behavior Enterprises of Arkansas. These methods are now used by Sea World and Marine Land to train their dolphins and whales, but credit is seldom given to Skinner for this remarkable teaching.

He was department chair briefly at Indiana University from 1945 to 1948. In 1948, Skinner accepted the Edgar Pierce Professorship in Psychology at Harvard and became Professor Emeritus in 1974.

In 1938, Skinner published the *Behavior of Organisms*, which many consider his classic.

In 1948, *Walden II* was published and stirred up a controversy over utopian ideals. Several experimental communities, which are still in vibrant existence, were founded on its principles.

I first met B.F. Skinner in 1951 when I was a

graduate student in Physiological Psychology at Harvard. He asked me to assist in teaching Natural Sciences 114, mentioning that he was being undermined by teaching assistants who were telling the undergraduates, "I don't believe this behaviorism either, but just answer Skinner's questions with what a behaviorist will reinforce you for writing." Since I had a prior Master's degree from Brown and had studied with Walter Hunter, Carl Pfaffman, and Gregory Kimble, Skinner said I ought to be at least a behaviorist!

For a Natural Sciences 114 class demonstration, in only a few days I trained Samson Rat to lift 250% of his own body weight. (This greatly impressed me, with my New England farm background.) Through Skinner I had gained more control over a whole free-running rat than I ever had over a cathode ray oscilloscope and one small rat nerve (the chorda tympani). I never went back to my electrodes, and have been an operant conditioner ever since. As Fred has often said, "the rats make operant conditioners, I don't."

In 1953, *Science and Human Behavior* was published. We had been teaching from a mimeographed form of the book for several years. Only 10 out of 450 pages (2%) were dedicated to education. In the index education was referenced at five places, and teaching was not even indexed.

In 1953, Deborah Skinner, the youngest of Fred and Eve's two daughters, was doing poorly in math at Shady Hill School in Cambridge. In characteristic fashion Fred rolled up his sleeves, went into the laboratory and built something that would really teach math. In 1954, "The Science of Learning and the Art of Teaching" was published in the *Harvard Educational Review*, picturing and describing two of the first teaching machines. In 1958, "Teaching Machines" was published in *Science*, picturing and describing the use of more advanced machines and giving examples of frames of programmed materials in elementary spelling and in high school physics. Here Skinner credited the earlier work of Sidney L. Pressey in the twenties and pictured a Pressey machine.

Among the many that helped in the Harvard

Robinson, James Holland, Charles Ferster, Susan Meyer Markle, Lloyd Homme, Wells Hively, Nathan Azrin, Matthew Israel and Douglas Porter. Others not at Harvard but equally active in the early days were Donald Bullock, Donald Cook, Francis Mechner, and Thomas Gilbert.

By 1962, teaching machines and Programmed Instruction were readily adopted by industry and the military. Surprisingly to us at the time, programmed instruction was successfully resisted by public primary, secondary and higher education. The first meeting of the National Society for Programmed Instruction met in San Antonio, the home of very large military training agencies.

In 1968, several earlier papers were reprinted and brought together in *The Technology of Teaching* which was fittingly dedicated to Skinner's most memorable teacher, Miss Mary I. Graves (1863-1922). In this book Skinner described the three major traditional theories of how we learn: "We learn by Doing," "We learn from Experience," and "We learn by Trial and Error." He pointed out that these are really incomplete descriptions of the three essential parts of any set of contingencies of reinforcement--the response, the occasion, and the consequences.

In 1969, Fred and Eve's older daughter, Julie, received her doctorate in Educational Psychology from the University of Pittsburg.

In 1974, the National Society for Programmed Instruction changed its name to the National Society for Performance and Instruction to represent its broadened interest in changing behavior by environmental engineering in addition to formal instruction, and to keep its initials (NSPI) intact. In 1987, the National Society for Performance and Instruction, now over 5000 members strong with 50% from industry and utilities, 25% consultants, 15% academic and 10% in government, the military, or medicine, had its 25th annual meeting in San Antonio. Note: there are very few public school or higher education professional educators in this association. Most public professional educators are either in the American Educational Research Association, serving rigid statistical research designs, or in the American Society for Curriculum Development, serving Bloom's taxonomy, cognitive theorists, and/or Piaget and A. S. Neil.

In 1977, the federally funded Project Follow Through reported its testing of 22 different

educational models. The two models producing the most educational gain were Direct Instruction and Behavior Analysis. The cognitive and cognitive-affective models were found to produce even less gain than the regular public school control groups. In 1988, Cathy L. Watkins reported on Project Follow Through, "The educational establishment's vested interests have effectively prevented the largest experiment in history on instructional methods (costing almost one billion dollars) from having the impact on daily classroom practice that its results clearly warranted."

Professor Skinner's work has generated six major scientific journals:

- *The Journal of the Experimental Analysis of Behavior.*
- *The Journal of Applied Behavior Analysis.*
- *The Behavior Analyst.*
- *Performance & Instruction.*
- *Performance Improvement Quarterly.*
- *The Journal of Precision Teaching.*

Professor Skinner's work has generated three major professional organizations:

- The National Society for Performance and Instruction in 1962, now at 5000 members,
- The Division for the Experimental Analysis of Behavior of the APA in 1965, now at 1300 members,
- The Association for Behavior Analysis in 1977, now at 2000 members.

Professor Skinner's work has influenced four behavioral instructional methods that, although not universally adopted in public instruction, have proven to be the most productive yet evaluated. When combined they are even more powerful: too powerful for schools with institutionalized scope and sequence requirements, and too powerful for schools with learning allotments for each child for each year. These four overly productive instructional methods are:

- Programmed Instruction.
- Behavior Analysis.
- Direct Instruction.
- Precision Teaching.

I have long remembered and often quoted one of Fred's maxims. "When you ask for the salt correctly in French in French class you get an 'A'. When you ask for the salt correctly in French in France, you get the salt!"

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