Humanism in Teaching Science

In Skinner's recent article (16 Feb., p. 704), a rather subtle transformation of his views seems to have taken place: a shift from a contemporary "behaviorism" (reinforcement or operant behavior theory) to something somewhat less mechanistic or reductionistic. The author of *Walden Two,* consciously or unconsciously appears to be moving away from his earlier behavioristic image of man. It is of course quite true that, at first glance, his article "Teaching science in high school" uses the language of "positive or negative reinforcement." However, consider his following remarks in that article: he subscribes to "creative insight" (which he hopes to define); he objects strongly to "contrived reinforcers"; and he advocates that the teacher should "never admire a student except when he is behaving admirably. Contrived admiration is self-defeating"; and again, "a teacher must move to more subtle contingencies and eventually to those inherent in the everyday physical and social environment of the student." And finally, against mere novelty or "innovation" in teaching methods, Skinner argues that "We need a much more positive attitude. The efficiency of current methods is deplorably low."

While it is perhaps conceivable to Skinner and others that we could redefine some of the above key terms and ideas in the behavioristic language of strict reinforcement theory, it is at least more obvious that the richness of our everyday ordinary language of human value and concepts has quietly crept into Skinner's view of science teaching in classrooms. How does one define "contrived admiration" and the converse notion of "genuine admiration" except by some appeal to the total human situation including the "mentalistic states" that Skinner deplores? And here it is noteworthy that Skinner recognizes the value of "nonverbal day-to-day behavior" of the laboratory research scientist; that is, the more subtle and inarticulate factors that seem to go into scientific discoveries. Again, Skinner talks about a student "inferring an understanding of the structure of science." (Where, in reinforcement theory, is there any place for such an inference?)

It is true that we might *measure* "genuine admiration" by the amount of reinforcement it provides in the student's learning of science. But unless we are merely very strict and narrow operationalists, this "measure" is hardly a real *definition* of "genuine admiration." Commitments to human *feelings* of "genuineness" (even though these feelings may be more or less verifiable or testable by reinforcement measures) seem to be logically necessary as basic premises for "good teaching." Skinner and B. Blanshard have recently argued on these fundamental points in *Philosophy and Phenomenological Research* (March 1967, p. 317), and Skinner has certainly *attempted* such definitions in *The American Psychologist* [**18**, 503 (1963)].

It is of course quite possible that Skinner has used the above humanistic terms out of consideration for the more general background of his reading audience in *Science,* and might have used (or tried to use) only the technical jargon of reinforcement theory in some psychology journal. But the general import of his remarks, plus the larger question of reduction of humanistic terms to mechanistic or operant language, suggest that Skinner may be about ready to recognize (at least *de facto*) the really basic problem: the totally human situation within which even the teaching of science must take place—where mechanical reinforcement techniques, if used, are to be used in classrooms under the careful and discerning control of teachers having a strong sensitivity to the need for *value judgments* as to the genuineness of encouragement ("reinforcement") of students who are behaving admirably in learning situations. "The improvement of teaching calls for the most powerful methods which science can offer," concludes Skinner. Indeed! But perhaps "the most powerful methods" of science have their deepest roots in the wisdom of our lives!

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As Berenda and Oldroyd surmise, I used a few humanistic terms to simplify matters for a nontechnical audience. They will find terms like "creative insight" and "genuine admiration" more fully discussed in my book *The Technology of Teaching* (Appleton-Century-Crofts, New York, 1968). The shift in my position has not been in the direction Berenda and Oldroyd indicate.

The experimental analysis of behavior has developed to a point at which it can be applied more and more successfully to the "totally human situation." This is not reductionism, however, but a restatement in a different dimensional system. The facts survive in all their richness and human relevance.

I must continue to disagree with Berenda and Oldroyd as to the sources of the most powerful methods of science. In the field of behavior, as in physics or biology, we vastly overrate the "wisdom of our lives."

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Skinner states that the aim of science teaching is to get the student to "behave like a scientist." As I have argued elsewhere (*1*) high school is not the place for purely preprofessional training. A high school course must offer the general student as much as it does the math- or science-oriented student—not in the sense of entertainment à la Mr. Wizard—but in preparation for citizenship in a society largely oriented around science and technology. I question the value of having every high school graduate think like a scientist, although it would do much to dispel the antiscientific attitude in our culture if he could understand *how* a scientist thinks. This is not to say I favor "kitchen physics" and other concessions to student interest for its own sake.

I feel I speak for many high school teachers when I say there is a xenophobia in young people (although they have no monopoly on this trait). They as much as say "O.K., I'm here. Teach me. Motivate me. Make me like the stuff—I dare you." In the face of this, there is just so much intellectual midwifery and vaudeville the most creative teacher is willing to do before he throws up his hands and allows the material to stand for itself. This is extinction behavior on the part of the teacher.

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References

1. P. Thompson, *Physics Teacher* **5**, 133 (March 1967).