More on Zoellnerism, The Question of Self-Teaching

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In one of the many responses to Robert Zoellner's remarkable article "Talk-Write: A Behavioral Pedagogy for Composition," Randolph Nesse points out that Zoellner failed to deal with the problem of abstract standards. Zoellner's adaptation of operant methods could enable a student to approach the standards of the teacher but provides no account of how a student might approach his own norms of scribal excellence. Nesse argues that students can make progress toward their own standards and suggests that self-reinforcement, as opposed to reinforcement by others, may provide an explanation. These two possibilities are of interest to me because, with C.K. Peek,[1] I have been involved in a small research project on the problem of self-reinforcement and self-teaching and the as yet unpublished results of our work seem relevant to a discussion of Zoellner's paper and Nesse's response.

The model upon which Zoellner has based his "talk-write" method is, in his own term, rodential. Rather than adopting the extrapolation from the experimental analysis of animal behavior which Skinner described in Verbal Behavior, Zoellner has produced his own extrapolations, leading to talk-write. Since the notion of self-reinforcement is itself an extrapolation from more basic theory, some comments upon the base model appear needed. In the more or less standard operant conditioning procedure for an animal such as the rat, several distinct steps are required. The first step is usually to deprive the rat of food according to a schedule that reduces the animal's body weight to about 80-85% normal. While this is being done over a period of several days, the animal is gentled by handling and is habituated to the operant conditioning box in which it will be trained. When the rat is ready to be trained, it is placed in the apparatus, which is typically an enclosure about one foot cubed that includes a small lever, a food tray, and one or more lights that can be used to develop discriminations later in training. The animal is observed through a window in the box, and the entire apparatus is usually enclosed in a sound

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resistant shell to control extraneous stimuli. The first step in training is to teach the rat to approach the food tray whenever the food magazine is operated to deliver a pellet. On first finding food in the tray, the rat makes frequent trips to the tray interrupted by much exploration of the box. When the food magazine first sounds, delivering a pellet in response to the experimenter's pressing a button, the rat may startle slightly, but has no tendency to approach the food tray. He is trained to do so by being given a series of 20 or more food pellets from the magazine spaced at intervals of one or two minutes. By the end of such a series, the rat has learned to associate the sound of the food magazine with the delivery of a food pellet and he comes to the food tray much as a dog learns to come when he sees or hears dinner being placed in his bowl. During the next stage of training, the rat is taught to press the lever. One method is simply to connect the lever, which serves as a switch, to the food magazine and wait until the rat emits a lever press response in the course of exploring the box. Since he has learned to go immediately to the food tray when the magazine sounds, food delivery and actual receipt of the food by the rat occur almost immediately after a lever press. Within a few minutes, typically, the rat is pressing the lever at a rate of some 10 or 12 responses a minute. He is then said to be conditioned.

This lengthy account was necessary in order to make clear a number of distinctions between the rodential model Zoellner employs and the model we shall introduce. In the narrative above, the rat emitted the first lever response without prompting. He was immediately reinforced by the sound of the food magazine, which had been made a conditioned reinforcer. That sound served to bridge the gap between the response and the actual arrival of food, which was the primary reinforcer. In Zoellner's talk-write procedure, sentences, uttered or written by students in the classroom, are the emitted operants (of a much more complex sort than lever presses, it goes without saying) and the instructor's praise is the reinforcement, conditioned or primary. In either case, if the behavior is truly operant, then omission of reinforcement will lead to a gradual weakening of the operant behavior and experimental extinction.

In contrast, the self-teaching model we shall develop requires the subject to learn a set of materials without at once performing them, and to then teach himself to perform, using an internal representation of the material as a basis for that performance and for the correction of errors which may be made. No external reinforcement is supplied at any point in this process. Whether or not self-reinforcement is involved is the question to which we turn next.

Operant conditioning of rat behavior is undisputed and there is much evidence, some of it cited by Zoellner, for operant conditioning in man. Self-reinforcement would appear a natural extension of the technique. However, Skinner, in Science and Human Behavior, approached the topic cautiously.

> The place of operant reinforcement in self control is not clear. In one sense, all reinforcements are self-administered since a response may be regarded as "producing" its reinforcement, but "reinforcing one's own behavior" is more than this. It is also more than simply generating circumstances under which a given type of behavior is characteristically reinforced--for example, by associating with friends who reinforce only "good" behavior.
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> Self-reinforcement of operant behavior presupposes that the individual has it in his power to obtain reinforcement but does not do so until a particular response has been emitted. This might be the case if a man denied himself all social contacts until he had finished a particular job. Something of this sort unquestionably happens, but is it operant reinforcement?
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> (Pp.237-238)

Two considerations suggest that Skinner's doubts were well founded. One is simply that if self-reinforcement were a strong variable in human behavior, if a man could train himself by withholding reinforcement until he had met his own standards of perseverance or skill, or if he could shape his own behavior as powerfully as one shapes the behavior of rats or pigeons or other people, then that fact would in all likelihood have been handed down to us by the ancient Greeks along with other principles such as hypnosis and association by contiguity. A second consideration comes from research conducted by Kanfer and Marston in a series of studies of self-reinforcement. (F.H. Kanfer and A.R. Marston, "Determinants of Self-reinforcement in Human Learning," Journal of Experimental Psychology, 1963, 66, 245-254; R. Marston, "Response Strength and Self-Reinforcement," Ibid., 1964, 68, 6, 537-540; A.R. Marston and F.H. Kanfer, "Human Reinforcement: Experimenter and Subject Controlled," Ibid., 1963, 66, 91-94.)

Their work appears at this point to show that while adult human subjects readily learn to deliver a stimulus to themselves that has been designated as a reinforcer and to do so only when they think they have responded correctly, such self-reinforcement has not resulted in much improvement in the performances on which it was made contingent. One difference between the situation Skinner has described and the situations employed by Kanfer and Marston is that Skinner's example concerned the

quantity of a particular behavior rather than the details of that behavior. The distinction is the difference between the quantity of sentences one utters in an hour and the content and grammaticality of those utterances. Thus the question of whether self-reinforcement actually works at all is not yet resolved within psychology.

Self-teaching, however, seems entirely possible. Anyone who has learned to write or print can presumably teach himself to typewrite. We teach ourselves to hum tunes "by ear," and a host of other similar activities. During the past year, C.K. Peek and I investigated some of the variables that affect "playing by ear" in the laboratory. The procedure required our subjects, college students, to listen to a series of seven musical notes played over several times on a tape recorder, and to then attempt to play the series on an electric practice organ. While a subject was teaching himself to play a series he was given no information about the correctness of his play but did, of course, hear the notes he struck. While our data have not been completely analysed, we can say at this point that our subjects' ability to learn a given "string" of seven notes, all played on the white keys between middle C and C above, depends upon their pitch sensitivity as determined in a pretest, the number of times they were allowed to hear the string before attempting to learn to play it, their musical training, and the difficulty of the string itself. While some strings were never, in the time allowed, played correctly by some subjects and others were played correctly the first try, many of the strings were learned by trial and error. The subjects made mistakes and corrected them. When a subject thought he had played a string correctly he often told us so, and usually he was right.

We think that we are now in a position to specify which strings will be learned most readily and by whom and without reference to reinforcement at all. In our study no mention of reinforcement was included in our instructions, and we delivered none. To explain successful learning in this situation by self-reinforcement would require also explanation of why self-reinforcement failed for some subjects and worked for others. The explanation for the behaviors we observed appears to lie in the relations between the task and the other variables listed above, including pitch sensitivity, previous keyboard training, number of exposures, and string difficulty.

A direct application of the model provided by our experiment to the teaching of English composition might be interesting, and something very much like it has undoubtedly been tried at times. It would seem to require the novice writer to memorize passages of good prose to the point that he could write them "from memory," correcting his own errors by comparing his written product with his stored representation of the

material. Such a method would clearly require attention to detail and one might guess that students required to memorize many passages would become adept at second-guessing their models with respect to word choices, punctuation, and other matters when they begin to work on original compositions in a mode similar to the memorized models. That something of this sort occurs in the normal course of learning to write seems very likely.

Reinforcement, in Zoellner's sense, and in Skinner's, seems to reenter the scene once a piece has been played or written. Some of our subjects wanted to continue to play some of the strings after they had learned them. The experimenters found themselves humming some strings, too. Skinner suggests, in Verbal Behavior, that the composer composes what he likes to hear and the writer writes what he enjoys reading. Our argument here is that a distinction must be made between being reinforced by one's own writing and learning to write well. Zoellner's remarkably astute application of operant principles to the classroom teaching of composition does not contradict the view that self-teaching also occurs. At the same time, the suggestion that self-teaching occurs through the operation of some mechanism of self-reinforcement presents the danger of lulling us all into a false sense of understanding in an area that can benefit from continued research and discussion.

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