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THE ROLE OF PROCTORING IN PERSONALIZED INSTRUCTION[1]

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The effect of amount of student-proctor interaction was investigated within the framework of Keller's (1968) method of personalized instruction. College students enrolled in introductory psychology were randomly assigned to five groups: 0%, 25%, 50%, 75%, and 100%, reflecting the percentage of units on which each student was proctored. The results indicated that (a) the proctored students were superior to the nonproctored students as measured by final examination performance, (b) for the proctored groups, the amount of proctoring did not differentially affect final examination performance, and (c) the major effect of increased proctoring was an acceleration of the rate of progress through the course.

The variables emphasized in traditional teaching methods have recently been subjected to critical scrutiny. Both in the laboratory and the classroom, behavior change can be effectively evaluated and controlled only after some objective behavior has been selected and reliably measured. Such objective or active responding is not emphasized in the lecture system in which the student is treated as a passive recipient of information (Corey and McMichael, 1970). More importantly, events or procedures capable of producing those changes in behavior that are the concern of any teaching method have seldom been detailed in terms of their schedule of presentation; nor have investigators described the effects of these procedures on the behavior of the individual student, behavior from which academic achievement is then inferred (Skinner, 1968). Personalized instruction (Keller, 1966), however, focuses upon the specific objective behaviors of the individual student. These behaviors are differentiated and maintained by presentation schedules of classroom events (such as a passing test grade) that function as reinforcers. Recent investigations of personalized instruction have shown this procedure to be more effective than the traditional lecture system in the following ways: (a) students earned higher grades in personalized instruction courses than in lecture courses (Keller, 1966, 1968); (b) final exam performance was better after personalized instruction courses than after lecture courses (McMichael and Corey, 1969); (c) in a retest one full semester after completion of the course, superior performance was maintained among students who had received personalized instruction (Corey, McMichael, and Tremont, *unpublished*).

The use of proctors is essential to the success of personalized instruction. The indispensable functions of proctors have been described in detail by Keller (1968). The most important tasks of proctors include: (1) the careful scheduling

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of reinforcing events, which, to be effective, must immediately follow the desired variant of a student's behavior; (2) increasing the chances that the desired variants will appear in the individual student's repertoire of behavior. Basically, this is done by explaining the course material and detailing the cues on which correct differential responses depend.

The present investigation attempted to ascertain the relative effectiveness of various proportions of proctored instruction.

METHOD

Subjects

The experimental subjects were 124 undergraduate students in two sections of Introductory Psychology at Queens College of the City University of New York. No knowledge of the procedure to be used was available to these students before the first course meeting. During the course of the term, seven students dropped the course. Three were from the 0% group, one from the 50% group and three from the 100% group. The data of these students were not included in the analyses.

Procedure

The course material, which was taken from *Principles of psychology* by F. S. Keller and W. N. Schoenfeld (1950), and *Analysis of behavior* by J. G. Holland and B. F. Skinner (1961), was divided into 20 units of approximately 20 pages each. Each unit consisted of a reading assignment, study guide, and test. A unit was passed only when a student had achieved a perfect score on the test associated with that unit; he was then allowed to proceed to the next unit. Each student was required to take as many alternate forms of each test as was necessary to achieve a perfect score. Students were permitted to take only one test per class session, each test being graded during that class session. Proctors were students from previous semesters who had demonstrated mastery of the course material. The experimental subjects were randomly assigned to each of the five proctoring conditions: 0% (N = 25), 25% (N = 24), 50% (N = 25), 75% (N = 24), and 100% (N = 19), indicating the percentage of 20 units on which the student was proctored. The tests of the 0% group were never proctored. These students were informed that they had passed or failed a test by the end of the class session in which the test was taken. The correct answers were written in the test booklets, and the booklets were redistributed during the next class session. The other groups were treated exactly like the 0% group, except that a certain percentage of the units (*i.e.*, all tests for those selected units) were graded by a proctor in the student's presence. For the 25, 50, 75, and 100% conditions, all tests taken on 5, 10, 15, and 20 units respectively, were graded in the student's presence.

The final examination consisted of a total of 120 questions, 61 multiple choice and 59 true-false, and was designed to sample equally the material from the 20 units comprising the course without repeating questions already used on unit readiness quizzes.

RESULTS

The Newman-Keuls method (Winer, 1962) for tests of differences between pairs of means revealed that all the proctored groups (25% to 100%) required significantly fewer tests for unit mastery than did the unproctored group (0%). The q values (4112) obtained for the several comparisons were as follows: 0% *versus* 100%, $q = 4.91$, $p < 0.05$; 0% *versus* 75%, $q = 4.43$, $p < 0.05$; 0% *versus* 50%, $q = 4.70$, $p < 0.05$; 0% *versus* 25%, $q = 3.95$, $p < 0.05$. All other comparisons were non-significant. That is, none of the proctored groups differed significantly from one another. Since the frequency of test-taking was fixed at one test per class session, the data in Figure 1 also indicated acceleration in class progress when any amount of proctoring greater than 0% was employed. The final exam performance shown in Figure 1 was also clearly improved by proctoring. Among the proctored

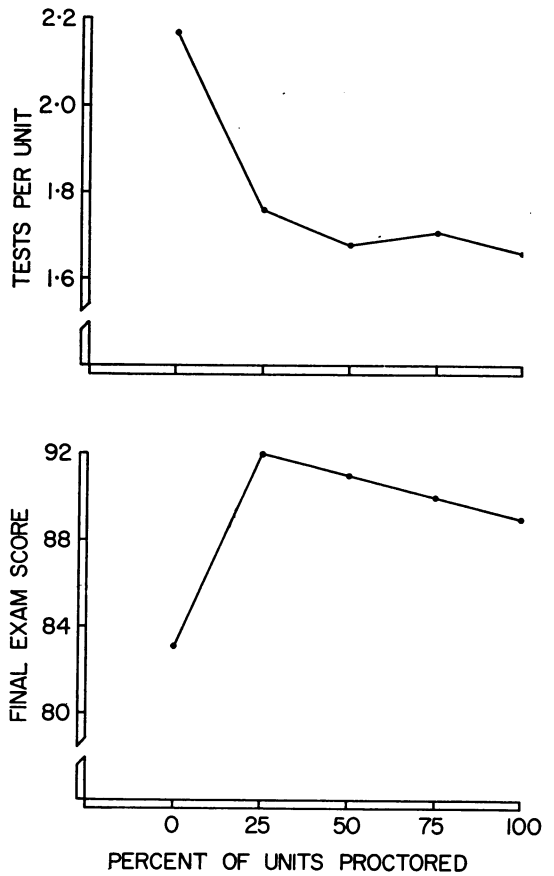

Fig. 1. Tests per unit and final examination score as a function of per cent of units proctored. The points for the tests per unit function were obtained by dividing the total number of tests taken by the total number of units passed for each group. The final exam score function represents the average score for each group, on a test with a possible maximum score of 120.

groups, different proportions of proctoring did not differentially effect exam scores $F(3.88) < 1.00$). The proctored students, however, were significantly superior to the non-proctored students in final exam scores ($p < 0.02$, $F(1115) = 5.73$). The final exam questions were selected from sources other than the unit tests used throughout the course in an effort to prevent any ceiling effect that might have obscured differences among proctored and unproctored groups. In addition, at the beginning of the next semester the same final exam was given to 100 students registered in Introductory Psychology courses before they had received any course material or any course instruction. This "operant-level" determination yielded chance performance on the test (a score of 45) by this uninstructed group. The value of the scores reported in Figure 1 thus represented improvements in test performance resulting from either proctored or unproctored class activities.

DISCUSSION

The clearest conclusion to be drawn from these results is that some proctoring (25% or more of the units taken) is both necessary and sufficient to improve a student's rate of progress. With proctoring, the student achieved a required level of mastery (in the current study, a perfect score on a test for each unit) with less exposure to test materials, and in less time than he would have without proctoring. The greater achievement in a fixed time period, such as a semester, is clearly linked to the use of proctors. However, in cases where less-definitive conditions are ostensibly responsible for progress, slow, and therefore less progress by a student during a fixed time is often interpreted as a chronic deficit in the student's ability or motivation. Since proctoring, as opposed to total lack of proctoring, can be clearly shown to affect rate of student's progress, arguments that attribute lack of progress to incontrovertible deficits on the part of the student may lose plausibility.

While some proctoring is both necessary and sufficient to improve a student's rate of progress in a course, proctoring of all units (100% group) is not necessary for such improvement. Lesser proportions of proctoring allow intermittent scheduling of proctoring without sacrificing the benefits of such assistance. Proctors can thus accelerate the progress of more students in the same amount of time and with no loss in effectiveness.

In addition to being associated with slow rates of progress in the course, the no-proctoring condition was inefficient from a manpower or cost standpoint. The subjects in the no-proctor-

ing condition required an average of 42 tests, whereas subjects in the 50% proctored condition required only 30 tests on the average, 15 of which (assuming the mean number of tests per unit was taken on each proctored unit) were graded in the student's presence. Thus, in this example, when the number of proctored tests was reduced by changing the per cent of proctored units from 50% to 0%, for every test not proctored, an average of one more test had to be given to each student.

Once shown to be feasible, intermittent proctoring may be desirable for reasons other than minimizing the number of personnel to staff a course adequately. The purpose of proctoring is not, nor should it be, to make the student dependent on unique information or service from the proctor. The advantage of proctoring is to provide training that enables the student to maintain and extend his academic achievement even in the absence of proctoring assistance. That proctoring should foster such independence is its most prominent recommendation. With intermittent proctoring comes, first, the means to increase academic progress, and second, a technique that determines the maintenance of progress over those periods when proctoring does not occur. It is, in essence, a self-evaluating system and can be measured directly to substantiate the adequacy and effectiveness of that technique.

Finally, the use of students as proctors under the guidance of professional teachers, clearly extends the efficiency and effectiveness of the teaching staff. This extension, together with intermittent yet efficacious use of proctors, may provide the means to relieve overburdened teachers.

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