INDIVIDUALIZED INSTRUCTION AND CONTINGENCY MANAGEMENT: AN APPLICATION OF LEARNING PRINCIPLES TO THE CLASSROOM SITUATION

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This study describes and evaluates the use of programmed instruction principles in two introductory psychology courses. While Experimental Class I employed most of the features embraced in programmed courses, Experimental Class II was subjected to an additional treatment – a mastery-before-proceeding contingency. A comparison made between the two experimental classes and a control class in terms of final departmental examination scores showed superior performance on the part of the former, although the class subjected to the supplementary contingency did not differ significantly from the other experimental class.

In recent years, an increasing number of researchers have joined the ranks to solve the basic problems plaguing higher education by directly applying concepts and principles of behavior engineering. Aside from establishing reinforcement contingencies which manage disruptive behavior in lower grades, behavior analysts are also probing into the problem of underachievement in higher learning, by developing a technology of teaching (Skinner, 1968) that utilizes principles derived from an experimental analysis of classroom behavior (Keller, 1968; Ferster, 1968; McMichael and Corey, 1969; Malott and Svinicki, 1969; Sheppard and MacDernot, 1970; Bijou, 1970). It has been suggested that when the reinforcement procedures in traditional education, which fail to maintain the studying behavior of many students with deficient histories, are replaced with reinforcements programmed more frequently, students respond well (Malott and Svinicki, 1969). This programming of reinforcements, together with clear specification of short-term terminal skills, perfection at every level, individual rates and maximum individual participation, makes up the basic features of programmed courses. Most of these courses have been patterned, with modifications, after the approach taken by Keller (1968) and adapted by Ferster (1968).

The aim in this area of research is not so much to test theories as to demonstrate functional relationships – changes in individual behavior and environmental events (Skinner, 1966). Hence, the strategy of teaching-oriented applied research should be "a search for ways to engineer an educational environment so that each student can learn specific tasks, and after that goal is attained, to compare achievement with some other school situation" (Bijou, 1970).

This study seeks to incorporate the methods of both Keller and Ferster. Like Keller, we employed certain principles of programmed instruction with a bigger sphere of action: instead of frames in a set, we had units (further divided into topics) more like conventional homework assignments. The "response" was not merely the completion of a prepared statement but the result of many such responses (Keller, 1968). Like Ferster, we also employed discussion and verbalization as a tool in understanding. Basically, our student studied and discussed the assigned text, talked with the instructor or proctors, attended the few lectures that were given during the semester, at his own "leisure". He proceeded at his own rate without having to wait for slow classmates, or needlessly catching up with fast ones. Mastery of covered sections was ensured because the student had to repeat any examination he failed. Lectures were given

not to give information, but to motivate students to study further. Proctors, who gave tests, immediately scored them, and discussed with students, played a significant role in furthering interpersonal relationships in the classroom.

Contingency management as a supplementary treatment to individualized instruction was explored. This study was carried out with the hope that any finding from it, whether for or against individualized instruction and/or contingency management, should have value for our educational system.

METHOD

Subjects

Three classes of introductory psychology students were used, two as experimental and one as control. The first experimental class (N = 35) was subjected to individualized instruction, the second (N = 34) to both individualized instruction and contingency management,[1] that is, the student had to pass each examination (henceforth also called readiness test) before proceeding to the next chapter. He may not take a test designated for a particular chapter if he had not passed the chapter (test) prior to it. The control class, which maintained the lecture method, was composed of 40 students.

Instructors

The experimental classes were handled by one instructor, the control by another. One rationale for the difference in instructors could be that the experimental classes were primarily "handled" by proctors, who were central to the system (see *Procedure);* hence it did not really matter who handled the control class, since the instructor in the experimental classes played such a minor role in terms of lecturing and interacting. A stronger rationale for this difference in instructors was that the instructor for the experimental classes, who was also one of the experimenters, might unwittingly discriminate against the control class, thereby resulting in a self-fulfilling prophecy. The instructor for the control group was informed of the experimental design, and of the comparison ultimately to be made between his class and the experimental classes in terms of performance. He was encouraged to achieve his best with the conventional teaching method, even to the point of competition.

[1]To be precise, the first class (subjected to individualized instruction) was not completely devoid of contingency management, since a satisfactorily evaluated discussion was a pre-requisite to taking a readiness test. However, the second class was subjected to all this plus an extra contingency: that of mastering each chapter, as shown by passing the readiness test, before proceeding to the next one.

Procedure

The control class was conducted in the manner introductory classes had generally been conducted, where the instructor played the central role. The teaching method used for the experimental classes was based on the procedure by Keller (1968, pp. 80–81), with our modifications, summarized in the instructions that were handed out to students at the beginning of the semester. The given instructions were as follows:

This is a course through which you may move, from start to finish, at your own pace. You will not be held back by other students or forced to go ahead until you are ready. At best, you may meet all course requirements in less than one semester; at worst you may not complete the minimum required chapters within that time. How fast you go is up to you.

The work for this course will be divided into 14 units of content, which will correspond roughly to a series of homework assignments. Each unit is a selected chapter and comes in definite numerical order; you must show your mastery of each unit (by passing a readiness test) *before proceeding to the next.*[2]

A good share of your reading for this course may be done in the classroom, at those times when no lectures are taking place. Your classroom, therefore, will often be a study hall.

After you have read each chapter, you will be required to discuss the topics in it with a partner recommended by your proctor. You may take a test for a chapter (unit) only after your proctor has received a satisfactory evaluation of your discussion on that unit from your listener.

The lectures and demonstrations in this course will have a different relation to the rest of your work from what is usually the rule. They will be provided only after you have demonstrated your readiness to appreciate them; and you need not attend them if you do not wish to. When a certain percentage of the class has reached a certain point in the course, a lecture will be available at a stated time, but it will not be compulsory.

The teaching staff of your course will include proctors and an instructor. The proctor is a psychology major who has been chosen for his mastery of the course content and orientation, for his maturity of judgment, and for his willingness to assist. The proctor will supervise discussions held by members of his group (approximately 8). He will pass upon your readiness tests as satisfactory or unsatisfactory. His judgment will ordinarily be law, but if he is ever in serious doubt, he can appeal to the instructor for a ruling. Failure to pass a test on the first try, the second, the third, or even later, will not be held against you. It is better that you get too much testing than not enough, if your final success in the course is to be assured. The proctor will occasionally clarify some points with you or allow you to defend your answer before he passes judgment.

Your work in the classroom will thus be under the supervision of the proctors who are responsible for various course materials (assignments, study questions, announcements, etc.), and who will keep up to date all progress records for course members. The classroom proctors will confer with the instructor daily and act

[2]The italicized phrase was inserted only for those subjected to this contingency, i.e., Experimental Class II.

in a variety of ways to further the smooth operation of the course machinery.

RESULTS AND DISCUSSION

Performance was based on an objective departmental final examination. Table 1 reveals the highest mean to be held by the first experimental group, the group subjected to individualized instruction without the test-mastery-before-proceeding contingency. The lowest mean was held by the control group.

TABLE 1

MEANS OF EXAMINATION SCORES IN TWO EXPERIMENTAL AND ONE CONTROL CLASSES

Class	Number	Mean
Expt'l I	35	117.6142
Expt'l II	34	113.7941
Control	40	95.9659

An analysis of variance was performed and the results of the analysis are summarized in Table 2. An F ratio of 15.1038 indicated highly significant overall differences within the groups. To determine where the difference actually lay, the two experimental groups were pitted against the control group in an orthogonal comparison (Winer, 1962, pp. 70–75). Table 3 shows that experimental manipulation for the two classes produced a statistically significant effect. This is in line with past researches by Keller (1968) and Ferster (1968) who observed improved study behavior to be consistent with individualized instruction and contingency management.

Finally, a t-test (Dixon and Massey, 1957) was carried out to determine if there was any significant difference between the two experimental groups who were subjected to slightly different treatments. The t-value turned out to be insignificant (t = .3594). The lower score for Experimental Class II, most probably due to normal variation, nevertheless poses the question why this added contingency failed to register

TABLE 2

ANALYSIS OF VARIANCE: PERFORMANCE ON FINAL EXAMINATION BY THREE CLASSES

Source of Variation	SS	df	MS	F
Between treatment	10,738.9837	2	5,369.4918	15.1038*
Error	39,105.4079	110	355.5037	

*$p < .01$

TABLE 3

ANALYSIS OF VARIANCE: ORTHOGONAL COMPARISON TO TEST FOR TREND

Source of Variation	SS	df	MS	F
E_1 and E_2 vs. C	10,465.5450	1	10,645.5450	29,4400*
Error	39,105.4080	110	355.5000	

*$p < .001$

any effect. One possibility could be that the amount of anxiety generated, which appeared to be considerably more in the second class than the first, was to such a degree that it hampers learning. Another explanation that might be offered is that what really "did the trick", or was most important for improved learning, was not contingency management, but individualized instruction. It could also be true that the extra contingency added to Experimental Class II was unnecessary and hence negligible in effect, considering that the contingency of a satisfactorily evaluated discussion was already imposed. By itself the contingency of mastering previous examinations before proceeding might otherwise show extreme importance.

The altered classroom behavior of the experimental class was something interesting to observe. There was a much higher incidence of study and allied behaviors performed in the classroom as compared with the control class. Behaviors not related to studying and listening were kept at a minimum. The students even showed more attentive listening during the few lectures held than was usually the case with lecture-oriented students. This apparently had much to do with the proffered option of attendance in the case of experimental students, as well as the active student participation that was present in the classroom. The student, once he chose to attend class, treated the classroom as a stimulus situation wherein he responded only in terms of study and allied behaviors. This strengthened the S-R connection between the classroom and studying etc. Contiguity theory maintains that all that is required to replace R (in this case, studying and related behavior) from the control of the stimulus population (classroom situation) is that $\bar{R}$ (competing R) should occur in its presence (Homme, 1966). $\bar{R}$ weakens and breaks an S-R connection. This explains the behavior of students in ordinary lecture situations where many $\bar{R}$'s occur – talking, day-dreaming, doodling, looking elsewhere, writing social notes – because the student attends class whether he learns there or not, simply for the sake of attendance.

The implications of this study are obvious. Our present educational system is much too lecture – and instructor-oriented that it does not allow for maximum student participation, neither for individual rates of progress. Also lacking are adequate contingencies of reinforcement that motivate increased learning. On the other hand, there are alternatives, like the method suggested in this study, which should be explored. Taking into consideration the expense in terms of personnel and energy, the educator should seek ways to eliminate some of the costs while reaping the benefits of individualized and contingency managed instruction.

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