

SELF-RECORDING AND STUDENT TEACHER SUPERVISION:
VARIABLES WITHIN A TOKEN ECONOMY STRUCTURE¹

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A token system was used to attempt to increase the accuracy with which special education students answered questions about reading assignments. In the token system, students recorded their own data, received toy money for accurately completing assignments, and were allowed to spend their toy money at the end of the week for educational activities. The accuracy with which students answered questions was higher when the token system was in effect than when it was not. When student teachers were used to manage the token system and when the self-recording feature of the system was removed, only slight changes in the accuracy of the student performance were obtained.

Token reinforcement systems have been introduced into special education classes with generally favorable results (Axelrod, 1971). Changes in the quality and levels of student behavior have been observed with various types of classroom performance variables, including both those concerned with academic achievement (Birnbauer, Bijou, Wolf, and Kidder, 1965; Nolan, Kunzelman, and Harring, 1967; and Wolf, Giles, and Hall, 1968) and with shaping appropriate classroom response repertoires (Kuypers, Becker, and O'Leary, 1968; O'Leary and Becker, 1967; and Quay, Werry, McQueen, and Sprague, 1966). It was observed that these changes in student behavior substantially eliminated many of the severe problems originally reported by the classroom teacher.

However, as delineated by Axelrod (1971) and others (*e.g.*, Kuypers *et al.*, 1968, and O'Leary and Becker, 1967), there are a number of practical limitations concerning the manner in which token systems have been implemented. First, the personnel implementing the system

have often been given extensive training in token reinforcement (*e.g.*, Phillips, Wolf, Bailey, and Fixsen, *unpublished*). Second, the back-up reinforcers or payoffs have usually been edibles or trinkets, which are extrinsic to the curricular program (*e.g.*, Broden, Hall, Dunlap, and Clark, 1970). Finally, extensive record keeping by the classroom teacher or observers, or use of electronic equipment has been required (*e.g.*, Patterson, 1965).

The present study was designed as an attempt to integrate a token reinforcement program into a special class setting without substantial alteration of the ongoing classroom structure. Specifically, this investigation sought to examine the following: (1) whether earning the use of educational activities can be an effective payoff within a token system, (2) whether the record-keeping aspects of the system can be effectively shifted from the responsibility of the teacher to that of the students, and (3) whether the management of the system can be transferred to student teachers, relatively untrained in the mechanisms of token reinforcement, without substantial decrement in pupil performance.

METHOD

Setting

The study was conducted in a junior high school special education program (EMR) in the

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Topeka Public Schools. The data on the variables under investigation were collected during the 50-min class period designated for reading instruction. During these 50 min, each student in the class worked in reading series in which there was a story to be read and a number of questions, based upon the story, to be answered. Each pupil was assigned material that the teacher considered appropriate for his particular level of reading ability. Thus, various reading series, usually designed for use in regular or remedial class settings, were employed. The instructional personnel in the classroom consisted of a certified special education teacher, a teacher aide, and a volunteer student aide three days a week.

Subjects

Thirteen seventh, eighth, and ninth grade students enrolled in this program served as subjects. Each student was assigned reading material in standard classroom reading series, such as the *SRA Reading Laboratories*. All subjects progressed in the reading series at the sequence prescribed by the teacher manuals accompanying each reading series. Generally, one story or reading card was assigned each day. The number of comprehension questions that the subjects were required to answer ranged from six to 48, depending upon the reading material assigned.

Response Definition

Accuracy of performance. The measures of accuracy of performance on the reading assignments were calculated as the ratio of the number of correct responses emitted to the number of responses possible for that assignment and converted into percentage values. A daily class average was determined on the basis of each student's level of reading comprehension for that day.

Observational Techniques

Data on the accuracy of reading performance were collected by the classroom teacher who corrected each student's reading responses when

the assignments were completed. Correction of the pupils' reading generally occurred during the same class period that it was assigned. Response keys, included within the published reading materials, were used.

Reliability of these data was determined at least once during each experimental condition. This was accomplished by having one of the aides recheck each pupil's reading assignment. The level of agreement for each of these reliability checks was calculated as the ratio of the number of student responses that both observers agreed that a subject's answer was correct or incorrect, to the number of responses emitted for that day. The measures of reliability ranged from 90% to 98% with a mean across experimental conditions of 95%.

Experimental Design

The design employed for the investigation of the experimental variables was a reversal design (Sidman, 1960, and Wolf and Risley, *in press*).

Experimental Conditions

Baseline I. The measures of baseline performance for the per cent of reading comprehension were collected in the manner described above. The teacher corrected each student's reading assignment upon completion and returned them, noting correct and incorrect responses. No manipulation was attempted at this time.

Token and Self-Recording I. Upon completion of the Baseline I condition, the students were presented with individual work record books in which they were instructed to enter the per cent of correct responses on their daily reading assignments. A conversion chart, which could be used to determine percentage values from the number of correct responses, was available for their use. They were also told that they would earn a particular amount of money based upon their recorded reading performance, and that payment would be made on the last day of each week. Space was provided in the work records for the students to keep an up-to-date account of their earnings. The money values

that the reading per cents earned are presented in Table 1. The coinage used for payment was the Ideal Brand Toy Money, which provides coins of the same approximate size, color, and denomination as United States coinage.

Table 1

Conversion chart to determine money values from reading accuracy scores.

<i>Per cent Accuracy</i>	<i>Money Value</i>
100-90	25¢
80-89	20¢
65-79	15¢
50-64	10¢
40-49	5¢
30-39	2¢

In addition, the subjects were informed that the amount earned could be exchanged each Friday for various activities (for example, listening to stories, Milton-Bradley's Phonetic Quizmo, teacher-constructed language games), or could be saved for nine-week payoffs, which included buying the materials necessary to make various craft and homemaking products and/or partake in a field trip.

The weekly payoffs were priced such that achieving a weekly average accuracy of 65% would earn one class period of payoff activities. When this average was not achieved, the student was presented with required reading material to perform during the payoff time.

Baseline II. The Token and Self-Recording I condition was terminated by collecting each student's work record book and informing the class that these records were needed for checking. No money or payoffs were presented to the students during this baseline condition.

Token and Self-Recording II. The token system was reintegrated into the special class program in the same manner as that described for the Token and Self-Recording I condition.

Token, Self-Recording, and Student Teacher I. During this condition, the token system continued as part of the classroom program; however, a student teacher was assigned the responsibility of conducting the class and imple-

menting the token economy. The purpose of this experimental condition was to determine what effects would accrue upon transferring the management of the economy to an untrained teacher. Thus, only a cursory explanation of the economy was presented to the student teacher and this focused only upon those activities necessary for maintaining the economy. Information concerning the rationale for a token system and the initial results of the study were not discussed. The special class teacher was generally not present during the reading periods.

Token and Self-Recording III. When the above condition ended, the special class teacher reassumed the responsibilities of the class. The classroom was structured in the same manner as that described for the previous Token and Self-Recording conditions.

Token I. The purpose of this condition was to determine what effects student record-keeping had upon the system. Therefore, before this condition was initiated, the teacher collected all student work records. However, the subjects were informed that they would continue to earn money on the basis of their reading performance and that payoffs would be made on the final day of the school week.

Token and Student Teacher. The responsibility for conducting the classroom and the economy was again transferred to a student teacher. A student teacher, different from the one previously employed, was used. In addition, the pupils in the class did not have the use of their work records. The classroom teacher was not present during this experimental condition.

Token, Self-Recording, and Student Teacher II. This experimental condition was a continuation of the previous condition, with student work records again distributed. The token system was conducted in the same manner as that described for the previous Token, Self-Recording, and Student Teacher condition.

Token II. During this condition, the special class teacher reassumed the responsibility of conducting the classroom program. The token system remained integrated into the class structure;

however, student work records were collected. This manipulation represented a replication of the previous Token I condition.

RESULTS

Figure 1 presents the daily averages of reading performance for the class. The variability in the data within experimental conditions and the small differences between treatment means (see Table 2) necessitated further analysis by a Treat-

Table 2

Number of observations (graded assignments), means, and standard deviations for each treatment condition.

Treatments	Number of Observations	Means	Standard Deviations
Baseline	324	69.47	18.19
Token and Self-Recording	586	82.92	13.70
Token, Self-Recording and Student Teacher	147	84.37	11.07
Token	85	82.26	14.18
Token and Student Teacher	49	79.76	14.78

ment-by-Subjects analysis of variance design (Winer, 1971). Raw data (i.e., daily per cent accuracies for each of the subjects) were used in this analysis (Gentile, Roden, and Klein, 1972). These results are presented in Table 3.

Table 3
Analysis of Variance Summary Table

Source of Variation	df	MS	F	F.95
Treatments	4	8770.576	39.42	2.37
Subject Obs.	1186	222.482		
Total	1190			

Since the overall F value exceeded the critical value of F at the 0.95 level, *post hoc* comparisons between treatment means were made using the Scheffe Test (Winer, 1971). This subanalysis indicated, as depicted in Figure 1, that there was a statistically significant difference ($p < 0.05$) between the baseline performance of the subjects and the four token conditions. However, differences between the means for the various token conditions were not statistically significant. Thus, when the token system was inte-

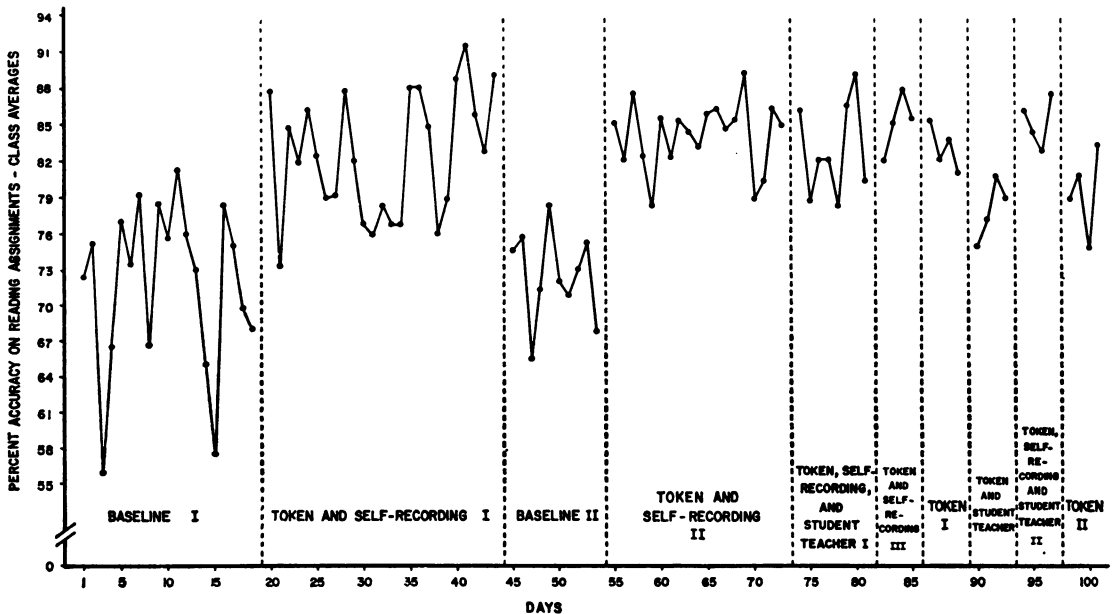


Fig. 1. Average per cent accuracy on reading assignments for the class on successive school days.

grated into the classroom structure, a significantly higher level of reading performance was observed when compared to baseline performance. In addition, no significant effects were observed between the token, token and self-recording, token and student teacher, and token, self-recording, and student teacher conditions.

DISCUSSION

This study attempted to investigate several aspects of a token reinforcement system. The first area of concern was whether earning relevant learning activities, instead of items extrinsic to the curricular program, could be employed for payoffs. The type of activities used in this system were supplemental in nature. The weekly payoffs essentially involved activities designed to develop specific reading and language skills, such as spelling and pronunciation, which the teacher considered to be a necessary component of the curriculum. Generally, these activities were provided noncontingently on a periodic basis before this study. Similarly, the extended payoffs were also designed for developing recreational and family living skills, which were part of the special class curriculum. From the changes in classroom reading performance observed, it appears that these educational activities were effective reinforcers within this token structure. On no occasion throughout the study did the students fail to earn the necessary amount to purchase the payoffs.

The second question studied was whether the record-keeping aspects of the token system could be transferred from the classroom personnel to the students. During this study, the teacher collected data on pupil reading performance during all conditions independent of those entered in student work records for the purpose of data continuity. In addition, these data provided a reliability check to determine the accuracy with which students kept their own records. With the possibility of cheating continually present, a comparison of student records with those of the teacher revealed only one instance throughout

the study when agreement was not achieved. A difference of only one percentage point between the records was observed on this occasion. Likewise, when the students kept their own records, their reading performance did not differ significantly from those when they did not. Thus, students were able to assume the responsibility for maintaining their own records without a decrement in their reading performance.

The final purpose of this study was to determine whether the management of the system could be transferred to untrained teachers without a decline in pupil performance. Two different student teachers were used, and their exposure to the students, the classroom, and the token system was minimal before they assumed control of the class. Little difference in the reading performance of the subjects was observed between teacher supervision and student teacher supervision of the classroom during token conditions. In addition, the student teacher was able to maintain reading performance at a level significantly higher than that of the baseline conditions.

Although reading performance has rarely been employed as an independent variable of a token system (Kazdin and Bootzin, 1972), the literature on token reinforcement generally indicates clearer effects than those observed in this study. Several alternatives may account for this.

First, the sequence of reading material appeared to have an effect upon the variability in performance observed. The reading series used did not generally have a consistent progression in difficulty. Students on one day may have worked on material that was essentially review, and the next day on material in which a large number of new words or activities were introduced. Systematic analysis and scheduling of materials to develop consistency or use of self-instructional materials would possibly reduce the variability observed.

Second, with per cent of correct answers used as a dependent variable, the possibility of a ceiling effect is apparent. In this study, only 5% of

the assignments attained a grade of 100% during baseline; however, approximately 30% attained this level during each of the token conditions. Hence, the amount of change in reading performance may not have been reflected in the measures obtained because they were insensitive to large changes in pupil performance.

Although feedback concerning performance was given to the students, payoff for their output was delayed by as many as four or five days during the token conditions. Even though this procedure was effective in changing performance, a more immediate payoff, perhaps during the final period of each class day, may have further enhanced the effects (O'Leary and Becker, 1967).

Finally, although the academic activities used as payoffs had reinforcing effects upon reading performance, clearer effects may have resulted by employing more artificial payoffs. Other classroom privileges, such as special jobs or projects, lend themselves to token systems (McLaughlin and Malaby, 1972).

Token reinforcement has been used in a variety of special settings and shown effective with many behaviors, but analysis of reading performance for an entire class is not common. Also, programming into a token system, pupil responsibilities, e.g., self-recording, may enhance the relevance and the interests of subjects of token systems.

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