

THE USE OF A TOKEN SYSTEM IN PROJECT HEAD START¹

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The present experiment sought to develop a practical and effective method for teaching the beginning elements of hand-writing in a Head Start program. The method consisted of reinforcing responses to a writing program by giving the children access to a variety of activities normally available in the pre-school classroom. Tokens were presented for correct responses. The children then used the tokens to select reinforcers, such as snacks and access to a variety of play activities. In an experimental evaluation of the token system, it was found that responding was maintained as long as access to the reinforcing activities was contingent upon responding. When reinforcement was no longer contingent upon responding, virtually no responding occurred. Informal observations suggested that the token system had several unanticipated effects: the children's vocabulary and ability to understand instructions improved; a favorable attitude toward school developed; and their ability to play cooperatively with other children increased. It was concluded that the token system is a practical and effective method for teaching beginning writing skills and that it has other desirable, if unanticipated, effects.

Token systems provide an effective method for generating socially important behaviors in a wide variety of settings (Ayllon and Azrin, 1965; Birnbrauer, Wolf, Kidder, and Tauge, 1965; Cohen, Filipczak, and Bis, 1965; Girardeau and Spradlin, 1964; Clark, Lachowicz, and Wolf, 1968; Staats and Butterfield, 1965; and Wolf, Giles, and Hall 1967). The present paper describes a token system designed to develop and maintain writing skills in a group of underprivileged children in a summer Head Start program. The function of the token system in generating these skills was assessed by individual experiments with each of the children in the experimental token class. The overall effect of the program was evaluated by comparing the pre-test and the post-test scores of the token class with a matched control class.

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METHOD

Subjects

Thirty students, 4 to 5 yr old, who were enrolled in the regular Head Start Program of a small midwest city, served as subjects with the explicit agreement of their parents. Students were randomly assigned to an experimental token class and a control class. For reasons of health and irregular attendance four children in each class were dropped from the experiment. Of the remaining 22 children, 19 were black and three were white. All children came from low-income families as defined by the Office of Economic Opportunity scale.

Staff

The staff for each class consisted of a teacher and two teacher's aides. The junior author, who had received training in behavior modification, served as the teacher in the token class. A local public school teacher taught the control class. The other staff members were welfare recipients and had no training in behavior modification.

Control Group

The control group consisted of 11 children. Their teacher was a state certified grade school teacher in the local system who had taught in the Head Start program the previous year.

Although she was not instructed on how to teach her class, she was provided with the same instructional and reinforcing materials provided to the experimental group to use as she saw fit. A writing achievement test was administered to her class during the first week of the program and she was informed that it would be administered again during the final week. It was suggested that she teach the children these skills as one goal of her summer program. However, no effort was made to force her to teach these skills, whether in her own way or by using the writing program developed for the experimental class. Furthermore, no systematic observation was made of her attempts to use it. Her own reports and casual observation indicated that several attempts to use the program met with no cooperation from the children.

Experimental Group

Experimental room. The experimental space consisted of a room approximately 25 by 40 feet and an additional outside play area (Fig. 1). This space was divided into six functional areas. Five of the areas were associated with reinforcement and had restricted entrances; the sixth area was associated with the opportunity to study. The areas were:

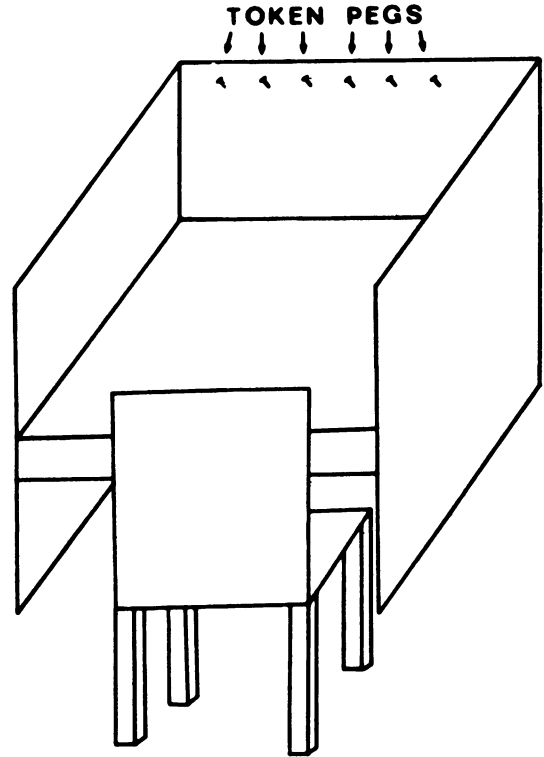


Fig. 2. Individual cubicle in which each child worked during study period.

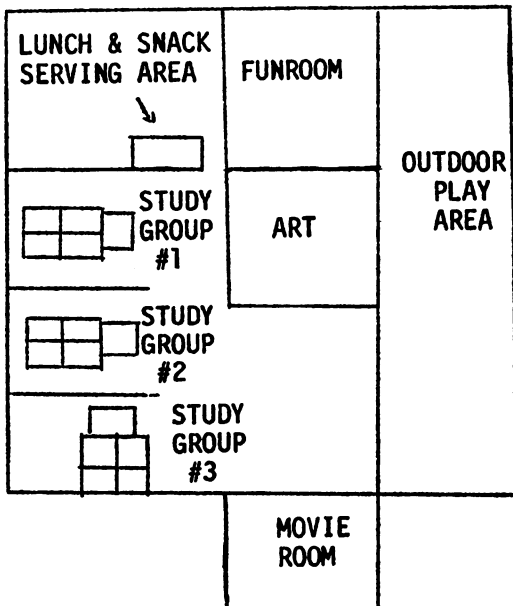


Fig. 1. Floorplan of the Head Start classroom.

- (1) *Food area:* snacks of cookies and Kool Aid were served here. Lunch plates, dessert cups, and milk glasses were dispensed as children earned them before lunch. Lunch was served to the children from this area.
- (2) *Funroom:* this area contained a wide variety of toys that the children could play with. The toys included blocks, cars, dolls, dress-up clothes, a piano, blackboard, and record player.
- (3) *Art:* this area contained such art supplies as paints, crayons, rubber ink stamps, paste-on pictures, and paper.
- (4) *Outdoor play area:* this area contained outdoor toys such as a beachball, rocking horse, climbing bar, pedal car, and several water guns.
- (5) *Movie room:* this area contained a strip film projector and a small library of educational films obtained through the school system.
- (6) *Study area:* this area contained three groups of five children's school desks.

Each desk was separated from the other four in that same group by plywood partitions (Fig. 2). Each group was separated from the other groups by folding partitions. Visual access between children required standing on their chair or table, or walking away from their desk.

Response definition. A program was prepared that was designed to teach the children the necessary skills prerequisite to learning freehand printing. These skills included: (1) how to hold a pencil, (2) how to draw a straight line at different angles, (3) how to draw curved lines at different angles, (4) how to draw freehand lines, and (5) how to draw a variety of different shapes in which lines joined and crossed at specified points. The entire program contained 15 distinct steps, several examples² of which are shown in Fig. 3. Each step was duplicated between 24 and 48 times on a single sheet of paper. Each child in the token class worked on each step until he produced one perfect paper. He was then allowed to progress to the next step in the program. Both classes were provided with as many copies of the program as they requested.

A correct response was judged by the teacher's aides. If the child's response started at the correct point, did not cross the guide-lines, and ended at the correct point, it was to be graded as correct. Each aide was supplied with a different colored marker so that her grading responses could be readily identified at any time. Her responses consisted of an "X" next to each incorrect response and a dot or short line next to each correct response.

Constant assessment of grading accuracy was required because of the volume of work required of the aides; they graded an average of 20 responses per minute, delivered tokens, and administered the reinforcing activities immediately after the work sessions. In addition, grading many responses at the very end of the work period was often done in a "crisis" atmosphere conducive to mistakes. It must be added that the aides were also somewhat more sympathetic toward near misses than was the

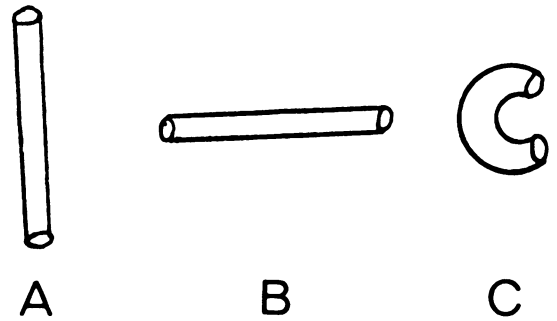


Fig. 3. Samples from writing program.

teacher. In order to maintain a reasonable level of accuracy, the teacher checked each aide's grading as soon as possible and gave her further instruction until the grading was at least 95% accurate. Spot checking of accuracy was maintained for the duration of the experiment.

Procedure. The children in the token class were introduced to the token system during the first eight days. At the beginning of the first day, the aides were given explicit instructions on their duties. After this instruction period, the children were permitted to sample each of the play activities if they first repeated its name to one aide, for which they received a token, and then gave the token on another aide. During the second day, access to the snacks and activities required one token. The children were permitted to earn tokens at any time by working on the writing program; they could immediately exchange the tokens for 5 min of access to the reinforcer. During the next six days, tokens could be earned only during formal study periods, which alternated with brief play periods. Initially, the study periods were 5 min long; they were progressively increased during the six day period until there were four 30-min study periods and four 20-min play periods. Once this change had been introduced, the children were permitted to buy play activities only during play periods.

Table 1 lists 10 reinforcers and their prices that were available to the children in exchange for tokens.

When the study periods were introduced, a response chain and a conditioned reinforcer system were developed to bridge the delay between the child's response and his access to the reinforcers. The response chain consisted of completing a fixed number of writing responses designated by the teacher and then

²This program has been expanded and perfected by Dr. Donald Bushell. Copies of the revised program can be obtained from Dr. Bushell, Follow Through Project, Department of Human Development, University of Kansas, Lawrence, Kansas 66044.

Table 1

Number of tokens required for lunch materials, snacks, and access to different activities.

<i>Reinforcer</i>	<i>Price</i>
LUNCH MATERIALS	
Lunch Plate	5
Second Plate	5
Dessert Cup	5
Milk Glass	5
SNACKS	
Kool Aid	5
Cookie	5
ACTIVITIES	
Fun Room	10
Playground	10
Art	10
Movies	10

raising his hand. When a child raised his hand, the teacher would go to that child's desk and grade each response. Tokens were given for correct responses according to a small fixed-ratio schedule. After receiving his tokens, the child could apply them to one or more tickets, which depicted the different reinforcers. He bought a ticket by filling up a peg in his study booth that also held the ticket. The peg was adjusted in length so that the number of tokens that could fit onto it equalled the price of the reinforcer. This system had the advantages of (1) not requiring counting, (2) displaying a wide variety of reinforcers, and (3) not requiring any intervention or assistance by the aides.

The effectiveness of the token system in maintaining responding was experimentally evaluated after a seven-day baseline period. The evaluation used four study periods of one day. Before the first and third periods of that day, the children were given 25 tokens non-contingently and instructed to complete eight responses. After they completed those responses, the teacher graded them, praised their work, and informed them that there were no more tokens available to give out. The children were then informed that they could complete more writing responses if they wished. During the second and fourth work periods, the children were given tokens contingent upon their completion of correct responses. Each work period was 30 min long and was separated from the next work period by a 20-min play period during which tokens could

be spent. The design was duplicated during a second day.

In addition to this basic experiment, the effect of different work durations was also evaluated. On subsequent days, 20-min, 30-min, and 60-min work sessions were scheduled with the token system in effect.

Finally, the overall effect of the token system was evaluated by an achievement test given during the first three days of the program (pre-test) and again at the end of the six week program (post-test). The test covered each target behavior of the writing program. This test was given to both the token class and the control class. The test was shown to the control class teacher before the start of classes as one target for her teaching.

RESULTS

Figure 4 shows the day-by-day variation in response rates during the seven-day baseline period for a child with a high, medium, and low rate. S-5 showed considerably more varia-

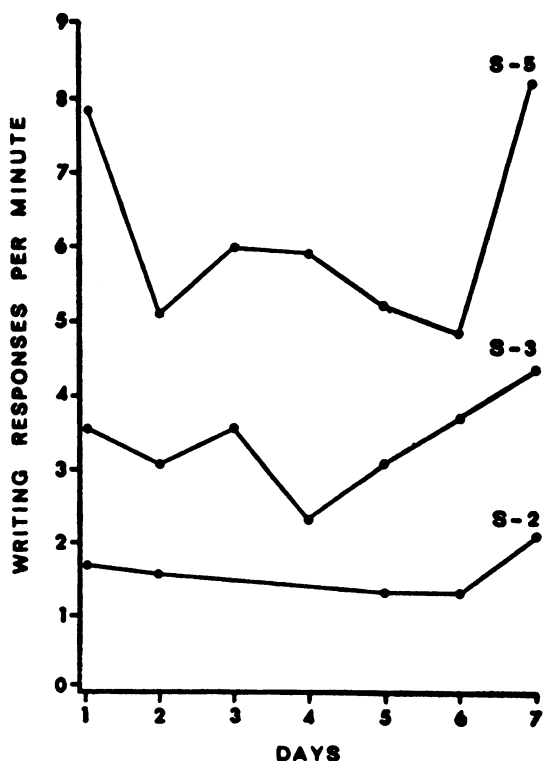


Fig. 4. Writing responses per minute for a high, medium, and low-rate child during first seven days of token reinforcement.

tion than the other children. Most children maintained a fairly uniform daily rate during the baseline period. Two children did not, both increasing from a low rate of about two responses per minute to about seven responses per minute. In general, these data suggest a relatively stable day-to-day rate of responding during baseline.

Figure 5 shows the variation within days during the baseline period. The average number of responses in each period decreased from about 4.2 responses per minute in the first period to about 3.3 responses per minute in the fourth period. These averages are not a precise measure of the individual children, however. For example, Period 4 is the slowest work period for only three of the 11 children. These data suggest a relatively uniform rate of responding within each day, with some tendency for a decrease in rate after the first period.

Figure 6 shows the average response rate for the 10 children present during the four study periods of the experimental session. In general, the students worked at a much higher

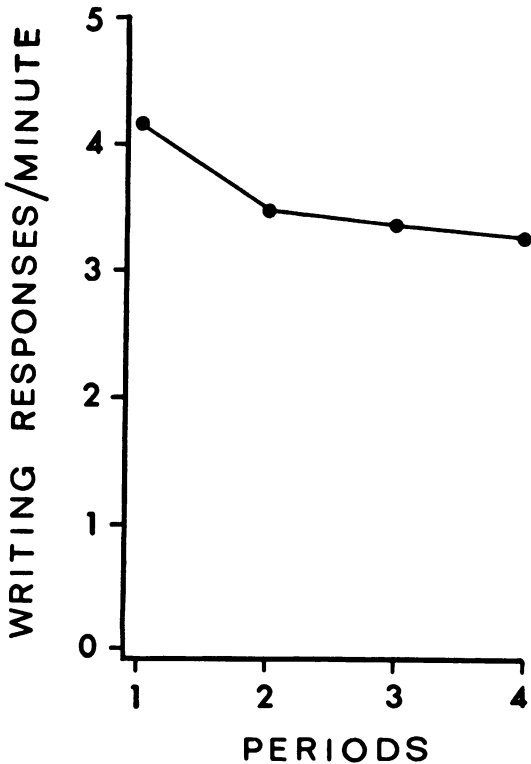


Fig. 5. Mean writing responses per minute for the four daily work periods for the first seven days of token reinforcement.

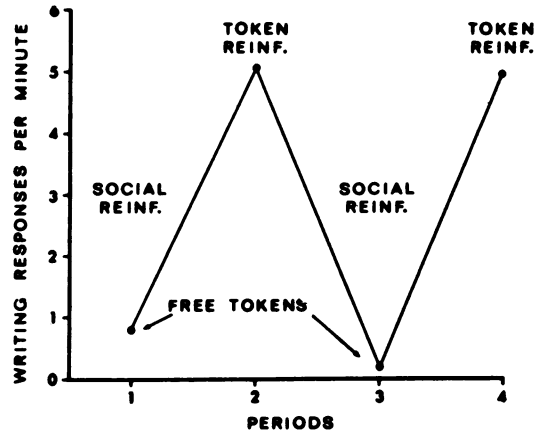


Fig. 6. Mean rate of responding with and without contingent token reinforcement. Each point represents the mean rate for 10 children during a 30-min study period.

rate during the two periods when the tokens were contingent. During those periods, they averaged about five responses per minute. During the periods when 25 tokens were given non-contingently and social attention was the only event contingent upon responding, they averaged about 0.8 and 0.2 responses per minute. T-tests were computed for each adjacent period. The differences between periods were significant at approximately the 0.0005 level or beyond for each comparison. Two subjects deviated from this statistical pattern. S-6 did not recover a high response rate during the first period. However, she showed comparable rates when tokens were delivered contingently during the other periods. S-10 worked at a high rate during the first period of non-contingent delivery of tokens but otherwise showed a pattern comparable to the other children. Six children made no responses after the eight responses they were instructed to complete. Two children maintained low rates, but still showed considerably higher rates during the periods when tokens were contingent. Virtually identical differences in rate between the reinforced and non-reinforced periods were obtained during the second experimental day. These differences between periods during the experimental days contrast sharply with the small variability between periods obtained during the baseline period. These results indicate that the tokens were effective in maintaining a high response rate among the children during the experimental days.

Figure 7 shows the effect of different study period durations on the children's rate of emitting writing responses. On the average, the children maintained a response rate of between four and five responses per minute whether the study period was 20, 30, or 60 min long. The rates for the individual children are similar to this average; four children showed a slight increase in rate when comparing the 20- and 60-min study periods, and three showed a slight decrease in rate. The interesting thing about this experiment is that there is no evidence to suggest that the children's response rate decreased even when hour-long study sessions were used. This contrasts with the intuitive notion that 4 to 5-yr old children have a very short attention span, particularly for formal educational behaviors. This experiment suggests that children can work at educational activities for long periods of time with no necessary reduction in response rate—if their behaviors are adequately reinforced.

Figure 8 shows the results of the pre-test and the post-test. Both groups made about 35% correct responses on the pre-test. On the post-test, the control group showed a small gain of about 3% to a score of about 38% correct responses. The token group showed a very large gain to almost 100% correct responses on

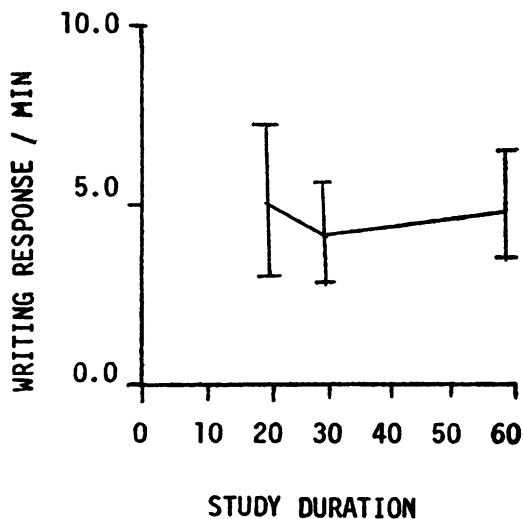


Fig. 7. Mean rate of responding during study periods of different durations. Each point represents mean rate for seven children during four 20- and 30-min study periods and during one 60-min study period. Vertical bars show ranges for the seven children at each duration.

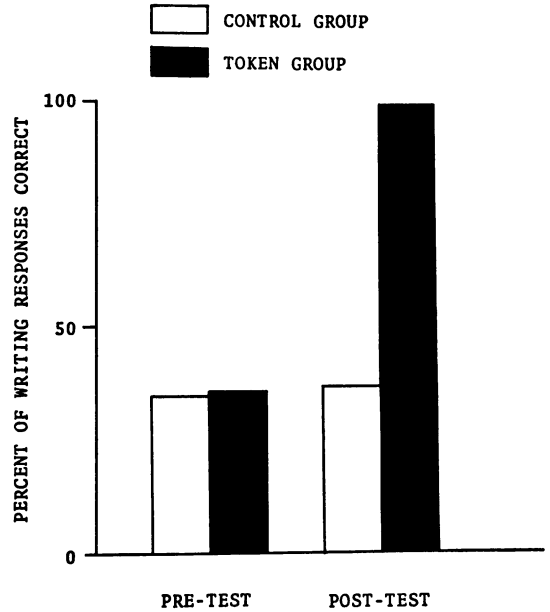


Fig. 8. Comparison of pre-test and post-test achievement scores for the token group and the control group. Token group bars are averages for seven children present at both tests; control group bars are averages for 11 children present at both tests.

the post-test. These results indicate that the token class made very large gains on the writing achievement test while the control group made only slight gains.

DISCUSSION AND CONCLUSIONS

The differences in rates between periods with and without reinforcement contingencies suggest that the tokens were effective in maintaining writing responses. This conclusion is further strengthened by the relative lack of differences between periods during baseline when all responses were reinforced.

The data also suggest that the token system can maintain writing behavior over a period of several weeks. Counting the seven baseline days, the two experimental days, and the three days during which different durations of work periods were studied, writing behavior was maintained during the reinforced portion of 12 days. This suggests that the present reinforcing procedure has some durability.

This research indicates that token systems can be adapted to the Head Start situation. It may be that the ease with which token control was developed over these children resulted

from several fortuitous features of the system. First, the development of an explicit response chain beginning with a writing response and ending with hand-raising may have effectively bridged the inevitable time delay between writing responses and token delivery. Without the hand-raising response, the aides would have had to move continually from child to child to see if they had completed their work. Not only would this have permitted unauthorized social reinforcement to occur, but it would have introduced a non-discriminated time delay between responding and token delivery. Second, the use of tickets containing a picture of the reinforcing activity may have effectively bridged the gap between token delivery and the actual access to the "back-up" reinforcing activity. It also made it possible to display a wide variety of reinforcers to subjects with no reading ability. Third, the use of token pegs adjusted in length to count the children's tokens for them permitted the children to select their reinforcers with no intervention from the teacher or the aides. Not only might this have taught them to make responsible choices, but, by eliminating the teacher's influence, it may have heightened the probability that the tokens were exchanged for the most reinforcing events. The pegs also permitted the use of a differential pricing system without first requiring the children to learn how to count. Fourth, the fact that the children could begin to apply their tokens toward a variety of back-up reinforcers while the study period was in process may have reduced the tendency of the children to satiate on tokens. In any event, the token system reported here did rapidly develop token control in the Head Start situation. This control also produced large and measurable gains in the writing skills of these children. This success suggests that we should explore methods for applying token systems to such basic skills as vocabulary improvement, counting and adding, and reading readiness.

It should be noted that the present token system is practical as well as successful. The reinforcers used are commonly available in Head Start classrooms without additional cost. Perhaps even more important is that the token system can be administered by untrained teacher's aides. This made it practical to hire the most needy Head Start mothers: those on welfare. One of the mothers serving

as a teacher's aide could not read; yet she was an excellent teacher within this system. Thus, this system was used without raising either materials or personnel costs.

Informal observations suggest that the token system had several unanticipated effects. First, the token system required intense interaction between the children and the teacher's aides. Children had to learn new words in order to follow instructions successfully; the fact that the situation was relatively objective made it possible for the aides readily to observe whether instructions were understood and take corrective measures if they were not. Second, the children appeared to develop a favorable attitude toward school. Several children were kept home for a day due to a minor misunderstanding. All of them cried for several hours because they wanted to go to school. This led the parents to investigate the misunderstanding and return the children to school. Third, children gained a great deal of experience playing cooperatively with other children. One very shy child with a deformed face initially refused to play with other children. But a brief shaping period encouraged her to try playing with them. After she had tried, she rapidly overcame her shyness and became a full participant in the play periods. These and other unanticipated effects suggest that token systems may provide an environment far more suitable to developing many of the less specified behavioral changes of interest to child development specialists than one might guess. It would be of value in future token studies systematically to investigate such changes. Perhaps objective methods could be developed to increase the rate of such changes deliberately. Even if these methods could not be developed, objective data demonstrating that such changes are not incompatible with token systems would be of considerable interest.

A major failing in the present experiment was the lack of community—in particular, parent—control over the program. While a parent advisory committee was involved in all decisions from the initial hiring to the selection of teaching goals, interest and participation tended to be low. Perhaps the extension of a token system to the parents, similar to that used to maintain participation in self-help clubs (Miller and Miller, 1969), could be introduced.

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