

*THE EFFECT OF INTERMITTENT FEEDBACK AND  
INTERMITTENT CONTINGENT ACCESS TO PLAY  
ON PRINTING OF KINDERGARTEN CHILDREN<sup>1</sup>*

BERNARD H. SALZBERG, ANDREW J. WHEELER,  
LINDA TAYLOR DEVAR, AND B. L. HOPKINS<sup>2</sup>

SOUTHERN ILLINOIS UNIVERSITY

Intermittent grading of papers and the combination of intermittent grading with contingent access to play were evaluated as methods for increasing the accuracy of kindergarten children's printing responses. For a group of target letters, intermittent grading alone failed to produce an increase in accuracy, but when grading was paired with access to play, accuracy increased for every child. These results were then replicated with another letter.

A number of studies have investigated the effectiveness of behavior modification techniques to develop socially desirable classroom behaviors. The types of teaching techniques investigated have varied along several dimensions. One dimension has been the extent to which the techniques are appropriate for all students in the classroom or are useful for only selected students. Many studies have focused on the use of reinforcers or special consequences to change the behaviors of a small number of problem children within a larger class (*e.g.*, Hall, Lund, and Jackson, 1968; Whitley and Sulzer, 1970; Harris, Wolf, and Baer, 1964). These techniques are useful for dealing with isolated social or disruptive behaviors or perhaps academic problems that are not common to all members of the class.

A more modest number of studies have dealt with the behaviors of all children in a class. Although trying simultaneously to develop similar social or academic skills of all of the children in a class is clearly the most frequent task faced by a teacher, it presents serious logistical problems. The teacher has to monitor the behaviors of all of the children and then use the collected data to determine appropriate differential consequences for each child. Most teachers probably cannot afford the time required to teach with this degree of precision.

One solution to this logistical problem is to employ outside observers to collect data on the behaviors of individual children (*e.g.*, Hall, Panyan, Rabon, and Broden, 1968). However, this solution is prohibitively expensive for most teachers and schools. An alternative solution is to use "group contin-

gencies". With this procedure the behavior of the entire class taken as a whole is used as the dependent variable (Barrish, Saunders, and Wolf, 1969; Schmidt and Ulrich, 1969). The efficiency of these group techniques, however, is offset somewhat by the tendency to obscure individual performances. Attending to individual performances seems highly desirable, especially when attempting to modify academic behaviors.

Another possible alternative to the logistical problem suggested by Lindsley (1958) would be to make observation and application of contingencies to individual performances intermittent. While the teacher could observe only some small portion of the class at any one time, every individual would be observed at some time. If intermittent consequences do maintain performance, the task of the teacher as a contingency manager can be considerably reduced.

A second dimension along which classroom investigations have varied is the way in which the response measured is defined. Definition of the response is closely related to the problem of logistics in observation. The majority of classroom contingency management studies have dealt with topographically defined behavior, *i.e.*, those behaviors defined by the various movements the student engages in while performing them. Examples of such behaviors would be various types of classroom

<sup>1</sup>The authors wish to express their contingent appreciation to Miss Carmen Howard for help in the preparation of this manuscript.

<sup>2</sup>Reprints may be obtained from B. L. Hopkins, Department of Human Development, University of Kansas, Lawrence, Kansas 66044.

disruptive behaviors as well as certain desirable behaviors, such as "attending" or "study behavior" (*cf.* Harris, *et al.*, 1964; Surratt, Ulrich, and Hawkins, 1969; Hall, *et al.*, 1968; Madsen, Becker, and Thomas, 1968). By virtue of such a topographical definition, the response must be observed at the exact moment in which it occurs in order to be recorded, requiring continuous vigilance on the part of the teacher observer.

The need for continuous vigilance is obviated, however, by defining the response in terms of some relatively permanent change in the environment that occurs as a result of the response (Ayllon and Azrin, 1968). Academic behaviors of interest such as per cent correct on some kind of task are usually defined in this way, by their product rather than by their topography. Such product-defined academic behaviors have been studied by Lovitt and Curtiss (1969), Birnbauer, Wolf, Kidder, and Tague (1965), Staats, Finley, Minke, and Wolf (1964), and Miller and Schneider (1970).

Not only does the study of academic product-defined responses offer an efficient method of monitoring behavior, but such responses are usually of considerable intrinsic interest. The relative frequency with which topographically defined and academic responses have been studied, however, would seem to suggest that educational investigators are more interested in problems of classroom control than in academic performance. The imbalance, however, is more likely due to problems of measurement and problems of shifting baselines when dealing with skill acquisition. If, indeed, the major task of education is to improve academic performance, the need for more studies of academic responses is obvious.

The intended thrust of the present study was to demonstrate an efficient classroom management technique with the use of intermittently applied observation and contingencies, and also to demonstrate the use of this technique with an academic response of interest, handwriting in kindergarten children. Although Miller and Schneider (1970) worked with skills prerequisite to writing, the responses with which they dealt consisted of individual strokes and shapes, rather than complete printed letters. A reliable measuring technique for the evaluation of handwriting

was developed, eliminating many of the problems of measurement of this particular response (Rondinella, 1963). Although carried out in a small class, it is believed that the techniques developed for control over writing responses could be generalized with little modification to larger classrooms and other areas of academic responding.

## METHOD

### *Subjects and Setting*

The study was conducted in a kindergarten classroom in a rural Southern Illinois elementary school. Six children, four boys and two girls, ranging in age from 5 yr to 5 yr, 10 months, with a mean of 5 yr, 4 months, served as subjects. Three other children in the class were not used as subjects, two because they had enrolled in kindergarten after the study had begun, and the other because his rate of absence was extremely high. Before beginning the study, the subjects used were taught rudimentary writing skills and had completed the first 35 pages in *Handwriting with Write and See* (Skinner and Krakower, 1968).

The reinforcer was limited access to two play areas at the school. One, the playroom, was a spare room in the basement of the school which had been stocked with various toys and playthings commonly available in schools. The other play area, the school yard was used when weather permitted. The school yard was a large grassy area, surrounding the school building and containing no special play equipment. Sometimes the children were allowed to take toys outside.

### *Materials and Scoring*

Specially treated writing paper was used for the writing lessons. An example of writing paper for a day when the letter M was used as the target is shown in Fig. 1. The paper had five sets of horizontal guidelines, each set consisting of a top, middle, and bottom guideline within which to print the letters. Each set of guidelines was divided by means of short vertical lines into 10 spaces, so that one letter, if written correctly would occupy each space. In the extreme left space in each of the top three sets of guidelines a model of the target letter for that day was written by the teacher before the paper was given to the child. The same letter appeared in all three sets of guide-

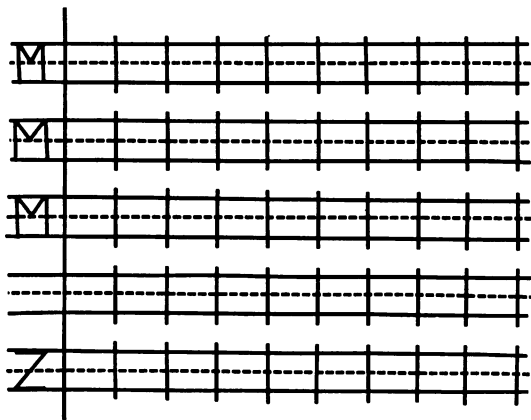


Fig. 1. Sample printing assignment sheet as it was presented to the student. Target letter for this day was *M*. No student responses are shown, and latent image grading aids are invisible at this time.

lines on a child's paper on any given day. The target letters used in the upper three sets of guidelines consisted of 13 upper case letters (all except *I*) that were composed of straight lines only. The sequence in which the target letters were presented was determined randomly before the experiment began. The fourth set of guidelines remained blank and was not used. If the student wrote anything in the fourth set of guidelines, it was ignored. In the first box of the fifth, or bottom set of guidelines, the teacher wrote a model for the letter *Z*. The letter *Z* was presented, in this fashion, every day throughout the study. The child's task was to fill the remaining nine boxes on each line with duplications of the letter that appeared in the extreme left box on each line. Thus, each day's assignment consisted of the child writing the day's target letter 27 times (three sets of nine letters each) and the letter *Z* nine times.

For scoring the completed paper, use was made of a special latent image process printed on the paper. Above and below each guideline at a distance of 1.5 mm from the guideline was an invisible horizontal line which the teacher could make appear by coloring over the guideline with a special pen. Once this latent image was made visible, spaces of 1.5 mm. were created above and below each guideline, and these spaces were used for scoring.

A correct response was defined as one that had no extra marks or missing parts, had no backward components, was within the appro-

priate box, and strokes that were supposed to end on guidelines fell within the 1.5 mm. space surrounding that guideline created by the treated latent image. The latent image process was employed because the teacher found it easier to use than a plastic overlay and grading marks could be easily made directly on the child's paper. Reliability of the scoring procedure was determined by calculating the per cent agreement between two graders. Per cent agreement was obtained by dividing the number of agreements by the number of letters scored and multiplying by 100. One of these graders was naive as to what contingencies were in effect for the child whose paper he was grading. A total of 31 reliability checks were made during all phases of the experiment to include checks on all children and all letters. Twelve reliability checks were made between the teacher and the second author, and 19 were between the first and second authors. The teacher's grades used in the reliability checks were the same as those shown to the students. One check yielded a reliability of 70%, one was 81%, and the remaining 27 checks ranged from 89 to 100%. The mean of the checks was 92%.

#### *Procedure*

Every day throughout the experiment, the teacher gave a short blackboard-demonstration before handing out the papers and pencils. The demonstration consisted of drawing a set of guidelines on the board and writing the target letter for that day while explaining the strokes composing the letter and cautioning about staying within the guidelines. The demonstration and instructions pertained only to the target letters, not to the *Z*s. No instruction or demonstration was ever given for the *Z*s. These events before the children began work remained constant throughout all experimental manipulations. Changes that occurred with different experimental manipulations involved only changes in events after work assignments were completed by the child. The sequence of experimental phases followed a multiple baseline design and is shown in Table 1 and explained below.

*Baseline.* During this phase, Sessions 1 through 19, each student gave his paper to the teacher as soon as he had completed it, and he was immediately allowed to go play in the playroom or outside. The papers were not

Table 1  
Sequence of Experimental Phases

Experimental Condition	Target Letters		Z	
	grading	contin- gency	grading	contin- gency
Baseline	no	no	no	no
Feedback only— Target	yes	no	no	no
Feedback plus contingency— Target	yes	yes	no	no
Feedback only— Z	no	no	yes	no
Feedback plus contingency— Z	no	no	yes	yes

graded in the presence of the student, but were scored after school. The play period lasted 15 min from the time the first student left the room.

*Feedback only—target.* During this phase, sessions 20 through 33, approximately 50% of the students had their papers scored upon completion each day. To select the children who would be graded on any given day, the teacher had a roster of the children's names arranged in a random sequence and she simply followed this list. A child did not know if he was to be selected until after he had completed his writing lesson. On those days when uneven numbers of children were present, thereby making it impossible to select exactly 50% of the class for grading, a prearranged random sequence was followed that indicated whether the number of children selected on a given day would be one more or one less than 50%. A child who was not selected for grading on a given day was immediately released to play as soon as he turned in his paper. A child that had been selected, however, stood by while the teacher colored over the guidelines with her special pen and graded the student's target letter. During this phase the Zs were never graded or colored over in the presence of the students. Once the paper was graded, the teacher showed the child how many and the nature of the mistakes he had made. An attempt was made to keep this feedback affectively neutral. The teacher never used words such as "good", "nice", "bad", or "poor". She made descriptive, factual statements such as: "You got four wrong. Your lines crossed the guidelines here and here and went out of the box there and

there." The child was then released to play regardless of his score.

*Feedback plus contingency—target.* During this phase, Sessions 34 through 52, grading and the selection of students for grading was the same as in the previous phase. In this phase, however, if the student's score on the paper did not meet or exceed a predetermined criterion of some minimum per cent correct, he had to repeat the assignment until his score did meet the criterion before he could go to play. Students were not informed of these criteria. If the play period expired before he reached criterion, he lost the opportunity to participate in that play period. Children who were not selected on a given day for grading were, as before, released to play immediately upon completion of the assignment. Once again, Zs were never graded.

Different response criteria were established for each child and response criteria did not necessarily remain constant for any given child across all sessions or experimental conditions. The teacher and the experimenters determined the criteria by evaluating the child's performance during early phases of the experiment and then setting a criterion level high enough to insure that the child would fail to meet it some of the time, but not so high that the child would not be able to reach criterion on a second or third attempt. The left-hand side of Table 2 summarizes the response criterion in effect for each child during this phase of the experiment. As can be seen, setting criteria was a trial-and-error process, and the criteria were adjusted both up and down, depending upon the child's performance.

*Feedback only-Z.* During this phase, Sessions 53 through 64, the target letters were no longer graded. Instead, the Zs were graded, following the same procedure used for grading the target letters in the Feedback only-Target phase. As before, play privileges were granted regardless of the subject's performance on the writing task.

*Feedback plus contingency-Z.* During this phase, Sessions 65 to 87, only the Zs were graded as in the previous phase, but response criteria set on the Zs had to be met before the child could go play. Although target letters were not graded, instruction on them before the assignment continued. Criteria for performance on the Zs were determined using

Table 2  
 Criterion scores for each child during feedback plus contingency-target and feedback plus contingency-Z.

Child	Feedback plus Contingency-Target			Feedback plus Contingency-Z	
	sessions 34-38	sessions 39-42	sessions 43-52	sessions 65-66	sessions 67-87
Ken	48%	70%	59%	56%	56%
Lynn	30	48	48	33	56
Max	30	48	30	33	33
Steve	30	48	33	33	44
Sue	59	85	85	67	67
Wade	70	70	70	78	78

the same considerations that determined the criteria for the target letters earlier. These criteria for each child are shown in the right-hand portion of Table 2.

RESULTS

The mean per cent correct printing responses of the six children for both the target

letters and the Zs are displayed in Fig. 2. A clear functional relationship between per cent correct and intermittent contingencies appears to exist. Correct responding on the target letters showed no change from Baseline to the Feedback only-Target phase of the experiment. Only when the feedback was paired with play-time, in the third phase, did responding improve. The ineffectiveness of feedback alone as

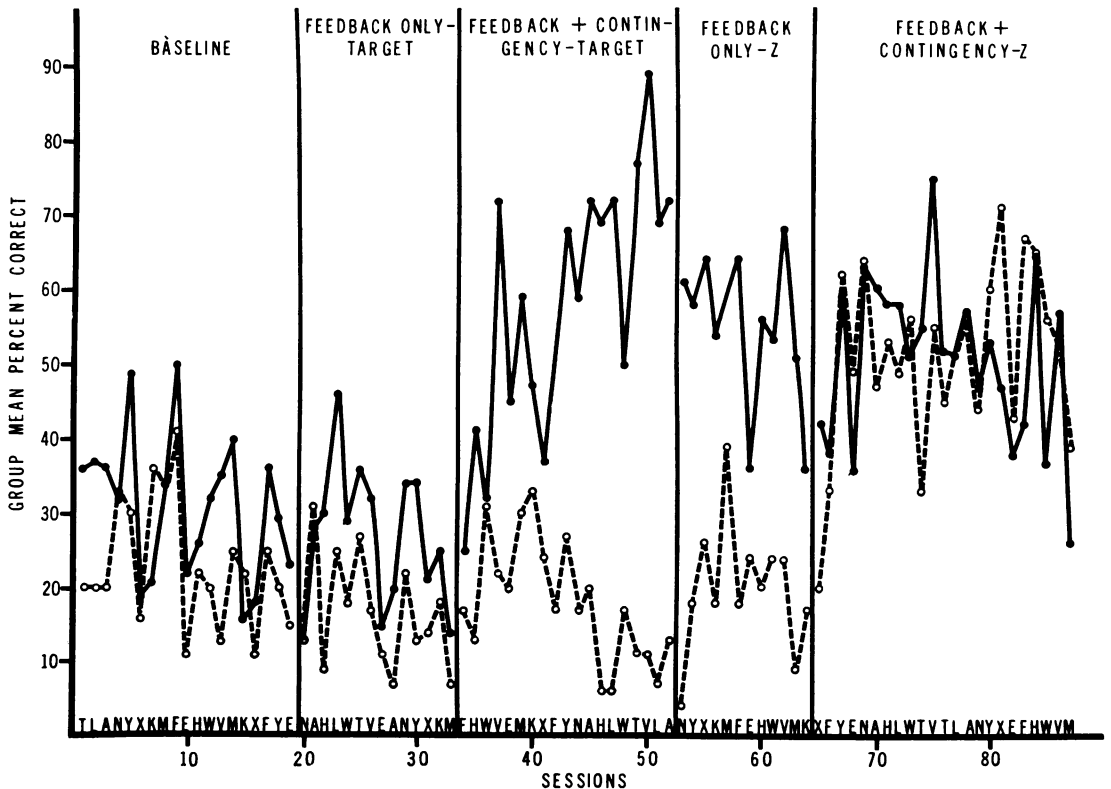


Fig. 2. Mean per cent of letters printed correctly each session. Each data point was obtained by dividing the total number of letters all of the children printed correctly by the total number of letters assigned. Solid circles are percentages on Target letters, and open circles are percentages on Zs. Letters appearing across bottom of graph are the Target letters assigned each session.

a reinforcer was confirmed when manipulations with the target letters were replicated on the Zs. No change is evident in responding on the Zs through the first four phases, but a substantial improvement on the Zs is evident in the fifth phase when intermittent contingencies were begun.

Figure 2 shows an apparent partial reversal of performance on the target letters when contingencies were removed in the Feedback only-Z condition. However, examination of the individual students' performances in Fig. 3 indicates that the mean per cent correct for two children, Ken and Max decreased during this condition. The means for the other children remained essentially unchanged. In addition, the average per cent correct on half of the letters presented during both conditions, increased from the third to the fourth condition. For example, the mean per cent correct responses on *W* during Session 48 was 50. During the next condition, Session 61, the mean per cent correct on *W*s increased to 53. The decrease in per cent of correct responding on target letters was greater during the final Feedback plus contingency-Z, condition. The mean per cent correct responding on target letters decreased for four of the children, all but Sue and Wade. Of the 12 target letters employed in both the third and fifth experimental conditions, the mean per cent correct responding decreased on all but one, *X*.

Figure 3 shows the mean per cent correct for each experimental phase for each child. Most of the variation between children is in the magnitude of the effect obtained and in baseline levels of performance. Almost all of the children showed the same directional changes that were evident in the graph for the group: little change in target letter performance from Baseline to the Feedback only-Target phase, improvement in target letters in Feedback plus contingency-Target, fairly steady low rate of correct responses on the Zs through the first four phases, and an improvement in the Zs in the fifth phase. All students maintained the highest average on the Zs during Feedback plus contingency-Z, but two, Sue and Wade, continued to improve in target letter performance in the last two phases. There is little evidence for generalization from target letter performance to Z performance. Only Ken and Steve showed increases in Z performance when target letter

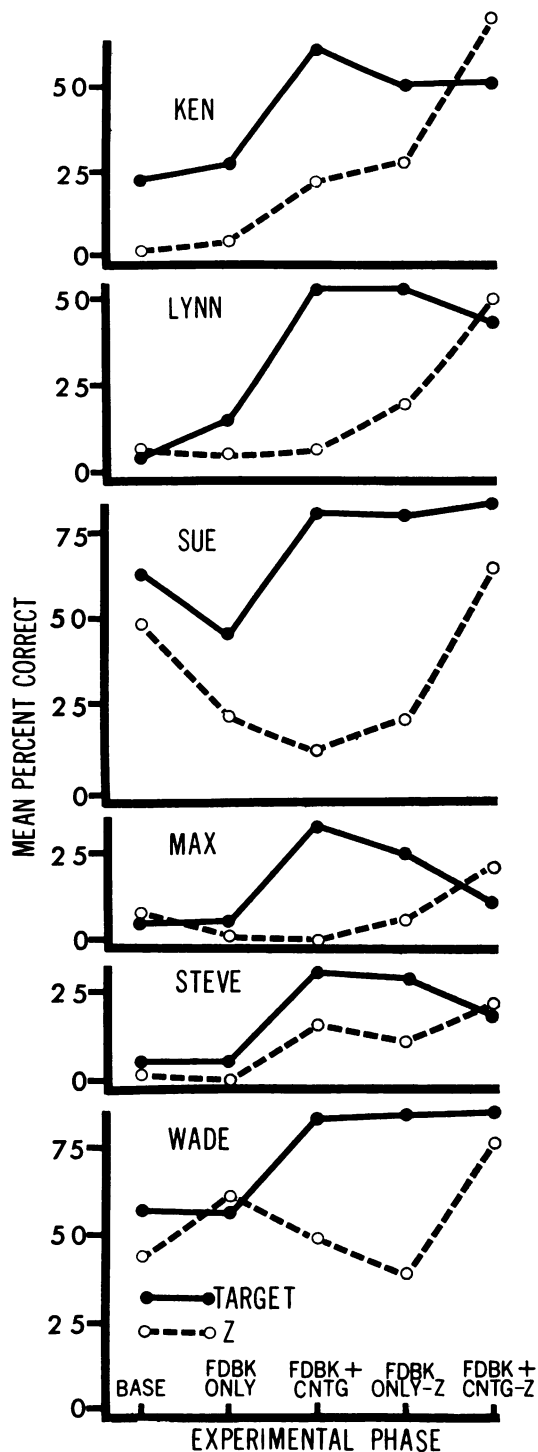


Fig. 3. Mean per cent of letters printed correctly by each child during each experimental condition. Each point was obtained by dividing the total number of letters printed correctly by a child by the total number of letters assigned to that child during the indicated condition.

performance was raised in the third phase, and Steve's mean increase in Z performance during the third phase was due to a temporary increase at the beginning of the manipulation. Steve's last four Z scores during the third phase were all 0%.

The children were also quite consistent in their unresponsiveness to feedback alone as a reinforcer. The largest increase in target letter performance from first to second phase was Lynn's 9%, due largely to three high scores during sessions 26, 29, and 30. The only large increase in Z performance during the Z feedback only condition was also Lynn's, and it was largely due to one high score of 78% in session 59.

Lynn's performance is unique among the children in one way, however. Although she proved remarkably responsive to the third manipulation with an increase in target letter performance of 38% correct, she never came into direct contact with the contingencies. Even though her criterion had been adjusted upwards, every time her paper was graded during the third phase, it exceeded the criterion set for her, so that she never had to repeat an assignment. From all outward appearances, the second and third phases were the same for Lynn, except that some of her classmates were having to repeat their work.

## DISCUSSION

Recent research (Hall *et al.*, 1968; Wolf, Giles, and Hall, 1968) has emphasized the importance of positive reinforcement to control the social and academic behaviors of school children. Hopkins, Schutte, and Garton (1971) and Surratt and Hopkins (1970) have shown that desirable classroom behaviors of elementary school children can be strengthened by allowing the children to play when they work rapidly and accurately. The present research replicates these findings with printing done by kindergarten children. However, the previous research had employed the application of this reinforcement contingency for every child as soon as he completed an appropriate assignment. The present study extended the general findings to the case where the contingency was applied to only 50% of the children on each day.

The intermittently applied consequences increased the quality of printing done by every

child. Moreover, the reliability of these effects was demonstrated by first applying the intermittent contingency to performances on one set of letters, and then later to performances on a different letter. Although the present study was conducted in a class of only six children, the intermittent contingency may prove especially useful for larger classes. Logistically, it has the effect of reducing class size by one half and of providing an organized means for classroom management.

The effects of the intermittent contingency were contrasted to two different teaching techniques. The first technique was the presentation of detailed instructions on how to print letters, with the children receiving no feedback on the quality of their work or differential reinforcement for relatively good performance. Instructions in the absence of both feedback and reinforcement generated relatively poor performances with no indication that this procedure was leading to better work. This finding is consistent with previous research, which has shown that instructions will not change the rate of non-academic behaviors of elementary school children unless the behaviors themselves are differentially reinforced (Zimmerman, Zimmerman, and Russell, 1969; Schutte and Hopkins, 1970). Once the rate of correct responding on target letters was raised to a higher level, this improved performance was partially maintained in the absence of feedback or play reinforcement during the fourth and fifth phases of the study. Unfortunately, this study does not provide for any indication of the extent to which the instructions were or were not partly responsible for the maintenance of the performances.

The second teaching technique to which the intermittent contingency was compared combined the use of detailed instructions with feedback on the quality of performances. No other differential reinforcement for accurate work was available. Again, this technique produced no improvement in the mean quality of the printing of target letters done by the class, and this general lack of effect was replicated for printing of Zs. This result is consistent with the findings of Surratt and Hopkins (1970) that the mathematics performances of first and second-grade children deteriorated when the children were given feedback on quality but no differential rein-

forcement for good work. However, other researchers (Michael and Macoby, 1953; Moore and Smith, 1961; Annett, 1964; Taber, Glaser, and Schaeffer, 1965) working with programmed instruction, have reported conflicting results, some obtaining an improvement in performance using feedback and others finding no such improvement. Feedback often includes the teacher making an evaluation or affective comment to the child such as: "You're doing good work today," or "My, what a smart boy you are." In the present study, the research design dictated that care be taken to provide affectively neutral feedback to the child. The teacher was instructed not to smile, touch the child, or make any other gesture that might connote approval or disapproval. This affectively neutral feedback did not improve the performance of either the target letters or the Zs. Many researchers (Hall, *et al.*, 1968; Harris, *et al.*, 1964; Whitley and Sulzer, 1970) have shown that teacher praise and attention can function as positive social reinforcers to increase the probability of behaviors they are contingent upon. To the extent that feedback includes attention and praise, a possible confounding exists, making it difficult to assess the effect of feedback independently from the effect of social reinforcement.

Perhaps the teacher or researcher should not be surprised by any effect or lack of effect produced by feedback or knowledge of results. If feedback is effective as a reinforcer it is clearly a conditioned reinforcer. The effectiveness of conditioned reinforcers to maintain or develop behaviors is apparently dependent on the conditioning history of the organism (Kelleher, 1966). Therefore, feedback might or might not strengthen the behaviors of a particular child or group of children. The exact effect would perhaps be dependent on such things as the extent to which feedback had been previously paired with other forms of positive reinforcement. The kindergarten children in the present study had limited academic histories; allowing for few pairings of feedback with other reinforcers. A teacher should treat the effects of feedback pragmatically and empirically. Before relying solely on feedback that is not paired with some stronger reinforcer she should carefully assess the effect of feedback to develop and maintain the performances of

the specific children being taught. If feedback alone is not effective, she should employ some more powerful differential reinforcement for good work.

This study did not compare the effects of the intermittent contingency to the effects that would be obtained by allowing every child access to play only when he adequately completed each printing assignment. It is possible that daily grading and contingent access to play would be more effective to develop desired skills but that the intermittent contingency would be adequate to maintain the skills once they were developed. Both Sue and Wade had relatively high baseline levels of performance which were improved during the intermittent contingency. In contrast, Steve and Max, who performed at a very low level during baseline, improved considerably during intermittent contingencies but never reached very high levels of performance. If they had had daily, rather than intermittent feedback and contingencies, this more frequent differential reinforcement might have been more effective in developing their skills. The teacher faced with the practical problem of levels of skills that vary widely over children might adjust her techniques to benefit each child rather than adopt a fixed procedure for all children, as was done for experimental purposes in the present study. A similar correlation existed between baseline performances and performances on target letters during the fourth and fifth phases of the study. Again, there were no decreases in the percentage of letters printed correctly by Sue and Wade, even though they received no feedback or contingent reinforcement. On the other hand, the printing performances of children with lower baseline scores decreased somewhat when reinforcement and feedback were discontinued.

In this experiment, the percentage of letters a child had to print correctly before he could go play was set at an arbitrary level. The imprecise rule that was followed was that the percentage requirement should be low enough that the child would not frequently miss getting to play entirely but high enough that he would get to play only if there was some general improvement in his printing. In fact, once the third phase of the experiment was well underway, most of the children consistently exceeded by comfortable margins the



criteria set for them. Practically, frequent small shifts in the criteria might be more useful to rapidly develop printing skills. However, a teacher would have to be careful not to set criteria so high that the child could not meet it, even on repeated assignments, or so low that no improvement would occur.

An intermittently applied contingency that involves allowing kindergarten children to play dependent on the quality of their academic work is a relatively effective teaching technique. The technique is sufficiently flexible that it can be rationally adjusted to accommodate a variety of problems inherent in the development of academic skills. It conserves a teacher's time and involves minimal demands for additional expense or teacher training.

#### REFERENCES

- Annett, J. Error responses and reinforcement schedules in self instrumental devices. In A. Lumsdaine and R. Glaser (Eds.), *Teaching machines and programmed learning*. Washington, D. C.: National Education Association, 1960. Pp. 506-516.
- Ayllon, A. and Azrin, N. H. *The token economy: a motivational system for therapy and rehabilitation*. New York: Appleton-Century-Crofts, 1968.
- Barrish, H. H., Saunders, M., and Wolf, M. M. Good behavior game: effects of individual contingencies for group consequences on disruptive behavior in a classroom. *Journal of Applied Behavior Analysis*, 1969, 2, 119-124.
- Birnbrauer, J. S., Wolf, M. M., Kidder, J. D., and Tague, C. E. Classroom behavior of retarded pupils with token reinforcement. *Journal of Experimental Child Psychology*, 1965, 2, 219-235.
- Hall, R. V., Lund, D., and Jackson, D. Effects of teacher attention on study behavior. *Journal of Applied Behavior Analysis*, 1968, 1, 1-12.
- Hall, R. V., Panyan, M., Rabon, D., and Broden, M. Instructing beginning teachers in reinforcement procedures which improve classroom control. *Journal of Applied Behavior Analysis*, 1968, 1, 315-322.
- Harris, F. R., Wolf, M. M., and Baer, D. W. Effects of adult social reinforcement on child behavior. *Young Children*, 1964, 20, 8-17.
- Hopkins, B. L., Schutte, R., and Garton, K. The effects of access to a playroom on the rate and quality of printing of first and second-grade children. *Journal of Applied Behavior Analysis*, 1971, 4, 77-87.
- Kelleher, R. T. Chaining and conditioned reinforcement. In W. K. Honig (Ed.), *Operant behavior: areas of research and application*. New York: Appleton-Century-Crofts, 1966. Pp. 160-212.
- Lindsley, O. R. Intermittent grading. *The Clearing House: A journal for modern junior and senior high schools*, 1958, 32, 451-454.
- Lovitt, T. C. and Curtiss, K. A. Academic response rate as a function of teacher and self-imposed contingencies. *Journal of Applied Behavior Analysis*, 1969, 2, 49-53.
- Madsen, C. H., Becker, W. C., and Thomas, D. R. Rules, praise and ignoring: elements of elementary classroom control. *Journal of Applied Behavior Analysis*, 1968, 1, 139-150.
- Michael, D. and Macoby, N. Factors influencing verbal learning from films under varying conditions of audience participation. *Journal of Experimental Psychology*, 1953, 46, 411-418.
- Miller, L. K. and Schneider, R. The use of a token system in project Head Start. *Journal of Applied Behavior Analysis*, 1970, 3, 213-220.
- Moore, J. and Smith, W. Knowledge of results in self-teaching spelling. *Psychological Reports*, 1961, 9, 717-726.
- Rondinella, O. R. An evaluation of subjectivity of elementary-school teachers in grading handwriting. *Elementary English*, 1963, 40, 531-532.
- Schmidt, C. W. and Ulrich, R. E. Effects of group contingent events upon classroom noise. *Journal of Applied Behavior Analysis*, 1969, 2, 171-179.
- Skinner, B. F. and Krakower, S. *Handwriting with write and see*. Chicago: Lyons and Carnahan, 1968.
- Staats, A. W., Finley, J., Minke, K. A., and Wolf, M. M. Reinforcement variables in the control of unit reading responses. *Journal of the Experimental Analysis of Behavior*, 1964, 7, 139-149.
- Surratt, P. and Hopkins, B. L. *The effects of access to a playroom on the speed and quality of arithmetic work of first and second grade children: a replication and systematic analysis*. Paper read at the 1970 American Education Research Association meeting, Minneapolis.
- Surratt, P., Ulrich, R. E., and Hawkins, R. P. An elementary student as a behavioral engineer. *Journal of Applied Behavior Analysis*, 1969, 2, 85-92.
- Taber, J., Glaser, R., and Schaeffer, H. *Learning and programmed instruction*. Reading, Mass.: Addison-Wesley, 1965.
- Whitley, A. D. and Sulzer, B. Reducing disruptive behavior through consultation. *Personnel and Guidance Journal*, 1970, 43, 836-841.
- Wolf, M. M., Giles, D. K., and Hall, R. V. Experiments with token reinforcement in a remedial classroom. *Behavior Research and Therapy*, 1968, 6, 51-64.
- Zimmerman, E. H., Zimmerman, J., and Russell, C. D. Differential effects of token reinforcement on instruction-following behavior in retarded students instructed as a group. *Journal of Applied Behavior Analysis*, 1969, 2, 101-112.

Received 2 October 1970.

(Revised 22 May 1971.)