*INTERACTIONS BETWEEN TEACHER GUIDANCE AND
CONTINGENT ACCESS TO PLAY IN DEVELOPING
PREACADEMIC SKILLS OF DEVIANT
PRESCHOOL CHILDREN¹*

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Token-mediated access to play and snacks was made contingent on completion of academic tasks in the Baseline Experiment. This contingency produced stable completion rates that were subsequently doubled, and then tripled, for four deviant children in a special preschool. A reversal design demonstrated that the contingency was functional in maintaining the children's rates of task completion. The Guidance Experiment examined the role of a social event, teacher guidance, in the acquisition of task-completion skills, in a multiple-baseline-across-tasks design (with reversals). The analysis demonstrated that teacher guidance was an important supplement to the token-mediated contingency in establishing significant increases in task completions for a second group of three deviant children in the special class. The importance of teacher guidance was related to the difficulty level of the children's tasks.

DESCRIPTORS: activities, attention, reinforcement criteria, DRO, natural reinforcers, teacher attention, tokens, preschool children

In the past decade, reinforcement principles have been used increasingly as the basis for the partial redesign of traditional educational settings, and occasionally for the design of new ones. Typically, reinforcement contingencies have been applied to either student on-task re-

sponses (the usual case), or to academic achievement (less often). This research should be relevant to educational settings that treat children with severe behavior problems, since such children usually become educational dropouts at the elementary school level unless early intervention remediates their behavioral deficits and excesses.

However, the extant classroom literature reveals many unsolved problems. For example, studies often differ in their specific definitions of appropriate classroom performance. Generally, target behaviors fall into three categories: (a) *on-task behavior*³—appropriate orientation to materials, in-seat, and/or low levels of disruptive behavior, (b) *instruction following*,⁴ and

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³Chadwick and Day, 1971; Dietz and Repp, 1973; Ferritor, Buckholdt, Hamblin, and Smith, 1972; Hall, Panyan, Rabon, and Broden, 1968; Harris and Sherman, 1973; Long and Williams, 1973; O'Leary and Becker, 1967; O'Leary, Becker, Evans, and Saudargas, 1969; Osborne, 1969; Patterson, Jones, Whittier, and Wright, 1965; Twardosz and Sajwaj, 1972; Walker and Buckley, 1968; Ward and Baker, 1968.

⁴Baer, Rowbury, and Baer, 1973; Schutte and Hopkins, 1970; Whitman, Zakaras, and Chardos, 1971; Zimmerman, Zimmerman, and Russell, 1969.

(c) *academic performance*⁵—amount of work, manipulation of materials, completion of assignments, and accuracy.

These three types of behavior certainly reflect aspects of appropriate classroom performance, but recent research indicates that they are not always functionally related and thus that "appropriate classroom performance" is not a unitary behavioral target. In particular, the development of on-task performances need not produce increased academic achievement (*cf.* Ferritor *et al.*, 1972; Harris and Sherman, 1973, p. 416), and although reinforcement of academic achievement often results in decreased disruptive and increased on-task behaviors (Ayllon, Layman, and Burke, 1972; Ayllon and Roberts, 1974; Johnson, 1970; McKenzie, Clark, Wolf, Kothera, and Benson, 1968), there have been important exceptions (*e.g.*, Ferritor *et al.*, 1972). Thus, the choice of which behaviors to treat is by no means settled, depending largely on still unclarified interdependencies among these behavior classes, and on the implicit values and goals of parents, school systems, and the populations under treatment. However, it does seem true that if academic-achievement outcomes are desired, they might best be targeted directly.

Similarly, the choice of the appropriate reinforcer system is open to question. The relevant considerations include cost, effectiveness, ease of delivery, potential for generalization to other settings, and social acceptability. Early studies found that teacher attention could be altered to provide an immediate and natural system for changing on-task rates (Chadwick and Day, 1971; Hall *et al.*, 1968; Hasazi and Hasazi, 1972; Ward and Baker, 1968). However, attention was not always effective as a reinforcer,

and token systems with more potent back-ups became popular alternatives (O'Leary and Becker, 1967, p. 637; Quay, Werry, McQueen, and Sprague, 1966). Studies that dealt with token systems typically dropped the analysis of adult attention and emphasized instead the effect of nonsocial consequences on appropriate classroom behavior. Thus, any interaction of the two motivational systems remained largely unexamined. Indeed, only the studies of compliance with instructions examined any positive effect of antecedent adult attention on the subsequent responses of children, and that was limited to the instructions given. Consequently, little research has focused on the potential mediating effect of "teaching behaviors" such as prompting, physical guidance, explanations of the task, and praise for successive steps toward solution, within a token-mediated reinforcement system. Thus, the possible supporting role of an adult's "teaching behaviors" has not received formal analysis, allowing some proponents to assume it is essential, while others consider it traditional but superstitious.

In the initial studies of token-mediated systems of reinforcement in classroom settings, tangible reinforcers in the form of trinkets, food, and money were used extensively (Chadwick and Day, 1971; Martin *et al.*, 1968; O'Leary *et al.*, 1969; Patterson *et al.*, 1965; Zimmerman *et al.*, 1969). Promptly, however, some researchers began examining the effect of another class of more-natural reinforcers—play activities and materials, and free time. These "natural" reinforcers were found in the home (Nordquist and Wahler, 1973; Phillips, 1968), in psychiatric institutions (Ayllon and Azrin, 1968; Mitchell and Stoffelmayr, 1973), and in educational settings for children and adolescents.⁶ It has been argued that natural reinforcers should be used whenever

⁵Brigham, Finfrock, Breunig, and Bushell, 1972; Chadwick and Day, 1971; Hall and Broden, 1967; Harris and Sherman, 1973; Hasazi and Hasazi, 1972; Hopkins, Schutte, and Garton, 1971; Jacobson, Bushell, and Risley, 1969; Knapczyk and Livingston, 1973; Lahey, McNees, and Brown, 1973; Martin, England, Kaprowy, Kilgour, and Pilek, 1968; Miller and Schneider, 1970; Salzberg, Wheeler, Devar, and Hopkins, 1971; Wolk, Giles, and Hall, 1968.

⁶Betancourt and Zeiler, 1971; Brigham *et al.*, 1972; Harris and Sherman, 1973; Hopkins *et al.*, 1971; Jacobson *et al.*, 1969; Knapczyk and Livingston, 1973; Miller and Schneider, 1970; Osborne, 1969; Reynolds and Risley, 1968; Salzberg *et al.*, 1971; Wolf *et al.*, 1968.

possible because they should facilitate generalization of behavior change (Axelrod, 1971; Lovaas, Koegel, Simmons, and Long, 1973).

The goals of the present study required the design and analysis of a natural classroom reinforcement system that would strongly promote the acquisition and maintenance of preacademic skills by young children with severe and comprehensive behavior problems. A class of product-defined behaviors—task completions—was chosen to reflect the terminal performances ultimately required in successful academic settings, and to allow for a range of difficulty of academic tasks. The purpose of the study then became the analysis of (a) the function of teacher behavior—"guidance"—within this strong system of token reinforcement, and (b) the interaction, if any, of teacher behavior with the difficulty level of the tasks being taught.

To this end, two experiments were performed. The first served as a baseline for the second: it established a natural classroom token system and displayed its functional role in maintaining deviant children's academic behaviors; it then tested the system's effectiveness in producing and maintaining extended academic performances of considerable length and effort. In the second experiment, the special role of the teachers' social guidance within that system, was examined together with the possible interactive effect of task difficulty on the role of teacher guidance. The Baseline Experiment's development and documentation of the power of the token system in use was essential to the logic of the Guidance Experiment that followed it: the role of social techniques such as guidance could easily be strong in a weak token system; only in a clearly effective system would their function be of interest.

METHOD

Subjects

Of seven children referred to the special preschool class because of comprehensive behavior problems, most had been ejected from normal

preschool classes, threatened with ejection, or required to postpone public schooling because of the severity of their deviancies. They had been variously described as emotionally disturbed, brain damaged, autistic, or retarded. Their problems included short attention span, hyperactivity, severe disruptive or aggressive behavior, bizarre or eccentric mannerisms, and language and cognitive deficits relative to their age and impending public schooling. Four of the seven were virtually nonverbal when they entered the class. The four children in the Baseline Experiment ranged from 4 to 6 yr of age; the three in the Guidance Experiment were 4 to 7 yr of age. The Baseline Experiment subjects comprised the total class when the experiment was begun. The Guidance Experiment was conducted the following school year; its three subjects were new pupils with no experience in the classroom reinforcement system.

THE BASELINE EXPERIMENT

Setting

The Baseline Experiment took place in a large, well-equipped preschool classroom. The children attended the class four afternoons a week (Monday to Thursday) for 2.5 hr per session. Initially, at least 1.5 hr each day had been devoted to free-choice activities. During the free-choice periods, the four subjects all consistently avoided preacademic materials, which included visual discrimination and matching items, form-insertion items, and manipulative materials. Even with teacher help, their contacts with these items rarely consisted of more than the placement of one or two pieces. Because these children had deficits in attending and preacademic skills, contact with precisely these materials was desirable. Consequently, the classroom was divided into two areas, a work area that contained preacademic materials, and a play area that contained a variety of preferred play activities. A barrier, consisting of a row of long blocks or dividers, separated the two areas. A gap in the barrier allowed passage be-

tween them. The work area was equipped with a container of Peabody tokens to be dispensed by the work teacher as reinforcers; the play area was equipped with a timer for each child, labelled with his name, to determine a length of play time for each child admitted to the play area. Any child with a token was admitted.

Fourteen preacademic tasks were included in the work area. The tasks were chosen from standard preschool curriculum materials, and nearly all had been available to the children previously. Tasks were chosen on the basis of requiring visual matching, form fitting, or manipulative skills. They were categorized as preacademic because the behaviors needed to complete them—visual comparison, form, color, and size matching, object orientation, and eye-hand coordination—are valuable precursors to later, more advanced academic performances. Furthermore, the subjects were all notably deficient in these skills. In addition, each task involved five to 15 responses that could be counted, or that led to an easily determined completed product. No task required an expressive (spoken) language response. A criterion of complete performance was established for each task before the experiment began. Seven tasks were available in the work area on Mondays and Wednesdays, the other seven on Tuesdays and Thursdays. A complete description of the 14 tasks and their one-completion criteria is included in Baer *et al.* (1973).

Design

The experimental design was a reversal design of the form B₁, A, B₁, B₂, B₃. B₂ and B₃ represented conditions of increased requirements for reinforcement relative to the requirements for reinforcement in B₁. Condition changes were made simultaneously for all four children, in the following sequence: (a) reinforcement for one completion per task ($\times 1$), (b) differential reinforcement of other than completion (DRO), (c) re-instatement of $\times 1$, (d) reinforcement for two completions ($\times 2$), and (e) reinforcement for three completions ($\times 3$).

The experimental design began with the token-mediated reinforcement system in effect, rather than with a more usual no-token baseline. Due to the severity of the subjects' behavior problems, it was desirable to initiate them immediately into a pattern of behavior consisting predominantly of productive academic behavior and acceptable play. The subsequent DRO condition then simply shifted the balance of these two behaviors, rather than discontinuing experimental control and thus allowing off-task or disruptive responses to emerge. At the same time, the DRO condition represented manipulation of the single factor targeted for analysis: contingent access to play, used as a reinforcer.

Reinforcement of One Completion ($\times 1$)

During this and all subsequent conditions, the seven daily work tasks were arranged on tables or on the carpet around the work area. At the beginning of the 1.5-hr period, the work-area teacher told the children that it was "token time" or "time to work", and led them individually into the work area, if necessary. She then gave an invitation to complete a task (for example, "How about doing a puzzle?" while pointing to the puzzles). Although the teacher's invitations were specific, the child was free to choose any of the seven tasks. When the child was seated at one of the tasks, the teacher remained available to help by demonstrating a response, putting the child through a response, instructing, and praising appropriate work behavior.

If the child performed the criterion completion of any task, the teacher offered praise and a plastic token. Dawdling was ignored. Children with a token could present it to the teacher in the play area, who admitted them to the area and set their individual timers for 5 min. If a child requested it, the teacher also offered a small snack (a miniature marshmallow, small cracker, several raisins, Kool-aid, *etc.*). The child was free to play with any of the four or five play-area activities during this time. The play activities

varied from day to day, but included at least one activity that was highly preferred by each child each day. The play-area teacher also gave out materials, interacted with the children, and actively played with the children in their preferred activities.

When a child's timer rang after 5 min, the play teacher again said it was "token time" and returned the child to the work area. The work-area teacher then gave an invitation to another task, systematically rotating her invitations through the tasks available each time any child entered the work area. This alternating work-play sequence was in effect for all four children for 1.5 hr a day.

Differential Reinforcement for Other than Completion: DRO

During this condition, the children could no longer earn a token by completing a task. Instead, tokens were delivered for sitting down at a task in the work area, or for doing the first part of a task, but were never delivered immediately after a completion.

Reinforcement of Two Completions ($\times 2$) and Three Completions ($\times 3$)

After a brief period (post-DRO) in which the $\times 1$ condition was re-instated, the amount of work required was systematically increased. During this condition, a child was required to perform two completions of the same task in order to earn a token for the 5-min play time. If the task was one for which duplicates could be provided, *e.g.*, puzzles, the child was asked to do two puzzles; if the item had no duplicate, *e.g.*, the form box, the child was required to dismantle it after one completion and do it again for the second completion.

In the next condition ($\times 3$), the child had to do three completions of the same task before earning a token and a 5-min play time.

Observation and Recording

An observer was assigned to each child. The observer recorded continuously in 10-sec inter-

vals, noting the name of a task in the first interval in which it was contacted by the child, and marking its completion in whatever interval it occurred. In the multiple completion conditions ($\times 2$ and $\times 3$), the observer noted 1, 2, and 3 in the appropriate interval for each successive completion of the task.

To evaluate reliability of observation, two observers periodically observed the same child for 30 min simultaneously but independently. Reliability observations on occurrence of completions were made at least seven times for each child during the study. Reliability was computed as a percentage of agreement between the two observers on the interval of occurrence of a completion. An agreement was counted when both observers scored a completion in the same or an adjacent 10-sec interval (to allow for typical slippage in stopwatches running for long periods of time).

Reliability of recording occurrence of completions ranged from 71% to 100% across the 32 reliability observations. Median reliability scores were 95%, 96%, 96%, and 97% for the four children, respectively.

RESULTS

Number of Completions

Figure 1 shows the daily number of task completions for each of the four children during the five conditions of the Baseline Experiment. In the first $\times 1$ condition, the average number of completions for the four children ranged between eight and 11 per day. When the DRO reversal was implemented, this average dropped to five or six completions per day. Re-instatement of the original $\times 1$ contingency produced a return to the original level of completions for each child, average completions ranging between six and 12. At this point, the levels of completions for all children were stable, with the possible exception of Frankie, whose performance increased in the last three days of the return of $\times 1$ condition.

Fig. 1. The daily number of completions for Charlotte, Hannah, Frankie, and Bertha during conditions of one-completion (X1), two-completion (X2), and three-completion (X3) requirements, and DRO.

In the last two conditions of Experiment 1, when systematic increases in the response requirements were initiated, the daily average completions of each child increased. Average completions during the $\times 2$ condition ranged from 12 to 15. When the requirement was increased to three completions for reinforcement ($\times 3$), average completion levels again increased, ranging between 17 and 24.

DISCUSSION

The results indicate that token-mediated access to the play area was an effective reinforcer for establishing and maintaining sustained levels of completion of the preacademic tasks in the work area. When access to play was not contingent on task completion (DRO), levels of completions dropped for all children. When increased numbers of chained completions were required to earn the 5-min play time ($\times 2$ and $\times 3$ conditions), completion levels of the four children increased systematically and readily in conjunction with the increased criteria. Thus, access to play appeared to be a reinforcer capable of maintaining sustained contact with preacademic materials (at least at the three-completion level) for long periods of time. Each child showed a stable level of completion during the $\times 3$ condition of the study for at least 54 days, or 13 calendar weeks of school. These levels were approximately 2.5 times the levels characteristic of the one-completion condition ($\times 1$).

The sequence of conditions comparing one-completion, two-completion, and three-completion response requirements has been termed a "changing criterion" design by Hall (1971). An important condition for successful use of this design is the display of essentially step-wise behavior change in close correlation with the criterion changes called for by the design. The behavior changes shown in Figure 1 seem to meet this condition.

THE GUIDANCE EXPERIMENT

The results of the Baseline Experiment demonstrated the effectiveness of access to play as a

classroom reinforcer system. However, its design did not permit analysis of the role of a potentially important component of that system, teacher attention. In fact, teacher attention was never manipulated: it was always freely available. In a classroom, a large part of teacher attention may be instructional in topography. Thus, it is important to establish whether such guidance, in the form of instructions, assistance, modelling, and praise for correct responses, is functional in developing increased rates of task completions. Such teacher attention may be an essential supplement in establishing preacademic skills or it may be merely superstitious behavior. Alternatively, its function early in learning may be different from its function in the later maintenance of completions. In the Guidance Experiment, both these possibilities were considered; meanwhile, the play-area reinforcement component was held constant.

Subjects and Setting

Three children who had no experience with the classroom were chosen for the Guidance Experiment in the school year following the Baseline Experiment.

The setting remained the same, but the work area now contained a desk for each child and shelves on which work tasks for each child were placed. Three teachers staffed the classroom: one in the work area, another in the play area, and a third who moved between the areas as needed. Assignments of teachers to these roles rotated daily.

Design

The design consisted of four phases for each subject: (a) a reinforcer test to establish the function of access to the play area as a reinforcer for task completions, (b) an analysis of teacher guidance given for certain groups of preacademic tasks, in a multiple-baseline design across groups of tasks, (c) a re-evaluation of the reinforcing function of the play area, and (d) steadily reduced guidance, with probes for the

possibility of independent performance free of any guidance.

Reinforcer test: procedure and results. Two simple tasks were chosen to evaluate the reinforcing function of access to the play area for the new children: one was placing chips in a wooden box with a slotted top, the other was placing wooden disks on an upright pole about 20 cm high. In each task, a completion was defined as six pieces placed. An observer watched each child, recording all pole- and chip-task completions.

There were three phases to the reinforcer test. (a) During a baseline period, each child was called to the work area; both toys, each with 18 pieces to place, were available on his desk. Tokens worth 5-min access to the play area were delivered after 10 sec of any acceptable (non-disruptive) behavior that was *not* a placement of either pole-task or chip-task pieces. If pieces were placed in the first 10 sec, the token was not delivered until 30 sec of (acceptable) nonplacement elapsed. Teacher attention in the work area was restricted to the "token time" instruction and token delivery. (b) After a stable baseline was observed, the token was given contingent on one completion of the child's less-preferred task, as assessed from the baseline data. (c) After clear effects were seen, the token contingency was reversed from one task to the other.

Figure 2 shows the rates of pole-task and chip-task completions for each of the subjects during the three conditions of the reinforcer test. The baseline generated low levels of pole-task and chip-task completions, but also established that the responses were within the children's skill levels. During reinforcement of the initially less-preferred task, Leo's and Larry's target completions (the chip task) increased, as did David's (the pole task). Completions of the nonreinforced task remained at lower levels. When the contingency was reversed from one task to the other, relative completion rates rapidly reversed for Leo and Larry: completions of the newly reinforced task increased, and completions of the

nonreinforced task decreased. In David's case, the shift produced an increase in the newly reinforced task, but erratic rates of completing the previously reinforced task, possibly due to adventitious chaining. However, as the condition continued, a preference for the reinforced task was seen.

Individual multiple baselines across groups of tasks. After the reinforcer test had shown positive results for the three new subjects, a list of preacademic tasks was drawn up for each child. These lists contained from six to 12 items estimated by the teachers to be just above the child's current skill level. A criterion performance (one completion) was defined for every task. Each child's list was then divided into three groups, for a multiple-baseline analysis of teacher guidance. Tables 1 and 2 show the groups of tasks established for each child, with their criterion performances. Leo and Larry's initial lists consisted of the same 12 tasks arranged in three groups of four tasks each, presented in the same Monday-Wednesday/Tuesday-Thursday alternation described in the Baseline Experiment. David's list consisted of six different tasks arranged in three groups of two tasks each, which he received daily. Larry, after completing a study based on his first list, was later exposed to a second list of eight tasks, divided into four groups of two tasks each (Larry, Set 2), which he received daily.

During all conditions of the study, a child's daily tasks were listed on a card placed by his desk. Individual tasks were listed in a sequence across groups, *e.g.*, one task from each of Groups 1, 2, 3; then, a second task from each of Groups 1, 2, 3; *etc.* The teachers followed this sequence in presenting tasks to a child, checking off each one as it was presented. In all conditions, exposure to each task was limited to 5 min per presentation. If a child did not complete the task (and thus receive a token) within that time, the next task was presented. Similarly, if the child placed all the pieces but made one or more errors, the next task was presented. Observers signalled the teacher when a child's 5 min had

Fig. 2. The daily number of pole and chip completions for Leo, Larry, and David during Baseline, Reinforcement 1, and Reinforcement 2 (switch) conditions.

Table 1
Description of Guidance Task Classes, with Criterion Amounts Defining One Completion

<i>Tasks</i>	<i>Task Group</i>	<i>Criterion Amount Defining One Completion</i>
<i>Monday-Wednesday Tasks</i>		
<i>Leo and Larry (Set 1)</i>		
Lotto (simple forms)	G-1 (Leo and Larry)	Complete one card correctly, <i>i.e.</i> , place six small cards on matching picture on large card.
Geometric Insets	G-1 (Leo and Larry)	Remove six insets and replace in correct frames.
Fit-a-Space (three- to four-piece rubber puzzle)	G-2 Leo G-3 Larry	Complete two Fit-a-Space puzzles correctly.
Wooden Puzzles (six to eight piece)	G-2 Leo G-3 Larry	Complete one puzzle correctly.
Rig-a-Jig	G-3 Leo G-2 Larry	Fit together five pieces in one or more units.
Number Sorter	G-3 Leo G-2 Larry	Remove 15 units, scramble, replace on correct peg configuration.
<i>Tuesday-Thursday Tasks</i>		
Judy Matchettes (common objects)	G-1 (Leo and Larry)	Complete one card correctly, <i>i.e.</i> , place six small cards under matching pictures on large card.
Shape Sorter	G-1 (Leo and Larry)	Place each of nine shapes correctly on one of three models.
Form Box	G-2 Leo G-3 Larry	Remove all 15 pieces from box and insert through matching holes in lid.
Inset Cylinders	G-2 Leo G-3 Larry	Remove, scramble, and replace 10 cylinders of graded size into correct holes.
Picture Dominoes	G-3 Leo G-2 Larry	Make five matches in two domino units or continuous lines.
Lego Blocks	G-3 Leo G-2 Larry	Fit together five pieces in one or more units.

elapsed. Normally the 1.5-hr work-play period allowed sufficient time for exposure to each task on the list, with perhaps one or two repeated exposures. The next day, the teacher began with the task following the last one completed the day before, to balance exposure to all tasks.

Four successive conditions made up the design of this part of the Guidance Experiment:

1. From the onset of the study (after the reinforcer test), teacher guidance was available for each subject's first group of tasks. This ensured some contact with the play-area reinforcer, thus avoiding massed extinction. Thus, for each child, every third task presentation was a guidance condition task, as specified by the presentation sequence.

For those groups of tasks in which teacher

guidance was presented, it took the form of instructions about relevant features of the task, "putting through", demonstrations of responses, and praise or physical contact for correct responses or appropriate attending behaviors. Examples include, "Put the blue one here", guiding a child's hand to the correct place for a match response; "See, it goes here", while placing a piece, then removing it for a child to place; or verbal descriptive praise, such as, "Good, you're looking at the card", "Right, dog goes with dog". One child, David, was deaf; in his case, guidance took the form of visual instructions, demonstrations, physical pats, and smiles or nods that he could see.

When a child was presented with a guided task, the teacher put the task on the child's desk in its completed form (with the exception

Table 2
Description of Guidance Task Classes, with Criterion Amounts Defining One Completion

<i>Tasks</i>	<i>Task Group</i>	<i>Criterion Amount Defining One Completion</i>
<i>David</i>		
Alphabet Lotto	G-1	Complete two cards correctly, <i>i.e.</i> , place 12 small cards on matching letters on large card.
Circle The Same	G-1	Circle the correct match to 10 samples (each match from three choices; five matches per page; two pages = 10 responses)
Writing	G-2	Trace two pages of horizontal, vertical, or diagonal lines with no errors. One page = 10 responses.
Coloring	G-2	Color inside the lines (no errors), filling in three 7.5-cm shapes: one circle, one square, one triangle.
Number-Dot-Cards (1-5)	G-3	Place two quantity dot cards under correct quantity sample cards (1-5)—one direct match, one indirect match.
Judy Matchette (word)	G-3	Complete two cards correctly, <i>i.e.</i> , place 12 small word cards under correct word-picture samples.
<i>Larry (Set 2)</i>		
Circle The Same	G-1	See David's List.
Alphabet	G-1	See David's List.
Number-Dot Cards	G-2	See David's List.
Judy Matchette (word)	G-2	See David's List.
Parquetry	G-3	Complete one eight- to 10-block design on top of paper design. All blocks of correct color and in correct orientation.
Writing	G-3	See David's List.
Tiles	G-4	Duplicate three lines of 10 tiles by placing exact color, number, and pattern of tiles under the sample rows.
Coloring	G-4	Fill in three 3.75-cm shapes (circle, square, triangle) with no more than one error of going outside the lines.

of Lego and Rig-a-Jig). She then helped remove all the pieces and gave one complete instruction about how to complete the task, or modelled one of the responses. For the remainder of the 5-min period, she delivered high levels of guidance, altering her responses from help to praise as the child showed skill increments in the response requirements. If the child completed the task within the 5-min period, a token was given that was traded for 5-min access to free play as previously described. If the child did not complete the task within 5 min, even with guidance, the next task on that child's list was presented. Another 5-min period was then begun.

At the same time that guidance was being applied to Group 1 tasks, Group 2 and Group 3 tasks were examined under baseline conditions of potential token reinforcement but no guidance. When a baseline task was presented, the

teacher again helped the child remove all pieces of the complete item. She then gave one comprehensive instruction or demonstration of how the task could be completed. After this initial instruction, she gave no further attention until the child had completed the task, or 5 min had elapsed, or the child had placed the pieces incorrectly. Completion of a task during baseline presentations resulted in the delivery of a token and the 5-min access to free play. Noncompletion of a baseline task resulted in presentation of the next task, and a new 5-min period.

2. When stable baseline levels had been assessed for the Group 2 and Group 3 tasks for each child, guidance was systematically added to Group 2 tasks, while Group 3 tasks were maintained under baseline conditions.

3. Finally, guidance was added to the last group of tasks (Group 3).

This same multiple-baseline strategy was implemented for Larry's second set of tasks, consisting of four groups of tasks.

4. A DRO reversal was arranged for each child after the third guidance condition (but before Larry's second set of tasks had undergone guidance). During DRO, the subjects were no longer required to complete a task in order to earn the token. Instead, tokens were delivered when the child entered the work area (after 5 min of play), when the child was initially seated at a desk, or after the performance of some responses of the task, but not a full completion. If a completion occurred inadvertently before a token could be delivered, a delay of at least 30 sec was imposed before the token was given. The subjects were still invited to complete the task on their desks, and guidance continued if a child was working on a task, before or after delivery of the token. Token delivery was accompanied by a teacher statement such as, "You can go play now or you can do (finish) the number sorter". (The teacher pointed to the options as she stated them.)

5. As the final experimental condition, the guidance package was re-instated for all tasks, but the teachers steadily reduced their levels of guidance across all groups of tasks.

Probes for independent performance were scheduled for Leo and David approximately 12 days after the end of DRO, for one group of tasks per day. Probes consisted of a return to the baseline conditions of one complete instruction and no teacher attention until the child completed the task, or 5 min had elapsed, or all the pieces were placed but not correctly. Completions were followed by a token and 5-min access to free play; noncompletion resulted in presentation of the next task. When any one group of tasks was being probed, guidance continued for the other two groups. (Larry's performance was probed only after a multiple-baseline analysis had been conducted with his second list of tasks. His performance with the first set suggested no need for probes of independence from guidance.)

Larry underwent the sequence of conditions described above. Because of his unique pattern of response to these conditions (described below), the study was repeated for him with a second set of tasks. In this repetition, the multiple-baseline design was similar to the one just described, but was based on four groups of tasks (see Table 2), rather than three. No DRO condition was applied, in view of the clear effects of the DRO condition seen in the first set of tasks (described below).

Observation and Recording

Each child's observer recorded the name of each task presented, task completions when they occurred, 5-min exposure periods, and teacher guidance during "work time", using 10-sec continuous-recording procedures. "Work time" for each task was defined as the elapsed time between sitting down to the task and receiving a token for its completion ("sit-to-token"), or between sitting down to the task and expiration of the 5-min time limit, *i.e.*, from the first interval in which a child was seated at a desk and presented with the task until the interval in which a token was received or 5 min had elapsed. Teacher guidance was recorded only during work time, thus excluding teacher attention between tasks and in transitions between the work and play areas.

Reliability of observation was assessed for each child, at each level of performance throughout the study. Reliability periods consisted of at least 30 min of simultaneous but independent recording by two observers. Their records were then compared for intervals of occurrence of completions and intervals of occurrence of teacher guidance. An agreement was scored if both observers recorded the event in the same or an adjacent interval. Both completions and guidance were relatively low-rate events, thus requiring an occurrence-reliability assessment and justifying the use of adjacent-interval recording as cases of agreement.

Each observer kept a daily record of completions, task presentations, and teacher guidance

of task performance, always identifying the groups to which the task belonged. These records were summarized as the percentage of presented tasks in each task group that was completed and the percentage of work time in which teacher guidance occurred, for each task group.

Reliability of recording the intervals of occurrence of pole-toy and chip-toy completions ranged from 67% to 100% across the three subjects. Median reliabilities for the three children, respectively, were 100%, 100% (in both cases all checks were 100%), and 100% (four of the six checks were 100%).

Reliability of recording occurrences of teacher guidance ranged from 75% to 100%, with median reliabilities of 88%, 85%, 82%, and 95% for the four multiple-baseline analyses (one each for David and Leo, two for Larry). Reliability of recording occurrences of completions ranged from 50% to 100%, with median reliabilities of 100% for each of the four multiple-baseline analyses. In most cases, disagreements on completions reflected disagreement about the exact interval in which the child performed the last response of a task, not disagreement about whether he had completed it.

RESULTS

Presentations of each task, and the number of presentations resulting in completions, were totaled daily for each child. From these totals, percentage of completions scores were computed, one for each of the child's three groups of tasks. In addition, totals were kept of daily number of work-time intervals, and the number of these intervals in which teacher guidance occurred. These totals were used to compute the daily percentages of guidance for each group of tasks.

Leo

The results of Leo's multiple-baseline analysis are shown in Figure 3. When this three-group analysis was begun, Leo received teacher guidance when Group 1 tasks were presented, but

no guidance when tasks from Group 2 or Group 3 were presented. His daily average percentage of Group 1 task presentations resulting in completions for this condition was 87%, and teacher guidance occurred in 81% of the work intervals. Percentages of completion and teacher guidance remained at low levels for the two groups still in their baseline conditions. However, when the guidance package was expanded to Group 2 tasks, Leo's completion of these tasks increased from a 10% average during baseline to a new average of 98% throughout this condition. This increase was correlated with the increase from 10% guidance during baseline to 73% guidance during this condition. Finally, when the guidance package was implemented from Group 3 tasks, completions of these tasks rose immediately from a baseline average of 17% to an average of 88% for this guidance condition, and the guidance for Group 3 tasks increased from 7% to 83%.

The DRO reversal was instituted for Leo after all three groups of tasks were being performed at a high level under guidance conditions. When teacher guidance was still available, but the token was no longer contingent on task completion, Leo's percentage of completions decreased in all three groups of tasks. Performance of tasks in Group 2 and Group 3 decreased to the former baseline levels. Teacher guidance levels are not shown in the DRO conditions because token delivery could occur before a child was seated at his desk. Guidance in the prior and subsequent conditions was measured from "sit" to "token". When the completion contingency was again added to teacher guidance, Leo's completions in all three groups of tasks returned to their former high levels.

In the remaining days of this condition, teachers were moderately successful in reducing their levels of teacher guidance, with little reduction in Leo's performance levels. During the days in which probes were in effect for one of the three groups, Leo continued to complete some tasks from each group with no guidance except the initial instruction. Completions dur-

Fig. 3. Leo's daily percentage of task completions per group, and the daily rate of teacher guidance per group, during conditions of Baseline (token for completion but no guidance), Guidance (token for completion plus guidance), DRO, and Guidance plus Probes.

Fig. 4. David's daily percentage of task completions per group, and the daily rate of teacher guidance per group, during conditions of Baseline (token for completion but no guidance), Guidance (token for completion plus guidance), DRO, and Guidance plus Probes.

ing probes averaged 52%, 89%, and 59%, lower than the averages during guidance, but much higher than the initial baselines.

David

Data from the multiple-baseline analysis on David's three groups of tasks are shown in Figure 4. The sequence of conditions and the experimental results of added guidance were nearly identical to those obtained for Leo. Guidance given only during Group 1 task presentations was correlated with near-100% levels of completions for Group 1 tasks. When the guidance package was introduced for Group 2 tasks, completions of these tasks rose from 35% baseline to 71%. While performance of Group 2 tasks was somewhat erratic, a much greater proportion of 100%-completion days occurred in this condition than during baseline. Finally, guidance added to Group 3 task presentations produced completions at the 100% level, compared to the 42% average during baseline. In each successive application of the guidance package, higher levels of completion were correlated with the onset of higher levels of available teacher guidance. The increase in available guidance for David's Group 2 items was not as great as other applications of the manipulation due to a logistical problem: Group 2 tasks for David consisted of coloring within lines and drawing precise lines. The teachers could not instruct or praise David verbally, due to his deafness, but physical contact proved to be disruptive, in that it distracted him or caused slips of his crayon or pencil.

When the DRO reversal was instituted for David, his completions in all task groups dropped to virtually zero levels. However, the re-instatement of completion contingencies produced immediate returns to near-100% performance. A reduction in guidance produced no disruption in David's completions, and he successfully completed probes of Group 1 and Group 2 tasks at the 100% level. (Time did not permit a probe of the Group 3 tasks.)

Larry

Data from the analysis of Larry's first set of tasks are shown in Figure 5. As can be

Fig. 5. Larry's daily percentage of task completions per group, and the daily rate of teacher guidance per group, for Task Set 1 during conditions of Baseline (token for completion but no guidance), Guidance (token for completion plus guidance), and DRO.

seen, Larry's performance for these three groups of tasks departed markedly from the pattern set by David and Leo. With the same tasks as those given to Leo, Larry reached 100%-completion levels in each group of tasks under baseline conditions of tokens for completions, with no teacher guidance. Sequential additions of teacher guidance produced no change in Larry's already perfect responses for tasks in Group 2 and Group 3. His performance dropped only during DRO, when the completion contingency was removed, but recovered immediately when completions were again required.

For a second multiple-baseline analysis of the effect of guidance for Larry, another, more difficult set of tasks was provided. This second set consisted of eight tasks (four groups of two tasks each) that required more responses at higher skill levels. Data for Larry's second set of tasks are shown in Figure 6. When Larry was exposed to the second set of more difficult tasks, his pattern of response resembled that of Leo and David. Initially, Larry's performance was at 100% for Group 1 tasks under guidance conditions, but at 0% for Group 2, Group 3, and Group 4 tasks under baseline conditions. When the guidance package was added systematically to one group of tasks at a time, performance of that group immediately increased and remained very high. Reductions in teacher guidance produced little disruption of Larry's performance, and he successfully completed some probes of each group at the 100% level.

DISCUSSION

While previous studies of token-mediated nonsocial-backup reinforcement systems have rarely examined the positive function of teacher attention within the system, in the present study, teacher attention in the form of teacher guidance did appear to be a vital component of the procedure that developed preacademic skills in four deviant preschool children. It was not possible in the present study to measure the exact proportions of specific guidance behaviors. When an attempt was made to analyze instructions,

praise, physical prompts, and "putting through" topographically, as separate teaching units, considerable overlap was found. A given teacher event could serve as an instruction and/or praise and/or prompt, if an appropriate physical

Fig. 6. Larry's daily percentage of task completions per group, and the daily rate of teacher guidance per group, for Task Set 2 during conditions of Baseline (token for completion but no guidance), Guidance (token for completion plus guidance), and Probes plus Guidance.

cue was added. An example is the comment, "Good, you are finding all of the red ones". This statement could serve as praise, or as an instruction to find more red objects, or as a prompt to stay with red. Thus, analyses of teaching behaviors that both cue and reinforce child behavior require a topographical analysis that can differentiate teaching units more precisely than in the present study.

It would probably be misleading to cite a precise function of teacher guidance in the present study. Guidance operated in either or both of two ways:

1. Through instructions, physical help, and demonstration, the children learned new skills important to their task completions;

2. The guidance package acted as prompts and/or social reinforcement for individual responses in the longer chain leading to task completion. Initially, the children may have been able to perform the responses, but not at a sufficient rate to complete a task unless intermediate prompts and/or reinforcers were available.

It should be noted that with the exception of probes, teacher guidance was never completely faded out for every task of each child. Thus, it is not clear whether some level of guidance continued to be a necessary support, or whether teachers continued at this level out of routine. Future studies of teacher guidance should examine this point, and, if necessary, systematically train students to perform in the absence of guidance.

The present results suggest that the systematic use of mediating teacher behavior—guidance—combined with the use of natural classroom reinforcers can produce a system that is capable of teaching new skills as well as setting the occasion for performance of longer response chains of skills already present in a child's repertoire. While such teacher behavior by itself does not appear to be optimally effective (DRO conditions), the combination of teacher guidance and the token-mediated activity reinforcer appears to be vital in the initial acquisition of the preaca-

demic skills described in this study. The only condition under which this combination is not required, according to the present data, is the case in which the student's tasks are sufficiently easy (as was seen in Larry's case with his first set of tasks).

In principle, it could be supposed that a perfectly enough programmed curriculum would present new tasks so precisely graded that they would always be within the student's grasp, and thus require no teacher guidance beyond the minimal amount for classroom maintenance; the reinforcement system operating (token-mediated or otherwise) presumably would be sufficient to maintain steady academic progress. However, it is doubtful whether the present state of curriculum development is advanced enough to allow such an outcome, and if it is not, then it appears that the social components of teaching, if well practised, can be an essential component of behaviorally based teaching systems. Of course, even given a well-graded curriculum not requiring a teacher's guidance in these forms, it still may be debated whether the absence of that guidance is desirable. The long-term consequences of its use or nonuse have not been determined.

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