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FLASHCARDS TO WORKSHEETS:

TRANSITIONAL TRAINING IN NORMALIZATION OF ACADEMIC BEHAVIOR

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From: Annual Report of the Behavior Prosthesis Department, 1 July 1974 -- 30 June 1975. Belmont, Mass.: Walter E. Fernald State School, 1975.

Teachers find flashcards appropriate and useful for initial instruction in visual-visual, auditory-visual or visual-oral matching, but as a rule they quickly wean their students from such individual attention and expect them to function more independently. To enable students to practice academic skills they have learned, teachers often use worksheets and workbooks.

In special education classes, however, where the need for individual attention is undoubtedly greater than in other classes, teachers may overlook the importance of teaching independent classroom skills. As a result, special education teachers lose opportunities to free their time for concentrated individual instruction, and their students never get a chance to learn to pace and monitor their own behaviors.

In our classroom, we have found that various worksheet activities used in elementary education can be successfully adapted for many behaviorally retarded students following their acquisition of component skills.

Two concerns motivated us to consider worksheets. First, on teacher-paced tasks (e.g., reading numerals on flashcards), our verbal students were attaining relatively low ceiling rates of performance -- below the normal range for elementary school children (Kunzelmann, 1973). Secondly, our nonverbal students were requiring a great deal of individual attention while practicing skills they had already acquired.

For these reasons, we devised a number of worksheet activities in beginning reading, printing and quantitative skills for our nonverbal and verbal students, whose psychometric classifications range from moderate to severe retardation. We begin worksheet-training when a student has acquired some rudimentary (prerequisite) academic skills (e.g., labeling numerals, letters or words, or counting a set of objects and selecting the appropriate numeral). While modifying our approach in response to the demonstrated competencies and needs of the individual student, we follow a basic strategy exemplified by the sequences outlined in this report.

SEQUENCE I: SYMBOL READING

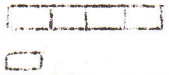
Prerequisite: Student reads or manually signs three or more printed symbols.

Step	ANTECEDENT Materials to set up & instructional cue to give on each trial	BEHAVIOR Student's (S) response	CONSEQUENCE Teacher's (T) response
1	T presents one symbol card and asks S to read it.	S reads symbol.	T presents reinforcing consequence (SR+).

Sequence I: Symbol Reading, continued

Step	ANTECEDENT	BEHAVIOR	CONSEQUENCE
2	Repeat Step 1.	S reads symbol #1.	T immediately places symbol #2 just to the right of #1.
	T asks S to read symbol #2.	S reads symbol #2.	SR+.
3	T asks S to read the cards; T presents one card.	S reads card.	T places another card to right of first card.
		S reads second card.	SR+
4	T presents additional trials of Step 3 for practice.	On each trial, S reads the cards with little delay between the two responses (response + criteria).	SR+ following every correct trial.
5	T asks S to read the cards and presents two cards in horizontal array.	S reads both cards, left to right, and meets response criteria stated in Step 4.	SR+.
6	Repeat Step 5.	S meets response criteria stated in Step 4.	T immediately places a third card to right of others.
		S reads third card.	SR+.
7	T presents additional trials for practice.	S meets response criteria stated in Step 4.	SR+ following every correct trial.
8	T presents trials with three cards in horizontal array.	S meets response criteria stated in Step 4.	SR+ following every correct trial.
9	T presents four cards in horizontal array.	S meets response criteria stated in Step 4.	SR+ following every correct trial.

Sequence I: Symbol Reading, continued

Step	ANTECEDENT	BEHAVIOR	CONSEQUENCE
10	Repeat Step 9.	S meets response criteria stated in Step 4.	T immediately places fifth card under first with 1 to 2 in. between.
		S reads fifth card.	SR+.
11	T presents additional trials of Step 10 for practice.	S meets response criteria stated in Step 4.	SR+ following every correct trial.
12	T presents five-card array: 	S meets response criteria stated in Step 4.	SR+ following every correct trial.
13	T presents additional trials of Step 12, moving fifth card a bit closer to first on each trial until array is:  on last few trials.	S meets response criteria stated in Step 4.	SR+ following every correct trial.
14	T presents six-card array: 	S meets response criteria stated in Step 4.	SR+ following every correct trial.
15	T presents worksheet: 	S meets response criteria stated in Step 4.	SR+ following every correct trial.
16	T presents: 	S meets response criteria stated in Step 4.	SR+ following every correct trial.

Sequence I: Symbol Reading, continued

Step	ANTECEDENT	BEHAVIOR	CONSEQUENCE
17	T presents: xxxx xxxx x	S meets response criteria stated in Step 4.	SR+ following every correct trial.
18 to 24	T presents worksheets, adding one symbol each time until 16 stimuli are presented at once.	S meets response criteria stated in Step 4.	SR+ following every correct trial.
25	T presents worksheets of 16 stimuli each, reducing size of stimuli gradually, step by step, until they are $\frac{1}{4}$ inch or until S's accuracy decreases (because of limited visual acuity).	S meets response criteria stated in Step 4.	SR+ following every correct trial.
26	T repeats Step 25, adding stimuli to the rows, one per row per trial.	S meets response criteria stated in Step 4.	SR+ following every correct trial.
27	T gradually decreases distance between rows until 20 $\frac{1}{4}$-inch symbols are presented.	S reads randomized symbols, left to right, top row to bottom, 20 to 100 per min. correct with no more than 1 error (learning opportunity) per min. (Aims range for grades 1-2, Kunzelmann, 1973).	SR+ following every increase in response rate per page.
28	T presents worksheets of Step 27.	S reads symbols, left to right, top to bottom.	SR+ following every page which meets criteria of stable performance rate.

Sequence I: Symbol Reading, continued

Step	ANTECEDENT	BEHAVIOR	CONSEQUENCE
29	T continues fading procedure along these dimensions: a) size of stimuli, b) number of stimuli per row, c) number of rows per page, d) number of different stimuli.	S maintains or increases rate and accuracy of performance.	SR+ following every page which meets criteria of stable rate performance.

SEQUENCE II: ARITHMETIC COMPUTATIONS

Example: horizontal addition.

Prerequisite: Given one horizontal addition problem (e.g., 2 + 4 =), S states or manually signs answer providing own cues.

Step	ANTECEDENT Materials to set up & instructional cue to give on each trial	BEHAVIOR Student's response	CONSEQUENCE Teacher's response
1	Given one problem at top of page, T asks S to answer the problem.	S states or signs answer.	SR+ following response.
2	Given one problem at top of page, T asks S to answer the problem.	S states or signs answer.	T writes another problem a few inches below the first.
		S states or signs answer.	SR+ following correct response.
3	T presents additional trials of practice on Step 2.	Same as Step 2.	Same as Step 2.

Sequence II: Arithmetic Computations, continued

Step	ANTECEDENT	BEHAVIOR	CONSEQUENCE
4	T presents two problems per page, one a few inches below the first.	S states or signs answers, proceeding from top to bottom of page.	SR+ following correct completion of two problems.
5	T presents two problems per page, one a few inches below the first.	S states or signs answers, proceeding from top to bottom of page.	T writes a third problem a few inches below the second problem.
		S states or signs answer to third problem.	SR+ following correct response.
6	T presents additional trials of practice on Step 5.	Same as Step 5.	Same as Step 5.
7	T presents three problems per page: x+y= a+b= c+d=	S states or signs answers, proceeding from top to bottom of page.	SR+ following correct completion of three problems.
8	T presents three problems per page.	S states or signs answers, proceeding from top to bottom of page.	T writes a fourth problem below third.
		S states or signs answer to fourth problem.	SR+ following correct response.
9	T presents additional trials of practice on Step 8.	Same as Step 8.	Same as Step 8.
10	T presents four problems per page.	S states or signs answers, proceeding from top to bottom of page.	SR+ following correct completion of four problems.

Sequence II: Arithmetic Computations, continued

Step	ANTECEDENT	BEHAVIOR	CONSEQUENCE
11	T presents additional trials of practice on Step 10.	S states or signs answers, proceeding from top to bottom of page, until response rate stabilizes at or surpasses 3/min. correct with no errors.	Same as Step 10.
12	T continues fading prccedure along these dimensions: a) size of stimuli, b) number of problems per page, and c) number of different problems per page, until:	S answers problems ($\frac{1}{4}$" symbols, 15 to 30 per page, 10 to 40 correct responses per minute, and no more than 2 incorrect responses per minute.)	SR+ following correct completion of each page.

SEQUENCE III: RATIONAL COUNTING

Prerequisite: Given horizontal row of zero to three or more pictures, S selects numeral flashcard which describes the number of pictures (or marks).

Fading procedures similar to those used in Sequence I (Symbol Reading) and Sequence II (Arithmetic Computations) can be used to teach students to select and mark appropriate numerals.

Example of rational counting worksheet:

. .	0 1 2
. . . . .	5 3 4
.	0 4 1
	2 0 5
. . . .	2 3 4
. . . . .	1 5 6

Correction procedure

When a student does not proceed smoothly from one step to the next in a sequence, we simply back up until the student performs successfully. At that point we present a reinforcing consequence and again proceed forward through the sequence. If necessary, we repeat steps. (Setting a more stringent response criterion for each step might be another way to facilitate acquisition.)

Results with our students

We used the worksheet "fading" procedures described above (and in George, 1975) to "worksheet-train" eleven students. Only one student required a remedial modification. For this student, before beginning Sequence I, we presented white counting tiles (instead of symbol cards), and followed procedures similar to those of Steps 10 through 15 in the sequence. Initially the last tile was red. Then, gradually, tiles of other colors were introduced. After that, the student proceeded through Sequence I with ease.

For all our students, worksheet training resulted in performance rates considerably higher than those observed when a teacher presented the same tasks. The students gained independent classroom skills which enabled them to practice already acquired tasks. Further, by increasing their performance rates to automatic, fluent levels, the students could use their skills (e.g., reading or adding) as tools to perform more complex tasks.

Discussion

As a result of our experience with worksheet training, we feel it is important to consider two points. First, even though during skill acquisition a student's performance rate may accelerate substantially while the teacher presents each word or problem (as on flashcards), such teacher-paced methods place a limit on a student's learning. The student's performance rate can increase only to the level of the teacher's rate of presentation. Such external response pacing may also hamper generalization of the skill to the natural environment, in which competent people must pace themselves and perform complex tasks accurately and quickly.

In addition, the worksheet training sequences presented here instruct pupils on two important skills which are components of reading: proceeding with ease from page left to right, and from top to bottom. Thus further transfer can be expected to facilitate acquisition of textual reading following acquisition of single word reading.

Our results also suggest the need to reconsider an age-old assumption: that "retarded" means slow. For we have demonstrated that "slow

responding" is not an inalterable dimension (or "trait") of our retarded students. We are certainly behooved to continue to explore tactics for modifying nonadaptive dimensions of retarded behavior.

REFERENCES

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