A diary of remedial instruction in division—grade seven

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The problem was one well-known to upper elementary and junior high school teachers—a student who has been instructed for several years in the rote application of an algorithm, who is generally not successful with it, but whose mental set prevents him from accepting a different approach. Laurie and Patty were perfect examples.

When I began working with them, both girls were in the seventh grade and both were perennial "D" students. Laurie and Patty were pleasant, cooperative girls who "tried," as the saying goes. (To some extent this means they had learned to cope with the system; they had learned to put something on paper in response to any assignment given them. They were not concerned with quality results; they were interested in maintaining good relations with teachers and with minimizing parental displeasure. This is not to suggest that they were devious. Their behavior had simply been shaped through a natural selection process. They had learned very easily that to "do-something-even-if-it's-wrong" results in a happier atmosphere than to rebel.)

Laurie and Patty were almost totally unsuccessful in applying the division algorithm that they had been taught (the "distributive algorithm"). They tried, but the results were discouraging. To them the symbol $)\overline{\quad}$ meant failure. I decided that if the girls were to make any progress then the mental set triggered by the symbol $)\overline{\quad}$ would have to be displaced by a different stimulus-response pattern, one that resulted in success.

The plan was to disguise division exercises—by presenting them in a new format—and then to reveal the fact that the "new exercises" were really division exercises.

The new exercises were presented in the form of three boxes and a circle.

The directions were as follows:

Subtract the first number from the second number as many times as you can.

Record in the empty box the *number of times* you are able to do this.

If there is any amount left over, record that amount in the circle. (See Fig. 1.)

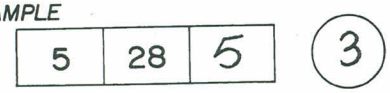
The terms *divisor, dividend,* and *quotient* were never used. The instruction was designed with four principles in mind.

1. The "new" problem would be simple to solve, involving only simple subtraction and multiplication.

2. There would be no history of failure associated with the problem.

3. The focus would be on success. During the developmental stages errors in multiplication and subtraction were considered

EXAMPLE



SOLUTION

28
-5
23
-5
18
-5
13
-5
8
-5
3

Fig. 1

trivial. When errors were pointed out emphasis was always placed on the fact that the student's process was correct—"a little error here, but the process is right."

4. Tedium would be minimized. (A typical lesson involved only two exercises—sometimes only one.)

THE INSTRUCTION SEQUENCE

For the first five sessions, the girls were given the exercises shown in figure 2.

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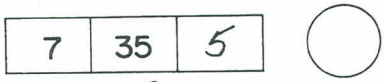
After explaining to the girls how they were to do the "new" examples, I gave them the first one. No questions were asked and no difficulties were experienced by either Laurie or Patty. Both did the example by subtracting 7 four times. (Fig. 3)



35
-7
28
-7
21
-7
14
-7
7
-7
0

Fig. 3

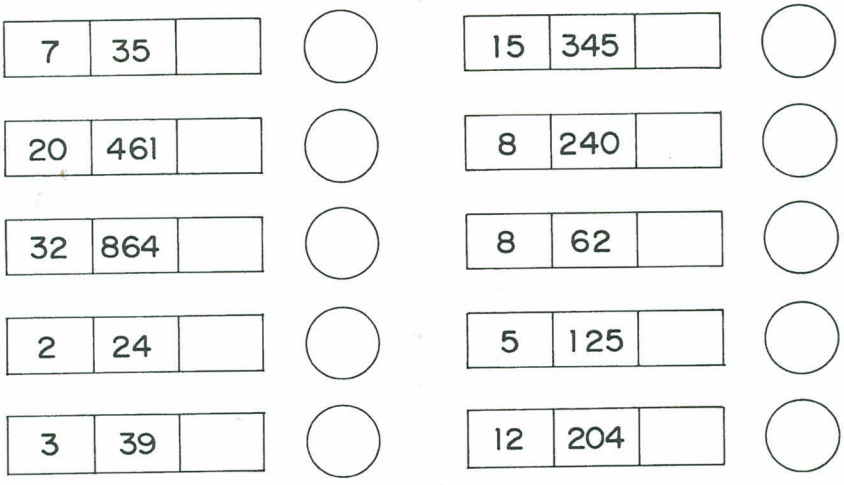


Fig. 2