SCOPE OF MODELING ARRAY IN CONCEPT ATTAINMENT

by

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ABSTRACT

The present study was aimed at determining components of the modeling process responsible for its effectiveness in transmitting information about rule-governed behavior across three different age levels. Four modeling procedures, displaying different degrees of scope display (narrow, medium, broad with overt verbalization and broad without overt verbalization), were compared to an instructions only control group to ascertain their relative efficacy in transmitting a complex concept. Ninety subjects of both sexes were randomly selected from three grade levels (2nd, 3rd, and 4th) and randomly assigned to the experimental and control conditions. They were tested for acquisition on three variables (number of correct arrays, number of correct placements, and time required for completion of each trial). It was found that method of training, grade level, and sex of the subject independently affected performance. Furthermore, the broad scope display, with and without verbalization, was found to be superior to the instructions-only group and narrow scope display. Broad scope display with verbalization also proved to be superior to the medium scope display on two of the dependent measures. No interactions approached significance. It was concluded that emphasizing decision steps involved in rule

learning is an important component of the modeling process. This factor can be considered responsible for its effectiveness in transmitting information about rule attainment across three different age levels.

INTRODUCTION

Modeling, as shown by considerable research, can effectively foster a wide variety of affective, motor, and self-regulatory behavior (Bandura, 1969; Zimmerman and Rosenthal, 1974). Recently, investigators have addressed the issues of extending social learning techniques to linguistic or abstract rule learning, problem solving, concept formation, and creative responses. A study by Carroll, Rosenthal, and Brysh (1972) investigated the modeling effects and transfer of sentence patterns among disadvantaged Mexican-American children. Other studies have investigated the differential effects of modeling procedures on concept attainment using a variety of populations and tasks (Zimmerman and Rosenthal, 1972; Rosenthal and Kellogg, 1973; Alford and Rosenthal, 1973).

Two factors appear to be particularly important in the enhancement of observational learning, especially when it involves complex concept attainment. One is the information-processing strategy modeled and the other, as Rosenthal (in press) points out, is the symbolic coding of modeled stimuli. These two processes will be discussed separately below.

In the area of information-processing strategies of children, Denney (1972) attempted to train six-year olds to use a constraint-seeking strategy and to increase the efficiency of their information processing by presenting constraint-seeking models. In a task similar to the old parlor game "20 questions," children were required to guess the single "correct" picture from an array of 42 pictures by asking questions that could be answered by yes or no. In such a task, the constraint-seeking strategy would require a general question, the answer to which eliminates more than one alternative from the array. In contrast to that, a hypothesis-seeking strategy would require a question which tests a self-sufficient hypothesis and bears no relationship to previous questions. Denney found that six-year-olds failed to change in response to any constraint-seeking models. Further, investigators (Denney, Denney, and Ziobrowsky, 1973) interpreted these results as suggesting that the opportunity to acquire new strategies through modeling is somewhat dependent upon the developmental level of the observer. To test this hypothesis, they showed six-year-olds verbalizing models who, in addition to asking constraint-seeking questions, illustrated partitioning of the stimulus array and the formulation of constraint-seeking questions based upon such partitions. Children exposed to the training conditions showed more constraint-seeking questioning than did untreated controls. Thus, for this developmental level, it seems that modeling utilizing verbalization and partitioning of the stimulus array enhances observational learning.

In the area of the symbolic coding of modeled stimuli, a study undertaken by Rosenthal, Alford, and Rasp (1972) investigated the effects of coding and verbalization upon observational learning, generalization, and retention of a novel clustering concept. Separate groups watched the model perform with no verbalizations to support symbolic coding, with a low-information verbal code, with a high-information code, or with a high-information code plus a statement of the rule governing the concept. It was found that the strength of concept attainment and generalization were related to the saliency of the information verbally coded by the model.

Zimmerman and Rosenthal (1974) propose that learning should improve if a verbal code enables the observer to classify or summarize aspects of the modeled display. They point out that one of the areas that needs to be explored in much greater detail to allow a better understanding of underlying processes is the properties of modeling operations. The studies to be discussed below, including the present one, focus on this particular issue.

White, Rosenthal, Kessler, and Phibbs (1975) state that often in vicarious learning studies the model simply exemplifies instances of correct terminal output; however, it is possible to expand the scope of the model's routine to suggest also key steps of decision-making to observers that may aid them in attaining rule-congruent behavior. White et al. (1975) compared the differential effects of four experimental training methods (modeling, error prevention, and feedback with or without corrected practice) on the acquisition of a complex card-arrangement rule by fifth grade subjects. They found that observational training, in which the model provided gestural cues to alert observers to the sequential decision steps, surpassed each other training method while the non-modeling experimental groups failed to differ significantly from each other or the controls. They also found that the amount of practice and feedback did not affect learning. They concluded that it appears likely that the ordered presentation of behavioral steps inherent in the vicarious routine must have accounted for much of the modeling's efficiency in rule training.

Along similar lines, Lassen (1974) performed an experiment to determine components of the modeling process responsible for its effectiveness in transmitting information about rule-governed behavior. She compared the relative effects of three modeling procedures displaying different degrees of task analysis (limited, intermediate, detailed), a practice-with-error-correction group, and a control group in transmitting a complex concept in 5th grade students. The task, a card-arrangement rule, involved first arranging cards according to a specified suit order and within suits according to a specific number order. Lassen found that, although the three modeling conditions did not differ significantly among themselves, modeling an intermediate level of task analysis was the only modeling condition significantly superior on any dependent measure to the control and corrected practice procedures. She suggested that there is an optimal level of analysis which should be modeled for maximum learning to occur.

The present study was aimed at further delineating the components of the modeling process responsible for its effectiveness in transmitting information about rule-governed behavior. Four experimental training conditions, varying in scope of display (narrow, medium, broad with overt verbalization, and broad without overt verbalization) were compared to an instructions-only group. Furthermore, a comparison of sexes was performed. Three age levels were used since there are reasons to believe that younger children have difficulty in grasping verbal instructions and are at least partially unable to draw correct conclusions. It was hypothesized that there would be differential effects of the four experimental conditions; furthermore, the medium and broad scope of display would probably prove to be more effective than the narrow scope of display. Also, it was hypothesized that broad scope display with overt verbalization would be more effective with younger children. Although younger children are thought to have difficulty in grasping complex verbal instructions, simple concrete verbalizations of each key decision step would focus their attention on the main gestural cues of the model. The instructions-only condition was hypothesized to be, in general, the least effective.

METHOD

Subjects and Experimenters

The subjects were 45 boys and 45 girls drawn from second, third, and fourth grade classes (mean ages 7.9, 9.1, and 9.8, respectively) in a parochial school in Tucson, Arizona. The experimenter (E-1), the model (E-2), and the data recordeer (E-3) were all female (approximate age, 25 years).

Fifteen boys and fifteen girls were drawn from each grade level and were randomly assigned to the four experimental conditions (narrow, medium, broad with overt verbalization, and broad without overt verbalization) and to an instructions-only control group. Each group consisted of three boys and three girls. The order of conducting the several experimental conditions and the control group was randomly determined. The sex of the subjects tested was alternated after each sequence of the five conditions. Each subject was tested for acquisition immediately after training.

All three experimenters were present throughout both the training and acquisition phases in all conditions. The modeling conditions were conducted by E-2, the instructions-only control group by E-1.

Apparatus and Task

The apparatus consisted of a wooden response board (21.6 x 68.6 cm) which was arranged horizontally on the table where the subjects were seated for training and testing. On the surface of the board five rectangular depressions (12.7 x 20.3 cm) were arrayed at equal distance from each other. These served as receptacles for cards deposited by subjects according to displays of six "suit" cards and eight "number" cards.

A high stand supported a wooden "stimulus" board. Six 17.3 x 20.8 cm depressions on the left side of the board and eight 12.5 x 20.8 cm on the right side of it formed receptacles for the "suit" and "number" stimulus cards, respectively.

The task involved arranging hands of five randomly dealt cards according to the order of the suits displayed on the left side of the stimulus board and within suits according to the order of numbers displayed on the right side of the board. Thus, there were four general rules to learn: First, the cards were to be grouped into suits according to the suit stimuli on the board. Second, the suits were to be arranged in descending order according to the order of the suit stimuli. Third, if there was more than one card of a suit, the cards within that suit were to be arranged by number according to the display order of the number stimulus cards. Fourth, the cards were to be placed in descending order into the depressions in the response board.

The six categories displayed on the stimulus board were people, buildings, musical instruments, land animals, flowers, and birds. All suits were used during training but two of those, birds and buildings, were deleted from the testing deck. Each of the suits was represented by eight different examples numbered from one through eight. The pictures were drawn in black ink on 11.4 x 15.2 cm white cards by a commercial artist. Each card had a 2.3 cm high number in the left upper corner. The six stimulus suit cards were made in a similar manner but were not numbered. The eight number stimulus cards were made by painting 10.6 cm high numbers on 10.2 x 11.4 cm white cards.

Procedure

Subjects were taken individually from their classroom and were accompanied by E-3 to the testing room where they were introduced to the other two experimenters and seated at the table. The procedure then varied according to the condition to which the subject had been assigned.

The instructions were identical for all conditions except that in the modeling conditions they were addressed to the model while in the instructions-only control group they were received by the subjects. The instructions were as follows:

This is a game of following signs. One of the rules of the game is that you cannot ask questions; so listen very carefully. You will be learning to put cards out here [E-1 shows] the way the signs tell. All of the cards we'll use later have two parts, a picture and a number. Look at these picture signs [E-1 shows]. There are six different kinds of pictures. There are land animals like this, people like this, musical instruments like this, flowers like this, and buildings like this. Remember, land animals, birds, people, musical instruments, flowers, and buildings. The picture signs up here [E-1 shows] from top to bottom, always tell you where to put the pictures down here [E-1 shows]. Always follow the picture signs when you put out your cards later.

Now look at the number signs [E-1 shows]. As you can see, there are eight numbers. Tell me what each one is as I point to it [E-1 points, model, or subject if in control condition, tells]. Later, you will get cards with the same kind of pictures on them. Say, you have two cards with people on them. Then, you must follow the number signs to know which person comes first. In other words, follow the picture signs from top to bottom. When you have two or more pictures of the same kind, the numbers will tell you which of those pictures comes first. We can change the pictures and the numbers anytime in the game. You watch us while we do that now [E-1 and E-3 show]. When I give you your cards, look at them carefully and follow the signs while you put your cards into the right places here [E-1 shows]. Put the card that goes to the left here [E-1 shows], the card that goes next here [E-1 shows], and so on, all the way to the other side here [E-1 shows]. Always follow the signs when you put out your cards. When you have finished arranging your cards, turn up the sign that says "FINISHED," this one here [E-1 shows]. After you turn up your sign, you cannot move your cards again.

For the instructions-only group, subjects were further instructed as follows: "Now [subject's name], I'm going to give you some cards and let you play the game. I won't show you how to play the game any more or tell you if you are right or wrong; but I think you know how to play the game now. Remember, just follow the signs carefully."

All modeling conditions further received the instructions below:

"Now [subject's name], let me show you better what I mean. You watch and listen very carefully so you will know when your turn comes later."

Narrow Scope Display

E-1 instructed E-2 who was seated next to the subject as follows:

> Here is a set of five cards [deals them]. Put them out to follow the signs [E-2 performs]. Now, we'll change the signs around [E-1 and E-2 do so]. Here is another set of five cards [deals them]. Put them out to follow the signs [E-2 performs]. Now, we'll change the signs around again [E-1 and E-2 do so]. Here is a set of five cards [deals them]. Put them out to follow the signs [E-2 performs].

In the narrow scope demonstration, the model left the cards dealt showing each time and then put them in the right order from high (top) to low (bottom) with minimal gesturing; that is, no step of comparison between signs and response cards was emphasized. When finished, the model turned up the "FINISHED" sign.

The model had memorized the correct order of three "fixed" sets of cards always dealt for training. In each training set of cards, no more than four suits were represented at a time. In hand I, four suits appeared, each showing one instance, except one suit that showed two instances. In hand II, three suits occurred, one showing three instances and two suits showing one instance each. Finally, in hand III, three suits occurred, two showing two instances each and one showing one instance. Thus, every one of the suits displayed occurred at least twice across training trials. Timing was equalized in all modeling conditions and the same three "fixed" sets were used for training in all conditions.

Medium Scope Display

In this condition, as soon as the cards were dealt, the model spread them apart leaving them in the random order dealt. She then looked at her "hand," the picture signs, the number signs, and back at her "hand." She picked up the highest card, looked at the suit signs, at the number signs (if appropriate), at the remaining cards, and finally placed the card in the first receptacle. The same procedure was repeated for the rest of the cards and for the remaining hands. After the completion of each hand, she turned up the "FINISHED" sign.

Broad Scope Display

As soon as the cards were dealt, the model looked at her suit signs and then at her hand. She then grouped them into suits, attended to the picture signs, and put the suits into descending order. She then looked at the number signs and arranged within suits by number. She finally picked up the highest card, looked quickly at the suit signs, the number signs (if appropriate), the remaining cards, and placed the card in the first receptacle. The same was repeated for the rest of the cards and the remaining hands. When finished, the model turned up the "FINISHED" sign.

Broad Scope Display with Verbalization

The procedure was identical to the foregoing one, except that the model also provided an extended verbalization of her strategy for the first training hand which was gradually faded in the remaining two trials. Thus, she introjected the following:

> O.K., now up there are people, birds, buildings, etc. So, here are all the people, birds, etc. Now, up there are people but I have no people, next come birds, so here they are. I have no . . . but I have . . . etc., last come the . . . . Now, let me look at the numbers. O.K., there is only one bird but there are two animals, number 7 and number 3. Number 7 comes first and then number 3, so here they are. O.K., this is the highest, let me check once more. Yes, it is, so I'll put it here.

In the next training hand the model verbalized the following:

> O.K., there are people, birds, etc. So, here they are all in groups. Now, at the top are birds, so they come first and next come the animals, so here they are, etc. Now, those go in this order, number 7 first and number 3 next. This is correct.

Finally, in the last training hand the model said: "People come first, next come buildings, etc. This is the right order of the groups. O.K., that's right."

This condition was timed in advance and all other conditions were equalized in terms of time to the broad scope display with overt verbalization.

Testing Phase

E-1 introduced the modeling subjects into the testing phase as follows: "Now [subject's name], you and I are ready to play the game for real. I'll set up the signs like this and you follow the signs in putting out your cards. I won't show you how to play the game any more. Remember, just follow the signs carefully."

The suit and number stimulus arrays were altered after each training trial and after each set of four trials. All stimulus arrays were randomly determined and were identical across conditions. The five-card hands dealt to the subjects were also randomly determined and were the same across conditions.

No feedback or reinforcement was delivered during testing. After the testing was completed, each subject was informed that he/she had performed well and was urged not to discuss the task with other children. Then the subject was accompanied back to class by E-3.

Design

The design used was a 5 x 3 x 2 factorial design involving five training conditions, three grade levels, and sex.

Each subject's card placements during testing were recorded by E-3 and subsequently scored according to their congruence with the pertinent display orders. Thus, three measures were collected for all subjects: the number of correct card placements, the number of completely correct five-card trials, and the time required for the completion of each trial measured in seconds with a stopwatch. Correct placements were determined by the number of cards correctly placed in the rectangular depressions per trial.

The dependent measures were analyzed by means of analysis of variance for fixed effects factors. The Tukey HSD test was used for all *post hoc* pairwise comparisons (Kirk, 1968). The proportion of variance accounted for was computed by means of ω^2 (Hays, 1973). Pearson correlation coefficients were computed between the dependent measure of correct placements with time and the number of correct trials with time. All levels of significance were based on two-tailed probability estimates.

RESULTS

Number of Correct Placements

Type of training significantly influenced performance (F [4,60] = 10.65, $p < .0001$). The broad scope display group surpassed both the instructions-only ($p < .01$) and the narrow scope display ($p < .05$) group. The broad scope display with verbalization surpassed the instructions-only, narrow and medium scope displays (p's $< .01$). The condition means appear in Table 1 and Figure 1. The training effect accounted for some 24% of the total variability in the experiment ($\omega^2 = .24$).

Table 1. Mean Number of Correct Placements by Training Method and Grade Level

Training Method	Grade Level II	III	IV
Instructions-Only	9.00	11.50	13.00
Narrow Scope Display	12.50	13.50	16.67
Medium Scope Display	12.67	15.50	23.00
Broad Scope Display	14.17	25.33	27.17
Broad Scope Display with Verbalization	17.83	28.33	36.50

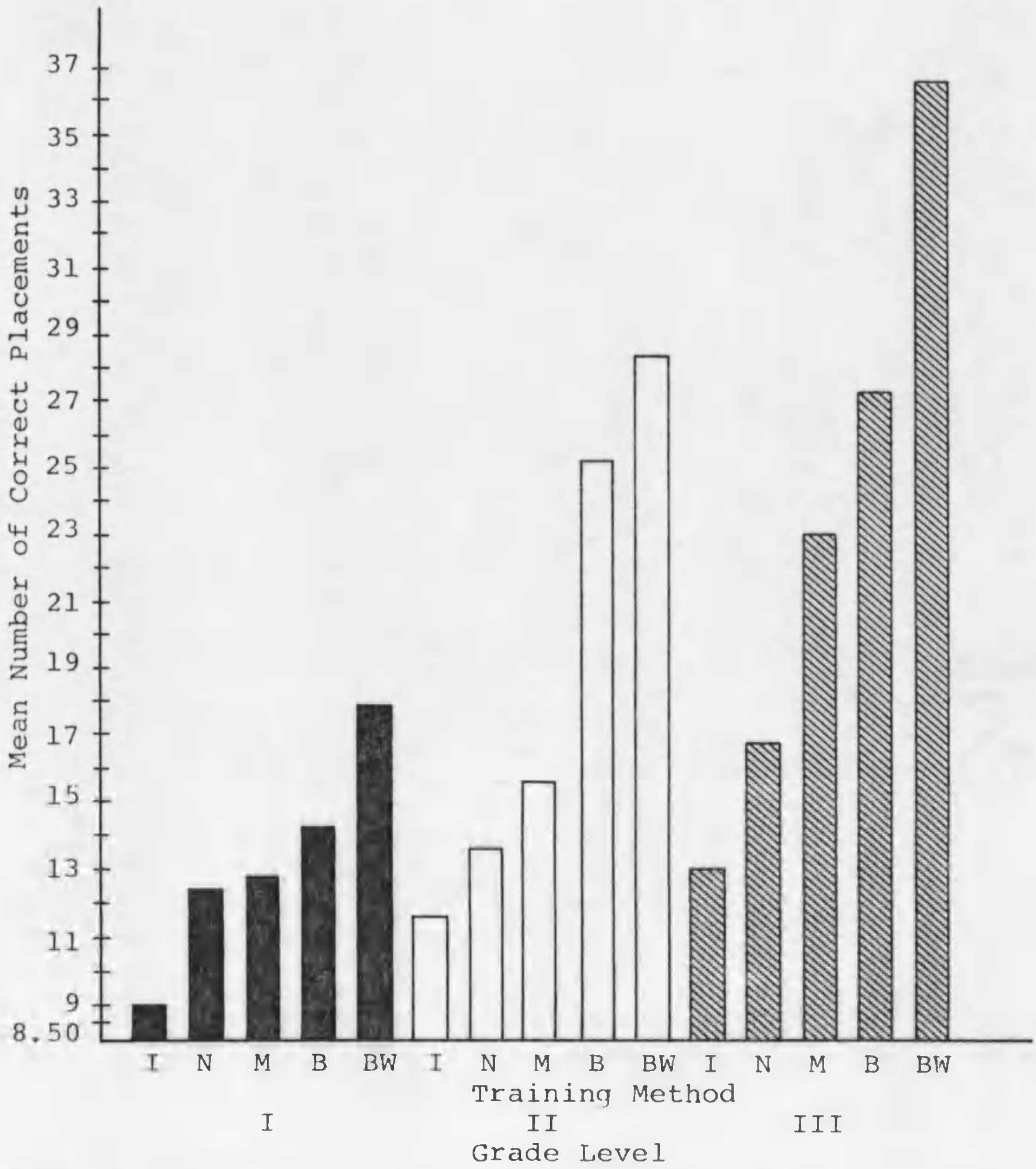

Figure 1. Mean Number of Correct Placements by Training Method and Grade Level

Grade level also affected performance (F [2,60] = 10.56, $p < .0005$). Both the third and fourth grades surpassed the second grade ($p < .05$ and $p < .01$, respectively). The grade level effect accounted for approximately 12% of the total variability in the experiment ($\omega^2 = .12$).

Performance was additionally influenced by the sex of the subjects (F [1,60] = 9.36, $p < .005$) which accounted for approximately 5% of the overall variability ($\omega^2 = .05$). Female subjects did significantly better than male subjects ($p < .01$) (see Tables 2 and 3).

None of the interaction effects approached significance (largest F = 1.80).

Number of Correct Arrays

As with the first dependent measure, training method significantly affected correct responding (F [4,60] = 7.98, $p < .0001$). The broad scope display surpassed the instructions-only control group ($p < .05$) while the broad scope display with verbalization exceeded the instructions-only, narrow and medium scope display groups (p's $< .01$). The percentage of variance accounted for by the training effect was some 19% ($\omega^2 = .19$). The conditions means appear in Table 4 and Figure 2.

Both grade level and sex of subjects significantly affected performance (F [2,60] = 7.63, $p < .005$, $\omega^2 = .09$, and F [1,60] = 9.72, $p < .005$, $\omega^2 = .06$, respectively). The

Table 2. Mean Number of Correct Placements by Sex and Grade Level Across All Training Methods

Sex	Grade Level II	Grade Level III	Grade Level IV
Females	14.27	22.47	26.20
Males	11.60	15.20	20.33

Table 3. Mean Number of Correct Placements by Sex and Training Method

Training Method	Sex: Females	Sex: Males
Instructions-Only	14.78	7.56
Narrow Scope Display	15.33	13.11
Medium Scope Display	20.22	13.89
Broad Scope Display	27.11	17.33
Broad Scope Display with Verbalization	28.44	26.67

Table 4. Mean Number of Correct Arrays by Training Method and Grade Level

Training Method	Grade Level II	III	IV
Training Method	0.17	0.67	0.83
Narrow Scope Display	0.67	1.17	1.50
Medium Scope Display	0.67	0.67	3.00
Broad Scope Display	0.83	3.50	3.33
Broad Scope Display with Verbalization	2.00	3.83	6.16

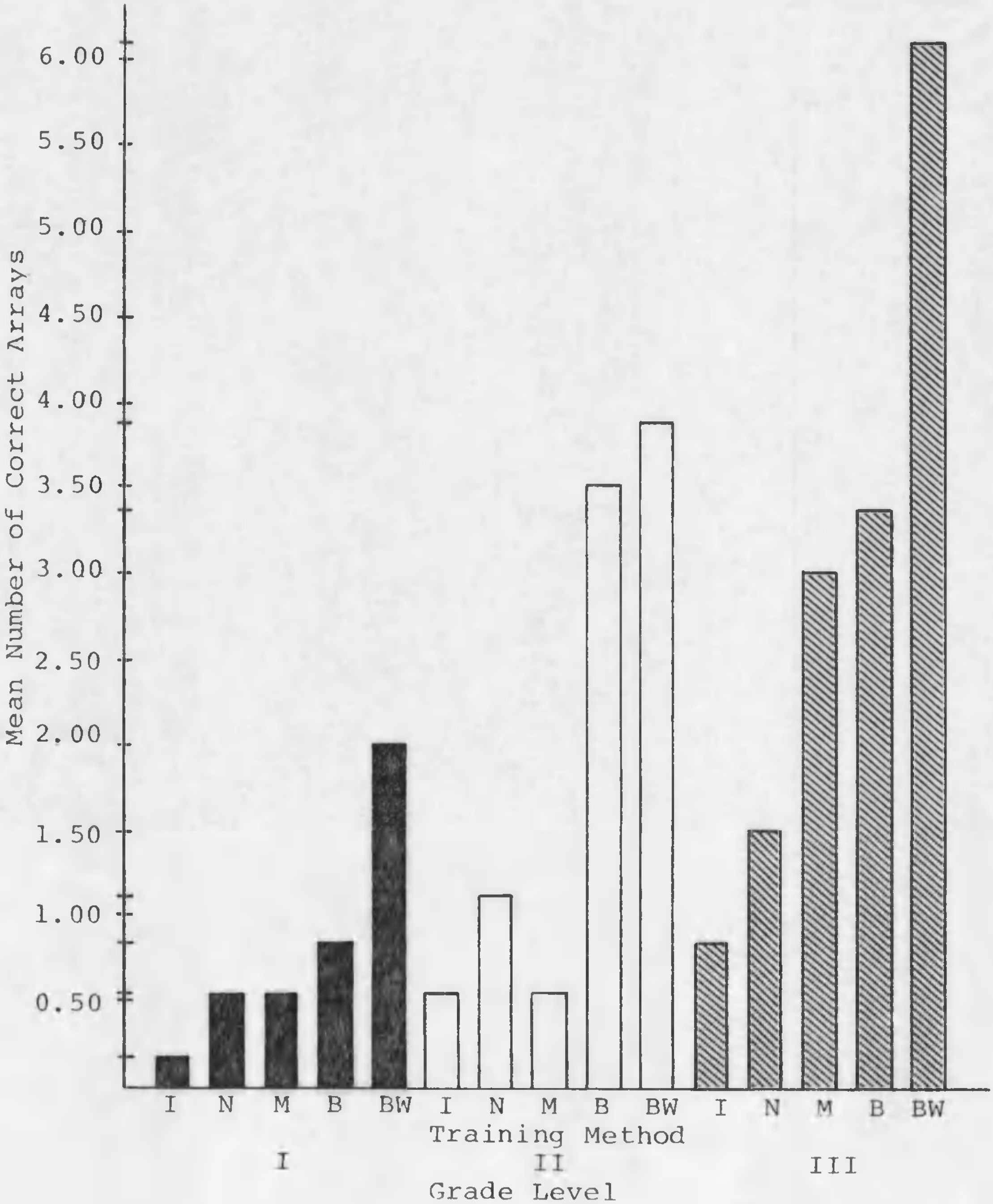

Figure 2. Mean Number of Correct Arrays by Training Method and Grade Level

fourth graders significantly exceeded the second graders ($p < .01$). Again female subjects did significantly better than male subjects ($p < .01$) (see Tables 5 and 6). None of the interaction effects approached significance (largest $F = 1.77$).

Time Required for Completion of Each Trial

Both the grade level of the subjects and the training method affected the amount of time required for the completion of each trial (F [2,60] = 4.32, $p < .05$, $\omega^2 = .06$, and F [4,60] = 4.54, $p < .005$, $\omega^2 = .13$). The second graders spent significantly more time on the task than did the fourth graders ($p < .05$). Subjects in the medium and broad scope display conditions spent significantly more time on each trial than did the control group (p's $< .01$) (see Table 7 and Figure 3).

The sex effect did not approach significance (F [1,60] = .002) nor did any of the interaction effects (largest $F = 1.85$) (Tables 8 and 9).

No significant correlations were found between time spent on each trial and each of the other dependent variables ($z = -1.83$, $z = -1.81$).

Table 5. Mean Number of Correct Arrays by Sex and Grade Level Across All Training Methods

Sex	Grade Level II	III	IV
Females	3.80	8.20	11.80
Males	1.40	3.80	6.20

Table 6. Mean Number of Correct Arrays by Sex and Training Method

Training Method	Sex Females	Males
Instructions-Only	0.89	0.22
Narrow Scope Display	1.22	1.00
Medium Scope Display	1.89	1.00
Broad Scope Display	4.33	0.77
Broad Scope Display with Verbalization	4.78	3.33

Table 7. Mean Number of Seconds Spent per Trial by Grade Level and Training Method

	Grade Level		
Training Method	II	III	IV
Instructions-Only	333.33	457.00	274.67
Narrow Scope Display	453.17	527.83	424.67
Medium Scope Display	775.67	643.33	468.50
Broad Scope Display	781.17	512.33	625.17
Broad Scope Display with Verbalization	639.67	519.50	300.33

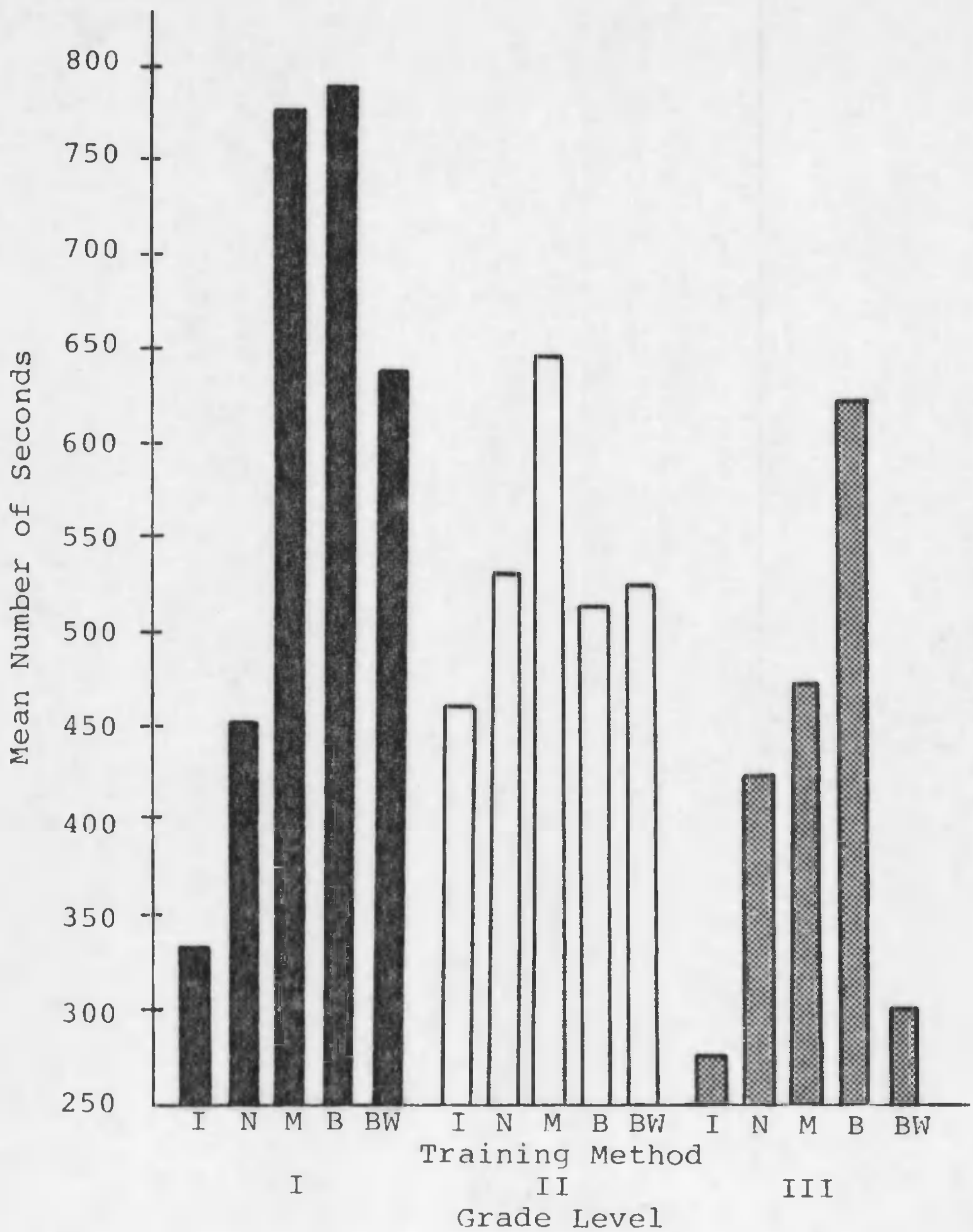

Figure 3. Mean Number of Seconds Spent per Trial by Training Method and Grade Level

Table 8. Mean Number of Seconds Spent per Trial by Sex and Grade Level Across All Training Methods

Sex	Grade Level II	Grade Level III	Grade Level IV
Females	550.20	597.40	396.07
Males	643.00	466.60	441.27

Table 9. Mean Number of Seconds Spent per Trial by Sex and Training Method

Training Method	Sex: Females	Sex: Males
Instructions-Only	414.67	295.33
Narrow Scope Display	491.44	445.67
Medium Scope Display	537.56	720.78
Broad Scope Display	660.00	619.11
Broad Scope Display with Verbalization	469.11	503.89

DISCUSSION

The general finding that method of training influences performance in concept rule attainment indicates that scope of display modeled is an important factor in observational rule learning. Other independent factors seem to be the grade level of the subject and the sex, although they account for a lesser amount of the total variability.

It appears that, for all subjects, modeling a broad scope display by exemplifying all important decision steps surpasses both instructions and modeling of correct terminal responses. This indicates that delineating turning points in decision making is one of the most important features of the modeling procedures in training for complex rule attainment. Furthermore, when overt verbalization is added, performance is also better than that attained through modeling an intermediate level of task analysis. This is perhaps due to the fact that verbalization aids in focusing the subject's attention on the most critical aspects of the model's behavior. Thus, it seems that, at least for children between the ages of seven and ten years, the most important factor for learning complex abstract rules (similar to the ones involved in the present study) through social learning techniques is analyzing the task into important decision steps and having the model present them in their sequential order coupled with overt verbalization. This suggests that modeling partitioning of a stimulus array facilitates information processing in children, and that overt verbalization enhances symbolic coding with subsequent enhancement of observational learning.

The instructions-only, narrow, and medium scope of display groups did not differ significantly from each other. The narrow scope of display proved to be a relatively ineffective training method. It should be noted, however, that in this particular condition the model not only did not show any task analysis but actually modeled the wrong type of behavior. The model placed the cards correctly in the receptacles without attending to the stimuli. Thus modeling solely correct terminal output not only may be relatively ineffective in teaching complex concept attainment but also detrimental, if inappropriate behavior is modeled.

The medium scope of display did not differ significantly from either the instructions or the narrow scope of display conditions. In this condition, the model showed what had to be attended to for correct problem solving (attendance to stimuli on the board) but did not show the behavior consequent to that (grouping of cards). This suggests that, in terms of information-processing, knowing what to attend to does not guarantee appropriate use of this information for correct problem solving.

Lassen (1974) in her study with 5th grade students had found that the intermediate level of task analysis was the only one superior to any other on all measures. She had suggested that there is an optimal level of analysis which can be modeled for maximum learning to occur. The results of the present study, however, indicate that a detailed task analysis is more effective than any other condition with 2nd, 3rd, and 4th graders. This suggests that the level of analysis which produced maximum learning may vary with the developmental level of the subject. An alternative hypothesis might be that the particular level of detailed task analysis examined in the present study was not above the optimum level suggested by Lassen's (1974) findings. A study of varying levels of task analysis across a series of developmental levels might further illuminate this issue.

An additional, rather interesting, finding was the fact that subjects in the medium and broad scope displays spent significantly more time on each trial than subjects in the control group. This may suggest that information given by those procedures was adequate to maintain the attention and interest of the subject in trying to attain the solution and thus the subject spent more time on the task. In contrast to this, the narrow scope display gave too little information and consequently the subject soon gave up and responded more or less by chance. On the other hand, the broad scope display with verbalization was explicit enough to enable subjects to perform correctly in less time. Overall, it seems that time spent on each trial is independent of correct performance.

The fact that second graders showed inferior performance in both the number of correct placements and number of completely correct arrays and required more time suggests that performance on such a task is independently affected by the age, educational level of the subject, and/or a host of numerous other factors that covary with age.

Furthermore, sex of the subjects appears to be another independent factor influencing performance. The fact that female subjects did significantly better than male subjects on two of the dependent variables could be attributed to a higher level of motivation in females, better attention processes, or any combination of factors that may covary with the sex of the subject. An investigation of such variables lies beyond the scope of the present study and therefore no conclusions can be drawn.

Perhaps the most striking finding was the fact that none of the interactions among the three variables was significant on any of the dependent measures. This implies that either each of the factors operates independently of the other two, or that this is the case only within the limits of the particular age, task, socioeconomic status, and other such factors operating in the sample studied. Further research could address this issue directly by studying the effects of this type of training at higher age levels.

In summary, the results indicate that traditional teaching techniques utilizing verbal instructions could be supplemented by social learning techniques focusing on verbalization and modeling of sequential decision steps involved in rule attainment. This could be legitimately generalized to teaching on the second through the fourth grade level.

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