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ABSTRACT

Three studies to determine the effects of adult models on interrogative strategies of children (ages 6-11) are reviewed. Two issues are analyzed: (1) the comparative effectiveness of various types of modeling procedures for changing rule-governed behaviors, and (2) the interaction between observational learning and the developmental level of the observing child. It was concluded from this series of studies that cognitive models are more effective than exemplary models. In addition, exemplary models were found to be capable of eliciting constraint-seeking questions (which help in "narrowing in" on a correct answer) from children who already possessed the generalized format of such questions within their repertoires. However, exemplary models have proven to be ineffective in provoking such questions among children lacking the covert search strategies and conceptual partitioning behaviors which go into constraint-seeking. Cognitive modeling has been effective in bringing about constraint-seeking in children who, by virtue of being in the initial phases of the transition from hypotheses-scanning to constraint-seeking, do not possess the component skills underlying constraint-seeking. Cognitive models, in addition, have effected increases not only in constraint-seeking but also in problem-solving efficiency. (CS)

Modeling and Interrogative Strategies

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Children elicit and control the information they receive through the questions they ask. Children's interrogative behaviors bear implications for their underlying information-processing capabilities. Consequently, developmental changes in the interrogative strategies of children have received a considerable amount of attention.

The most common method for investigating children's interrogative strategies employs the old parlor game of "20 Questions." The child is shown a large array of pictures of common objects and is instructed to ask questions in order to determine which picture the examiner is thinking of. The child is allowed to ask any question that can be answered "yes" or "no".

Mosher and Hornsby (1966) distinguished between hypothesis-scanning and constraint-seeking questions on the 20 Questions Procedure. Hypothesis-scanning questions test specific self-sufficient hypotheses and bear no relationship to previous questions (e.g., Is it a dog? Is it a car?). Constraint-seeking questions are more general, referring to and allowing the elimination of more than one alternative from the array (e.g., Is it an animal? Does it fly? Does it have four legs?). Constraint-seeking questions can be integrated within an overall questioning strategy, permitting the child to "narrow in" on the correct answer. Such a strategy usually results in more efficient problem-solving, as reflected by smaller numbers of questions being required for solution.

Mosher and Hornsby reported that between the ages of 6 and 11, hypothesis-scanning questions declined from 98 to 17%, while constraint-seeking questions increased from 2 to 81%, with accompanying increases in the efficiency with which the children solved the problem. The years between ages 6 and 11 seem to mark an important transitional period in the development of children's interrogative strategies. Although we have completed some studies of interrogative behaviors

of younger children (Denney, 1974) and of elderly persons (Denney & Denney, 1973; 1974), it is the research with children in the 6- to 11-year-old range that I wish to focus on here. In particular, I wish to review three studies which have been completed to determine the effects of adult models upon the interrogative strategies of children occupying the transitional period from 6 to 11. These studies have produced some results concerning (a) the comparative effectiveness of various types of modeling procedures for changing rule-governed behaviors; and (b) the interaction between observational learning and the developmental level of the observing child. I will conclude with a discussion of these two issues after reviewing the studies.

In the first study (Denney, 1972), 6-, 8-, and 10-year-old boys were shown an adult model who asked either (1) hypothesis-scanning questions, (2) perceptually-based constraint-seeking questions (e.g., Does it have a sharp point?), or (3) functionally-based constraint-seeking questions (e.g., Does it fly?). These were exemplary models, who only provided examples of hypothesis-scanning or constraint-seeking questions. Pre- and posttest comparisons between the three modeling groups and untreated controls revealed that boys at various ages were differentially responsive to the modeling conditions. The 6 year olds did not change at all; floor effects precluded their changing in response to the hypothesis-scanning model and they were completely unresponsive to the constraint-seeking models. The 8 year olds decreased their constraint-seeking questions in response to the hypothesis-scanning model and increased their constraint-seeking questions in response to the perceptual constraint-seeking model. The functional constraint-seeking model had no impact upon the 8 year olds. The 10 year olds increased their constraint-seeking questions only in response to the functional constraint-seeking model. Analysis of the numbers of questions required for solution of the pre- and posttest 20 Questions Procedures indicated no changes. The increases in

constraint-seeking effected by the exemplary models were therefore not accompanied by increases in problem-solving efficiency.

In the second study (Denney, Denney, & Ziobrowski, 1973), cognitive rather than exemplary models were used in an attempt to have a fuller impact upon the interrogative strategies of 6-year-old children. The cognitive model not only exemplified constraint-seeking questioning, but also verbalized strategies for partitioning the array and formulating constraint-seeking questions based upon such partitions. These verbalizations were emitted before each question, as though the model was talking to himself. There were three different training procedures in this study: (1) cognitive modeling alone; (2) cognitive modeling plus elimination, in which the model removed from the array the alternatives that he had eliminated with each of his constraint-seeking questions, and (3) cognitive modeling with graduated arrays, in which the cognitive model depicted his constraint-seeking strategy on increasingly larger stimulus arrays.

Compared with untreated controls, all three training conditions brought about increases in constraint-seeking questioning. Modeling-plus-elimination was significantly more effective than the other two conditions, the graphic depiction of whole subsets of stimuli disappearing from the array proving to be a particularly effective addition to cognitive modeling. Once again, however, in spite of substantial increases in constraint-seeking questions, the training brought about no increases in problem-solving efficiency.

The third study (Denney, 1974) provided an opportunity to compare exemplary and cognitive modeling procedures directly for children of various ages. In view of the preceding studies, we predicted that the difference between cognitive and exemplary models would be greatest among the youngest children in the study. The verbalizations of the cognitive model were changed somewhat in this study; The model addressed the issue of solving the problem in the fewest number of questions and of making effective use of the information gained through constraint-

seeking questioning. These changes were introduced in an effort to alter problem-solving efficiency in addition to constraint-seeking questioning. We also added a new training procedure, combining cognitive modeling with self-rehearsal training, again in an effort to enhance problem-solving efficiency. The self-rehearsal training was patterned after that used by Meichenbaum and Goodman (1971) for increasing reflective behaviors among impulsive children; in the present study, children observed the cognitive model and then were instructed to repeat certain key phrases relevant to the constraint-seeking strategy before asking questions on a series of training items.

In all, 6-, 8-, and 10-year-old children observed either (1) exemplary modeling, (2) cognitive modeling, or (3) cognitive modeling combined with self-rehearsal training. Compared with untreated controls, all three training conditions brought about greater constraint-seeking for the 8 and 10 year olds; however, cognitive modeling alone was the only effective training procedure for the 6 year olds. Cognitive modeling was significantly more effective than exemplary modeling for this youngest age group. Unlike the other studies, there were also significant training effects upon problem-solving efficiency. For each of the age groups, including the 6 year olds, cognitive modeling was responsible for increases in problem-solving efficiency along with constraint-seeking. The addition of self-rehearsal training failed to enhance the effectiveness of cognitive modeling in all instances. In fact, self-rehearsal training seemed to detract from cognitive modeling, perhaps by distracting the child from the learning made available through cognitive models.

What is being changed in these studies appears to be a generalized, rule-governed interrogative strategy as opposed to a set of specific questioning responses. Children can use their newly acquired constraint-seeking strategies on stimulus arrays other than those on which they observed the model perform. Furthermore, we have found relatively little direct mimicry of the model's own questions. For

example, in the last study we examined the percentage of constraint-seeking questions asked during the posttest that differed from questions posed by the model on the training items. About 75% of these posttest constraint-seeking questions were novel constraint-seeking questions, not depicted by the model. This figure, incidentally, is remarkably stable for children of various ages and for children observing various types of models. If a child is going to increase his constraint-seeking questioning at all, he does so in a generalized fashion, with about three-fourths of his subsequent questions differing from those asked by the model he observes.

The most obvious conclusion to be drawn from this series of studies is that cognitive models are more effective than exemplary models. However, these studies permit us to go beyond this straightforward conclusion and to begin to specify the conditions under which differences in the effectiveness of cognitive and exemplary models are likely to be encountered. In this regard, it is important to note that in both the first and third studies our 8- and 10-year-old children were already asking constraint-seeking questions on the pretest, while such questions were extremely rare among the 6 year olds. Exemplary models were capable of eliciting constraint-seeking questions from those who already possessed the generalized format of such questions within their repertoires; however, exemplary models have proven to be quite ineffective in provoking such questions among those children whom we suspect lack the covert search strategies and conceptual partitioning behaviors which go into constraint-seeking. On the other hand, cognitive modeling has been effective in bringing about constraint-seeking in children who, by virtue of being in the initial phases of the transition from hypothesis-scanning to constraint-seeking, do not possess the component skills underlying constraint-seeking. Cognitive models have effected increases not only in constraint-seeking but also in the much less malleable feature of 20 Questions performance, namely problem-solving efficiency.

In terms of Bandura and Walters' (1963) distinction between modeling and eliciting effects of models, we are led to conclude that cognitive models bring about true modeling of developmentally more advanced interrogative strategies, while exemplary models appear to be capable only of eliciting strategies already possessed within the repertoires of somewhat older children. Thus, the developmental level of the child interacts with the type of model to determine the amount and type of observational le ..ng that occurs. Children in developmentally earlier periods require the additional guidance afforded through the self-verbalizations of cognitive models.

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