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ABSTRACT

The purpose of the present experiment was to investigate whether the effect of observing a peer who was conserving could facilitate subsequent acquisition and transfer of conservation ability in a nonconserving child. Eighty-two nonconserving first grade children acquired the ability to give conservation judgments and reasons on six conservation problems after they had had the opportunity to observe conserving children respond. The ability transferred to twelve different problems on the same and different concepts, and was retained and present after two weeks. The performance of conservers who observed nonconservers' performance was unaffected. (Author/ST)

The Acquisition of Conservation through the Observation of Conserving Models[1]

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Nonconserving first-grade children acquired the ability to give conservation judgments and reasons on six conservation problems to which they had the opportunity to observe conserving children respond. The ability transferred to twelve different problems on the same and different concepts, and was retained and present after two weeks. The performance of conservers who observed nonconservers' performance was unaffected.

[1] Draft of a paper presented at the American Educational Research Association, annual meeting in New Orleans, 1973.

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A variety of techniques have been employed in attempting to train conservation in children and have met with varying degrees of success. Few of these attempts have employed social variables as a means of inducing conserving behavior in nonconserving children. Murray (1972) has reported two studies in which he found that nonconservers acquired the ability to make correct conservation judgments (supported by sound reason) after they had been subjected to a brief social conflict situation in which one nonconserver and two conservers were required to agree in their responses to a series of six conservation problems. Moreover, Murray (1972) found that the previous nonconserving child was able to transfer widely his new acquired ability to conserve, to six different conservation problems on the same concepts as well as to six conservation problems on different concepts.

Several recent experiments by Rosenthal and his colleagues have pointed to the effectiveness of a modeling technique on the learning of various classes of conceptual behaviors. For example, Rosenthal, Zimmerman and Durning (1970) demonstrated the significant influence of a model on the class of questions children ask in seeking information with reference to stimulus pictures, and the subsequent generalization to a new set of stimulus pictures. Model induced modifications of object classification have also been reported in children by Rosenthal and White (1972) as was concept acquisition and generalization (Rosenthal, Alford & Rasp, 1972). Rosenthal and Zimmerman (1972) also demonstrated the extent to which modeling is a powerful learning technique by inducing conservation in nonconserving children subsequent to their observing a conserving adult model. In addition, Cook & Smothergill (1973) demonstrated the extent to

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which an observing child retains and has knowledge regarding the model's behavior.

To the extent that such experiments demonstrate the acquisition of rules governing the types of behavior modeled, the present study investigated whether the system of rules governing conservation could be acquired through the process of peer modeling in the absence of any social interaction and/or dialectic between model and observer. More specifically, one purpose of the present experiment was to investigate whether the effect of observing a peer who was conserving could facilitate subsequent acquisition and transfer of conservation ability in a nonconserving child.

METHOD

Subjects

The subjects were 82 first graders with a mean age of 6.2 attending an elementary public school in Queens, New York. All subjects were of Anglo-American ethnic background and came from middle class homes.

Materials

Forms A, B and C of the Goldschmid and Bentler (1968) Concept Assessment Kit - Conservation was utilized in this study. Forms A and B are closely parallel forms and include six tasks: Two-dimensional space, Number, Substance, Continuous Quantity and Discontinuance Quantity. Form C (used as a transfer task in this experiment) assesses conservation of Area and Length.

Design and Procedure

All 82 subjects were pretested on the six conservation problems of Form A of the Goldschmid Bentler (1968) Concepts Assessment Kit to determine which were conservers and nonconservers. The directions and verbal instructions incorporated in the test manual were closely adhered to. The protocols were scored in accord with the test manual, one point given for each correct response and one point for each correct justification for a maximum of 12 points. Conservers were taken to be subjects who had a score of six or more points, nonconservers were taken to be those subjects who scored under six. By this criteria there were 35 subjects who were conservers, and 47 subjects who were nonconservers.

The subjects balanced for conserving ability were then randomly assigned individually to the model or observer condition, and the observers were then randomly assigned to peer models. Four groups were constructed by arranging conservers and nonconservers to observe conserving and nonconserving models. Thus, one group consisted of nonconservers observing a conserving model, while in another group nonconservers observed a nonconserving model. Two similar groups were formed employing the conservers such that conservers observed either a conserving or nonconserving peer model. The modeling treatment immediately followed the pretest. The observer was instructed simply to <u>watch</u> and <u>listen</u> carefully to what the experimenter and model (the other child) did and said, and not to talk or ask questions even if the model said something wrong. The experimenter then administers Form A again to the model, following the exact instructions as in the pretest. Immediately after this observational session, the model exited and the observers were tested on Form A and Form B, which are parallel forms of the six problems. Two weeks later all observers were tested again on Form A and B, and also on Form C which constituted six problems on new concepts.

The final protocols were scored one point for a correct conservation judgment, and one point for a correct justification (reason) for each of the six problems of each Form of the Concept Assessment Kit. The data of interest were the subjects scores on the pretest, the immediate and delayed posttests.

RESULTS

The mean posttest score ($\bar{x}$=9.53) for all observers was significantly ($p < .01$) greater than their mean pretest scores ($\bar{x}$=5.78) on Form A. On the other hand, the mean of the models' pretest scores on Form A ($\bar{x}$=6.23) was not significantly ($p > .05$) different from their performance during the modeling session on Form A ($\bar{x}$=6.47). Therefore, gains in the observers conservation performance were not simply due to practice effects.

Nonconserving subjects observing conservers gained more in conservation ability on the immediate and delayed posttests than those nonconservers observing nonconservers (See Table 2), whereas conserving subjects observing nonconservers were not adversely affected (See Table 1). It should also be noted that the gains on the posttests of subjects who can be considered true nonconservers ($\bar{x}$=0) include the ability to give good reasons.

DISCUSSION

The analyses of the data strongly support the notion that exposure to a conserving peer model would be highly effective in facilitating conservation in the subjects subsequent conservation performance. Comparison of the results in this experiment with the Murray (1972) findings and that of Rosenthal and Zimmerman (1972) indicate that peer modeling is as effective in facilitating conservation as social interaction, and that modeling is more effective when the model is a peer than when he is not. The frequency of new justification emitted by the nonconserving observers suggested that children were assimilating the properties of the models' justifications, and were not merely copying the models' utterances. This finding appears contrary to Piaget's (1951) view which suggests that social transmission techniques, such as imitation, while necessary are not sufficient to transmit the schemas necessary for conservation. Clearly the observers learned some complex, organized behavior.

It is not really clear what the observer learned from the model, and it is difficult to speculate about what kind of cognitive processes functioned in the present situation and not in the other training situation that have been investigated. It may be the case that "Observation of a model performing a task in a manner discrepant from (but not inferior to) the child's own conceptualization of the task may be sufficient to induce in the child an awareness of alternative conceptions and will perhaps lead to disequilibrium and reorganization..." (Kuhn, 1972). In addition, the present findings provide evidence supporting the view that a nonconserving child not only learns specific cues from the peer model that he retains, but he also acquires more generalized "rules" from the model.

Techniques like the present modeling procedure that induce or facilitate conservation and also have classroom application, constitute an important part of the psychology of instruction.

The success of the present procedure requires theoretical and empirical reconciliation with so many other reasonable training methods that have failed to induce conservation.

Table 1

Mean Conservation Scores for Nonconservers (NC) Who Observed Nonconserver and Conserver Models and Conservers (C) Who Observed Nonconserver and Conserver Models on Forms A, B and C

Groups		Immediate Posttests		Delayed Posttests (2wks.)			Models' Score	
Observer	Pretest A	A	B	A	B	C	Pre A	Model A
NC (N=11)	0	7.1	7.1	7.7	8.9	8.6	12.0	12.0 C (N=11)
C (N= 6)	8.0	12.0	12.0	12.0	12.0	10.0	11.3	10.7 C (N= 6)
NC (N=12)	2.9	5.9	7.1	7.8	7.0	5.3	3.8	6.3 NC(N=12)
C (N=12)	12.0	11.6	12.0	12.0	12.0	11.8	0	1.5 NC(N=12)

Table 2

Mean Gain Scores Between Pretest A and Immediate and Delayed Posttests For Nonconservers (NC) Observing Conserving (C) And Nonconserving (NC) Models

	Immediate Posttests		Delayed Posttests (2 wks.)		
Groups	Form A*	Form B	Form A	Form B*	Form C*
NC Observing C (N=11)	7.9	7.1	7.7	8.9	8.6
NC Observing NC(N=12)	3.0	4.2	4.7	4.1	2.5

* $p < .01$

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