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ABSTRACT

This study investigated how a child's level and pattern of performance affected teachers' perception of the cause of the hild's performance and teacher's evaluation of the child and his characteristics. Pairs of either teachers, student teachers, or education students participated in the study, accepting the role of participant or observer. The participants taught a fifth grade student a mathematics lesson for three 5-minute trials, while the observer watched the participant during her task. Data from 108 subjects were subjected to analysis of variance. The results provided some support for the presence of ego-relevant attributional biases in teachers. In some instances participants appeared to show ego-defensive biases, while in other cases, participant responses were identical to those of observers. Participants sometimes appeared to be trying hard to be non-biased and to avoid ego-protecting or enhancing attributions. This study observes the interaction of the participant and observer, to find who influences whom. Further research is needed to assess the influence of other persons upon teachers. Included in this study is a ten-item bibliography and appendixes with testing instructions, post-experimental and post-trial questionnaires, and lessons. (MJM)

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TEACHERS' AND OBSERVERS' PERCEPTION OF CAUSALITY FOR A CHILD'S PERFORMANCE

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SUMMARY

This study investigated how a child's level and pattern of performance affected teachers' perception of the causal source of the child's performance and teachers' evaluation of the child and his characteristics. Teachers were randomly assigned to one of two possible roles (participant or observer) in one of the three feedback conditions. One pair (a participant and an observer) both in the same feedback condition participated in the experimental situation at a time. The participants taught an elementary school child, supposedly on the other side of a one-way mirror, a mathematics lesson for three five-minute trials; the observer watched the participant during her task. In the Low-High feedback condition, the child's performance improved over trials. In the High-Low condition, the child's performance deteriorated over trials. In the Low-Low condition the child's performance remained stable, but low.

Based on the attribution theory (Heider, 1958; Kelley, 1967), it was hypothesized that participants and observers would differentially attribute causality in each outcome condition. The participant was expected to attribute the child's success to herself in the Low-High condition, because such an effect is ego-enhancing. On the other hand, she should attribute the child's failure (in the Low-Low and High-Low conditions) to external factors, either the situation or the child himself, because this is ego-protective. Observers, however, were not expected to exhibit these ego-relevant attributional biases.

Data from 108 female teachers and student teachers were analyzed through a 3 (Condition) x 2 (Role) x 54 (Pair) analysis of variance design. Data from an open-ended question regarding causality was subjected to Chi Square analyses. Results showed that, as predicted, participants were somewhat more likely to attribute poor performance to situational factors than were observers. However, both groups attributed low or descending performance to situational factors more than they did high performance. Contrary to prediction, participants appeared to attribute any change in the child's performance (improvement or deterioration) to themselves, although they ranked their teaching as less important in the Low-High condition, and they accepted blame for deteriorating performance as much or more than they took credit for improving performance. Ratings of the participants' presentation revealed that observers rated participants as performing better than did the participants themselves. Teachers' performance ratings closely followed the actual performance of the child for both participants and observers.

Measures of sentiment toward the child (pride, praise and reward) showed that the Low-High child was evaluated higher than the High-Low child, who in turn was evaluated higher than the Low-Low child. This pattern of evaluation was consistent for both participants and observers. The Low-High child was rated higher in skill than the High-Low child by both groups, while the High-Low child was rated higher in both skill and effort than the Low-Low child. Observers rated the Low-Low child higher in effort than did participants.

These results disagree with earlier studies (Johnson, Feigenbaum and Weiby, 1964; Beckman, 1970) which showed that teachers took credit for success and did not blame themselves for the child's failure. It was concluded that differences between the present results and previous results could be due to differences either in (1) the populations or (2) the experimental situations. First, it may be that teachers (and education students) are becoming more sophisticated about research dealing with teacher bias or that, through training, they are learning to take responsibility for any change in their students' performance, both improvement and deterioration. In fact, some of our results suggest that participants may actually make anti-defensive attributions, i.e., as a group they may be somewhat more likely to accept responsibility for descending performance than improving performance. Secondly, the particular experimental situation may have allowed the observers to become involved in the situation. The fact that participants and observers were aware of each other may have affected the responding of one or both groups. Suggestions for further research include assessment of the influence of the presence or absence of peers and higher status persons upon participants' attribution and ratings and further manipulation of the level of situational involvement of observers.

INTRODUCTION

This study was concerned with the forces influencing the teacher's formation of beliefs and expectations about her students and their performance. It investigated how one important variable, the child's performance, affected the teacher's perception of the child and the causal source of his performance. It was hypothesized that when teacher and child interact in the classroom, the pattern of the child's performance affects not only the teacher's belief concerning her competency, but also her attribution of causality for the child's performance and her sentiments toward him.

This influence of the child's performance on the teacher's belief is important, because these beliefs, in turn, may influence the child's permanent learning and achievement. Rosenthal and Jacobson (1966) have shown that students whom teachers falsely believe have superior intellectual capacities, may improve more in intellectual competence than do other students. However, it is the teacher's belief in a child's inferior intellectual capacities that possesses more potential danger for the child. Clark (1965) has placed blame for failure in education of minority group children directly upon teachers and educators. He believes that the Negro child does not learn,because his teacher does not expect him to learn. A survey by Herriot and St. John (1966) supports Clark's analysis. This survey found that as socioeconomic status drops (and the proportion of minority students increases), a smaller percent of teachers have favorable impressions of the motivations of their students.

In certain classrooms the failure (i.e., low performance) of the child is responded to in such a manner by the teacher that the child's feeling of inadequacy is increased. Katz (1967) believes that many teachers inadvertently express negative reinforcement in terms of disapproval or rejection of these students who perform poorly. In some cases, the effect on the minority group student may be a strengthening of his tendency toward indiscriminate self-criticism of his own efforts. The feelings and opinions of the teacher can have a lasting effect on the child's personality by creating permanent feelings of inferiority or lack of confidence in the child.

The child's performance obviously is not the only variable influencing teachers' beliefs; nor are the teacher's beliefs and expectations the only forces influencing the child's future performance. However, each of these factors is an important potential determiner of the child's permanent intellectual capacity. Therefore, the following reciprocal interaction model was assumed: The child performs poorly, the teacher concludes that the child's ability or motivation is low, and she dispenses negative stimuli in the form of negative (or lack of positive) remarks or actions. These stimuli from the teacher inhibit the child's performance, and, therefore, he performs more poorly than his capabilities. Subsequently, his performance is downgraded by the teacher.

The young child is extremely dependent on information of others in making attributions about his performance. The information provided may overstate his responsibility for poor outcomes and understate his responsibility for good outcomes. Thus, attributional cues given the child by the teacher may inflect biased self-evaluations upon him. This biased self-evaluation, in turn, may influence his academic achievement.

Teachers' Attributions and Sentiments

The basic premise of the above discussion is that the child's performance influences the teacher's perceptions and beliefs, and thus, possibly the child's own future performance. Assuming this premise is true, it is necessary to consider in detail the interaction of the child's performance and the teacher's perceptions and cognitions.

While the theoretical background espoused here is applicable to causal analysis in any interpersonal situation, it is particularly fruitful to analyze the perceptions of the teacher in these theoretical terms, because such an analysis enables us to better understand interpersonal perceptions and interactions in the classroom. The social-psychological position upon which this study is based (Heider, 1958) assumes that when man perceives the occurrence of an event within his life space he searches for the causal locus of that event. He may attribute the event internally to self or externally to the environment (e.g., the teacher may attribute the child's performance internally to her own teaching or externally to the child or to situational demands). In either case, causal attribution is greatly influenced by a force toward consistency among a person's many cognitions and beliefs. New attributions must concur with an already existing constellation of cognitions about one's world. Although veridical interpretation of causal relationships usually helps adaptation and survival in the environment, the force toward consistency among a person's many cognitions and beliefs can create situations in which misattribution of the cause of a new event is adaptive for the individual. Biased attribution is sometimes consonant with a person's perception of himself and his world.

It is evident that biases, illusions, and errors in attributional processes may sometimes occur. One type of disregard for the relevant situation is seen in superstitious behavior. Here, covariation between one's actions and certain consequences helps to create strong feelings of personal control where actual control does not exist. Another type of attributional illusion is present in rationalization where a person attributes cause to external factors rather than to himself (e.g., He says "They are jealous and vengeful so they will not publish my novel" rather than "I am a poor writer").

Similar types of attributional errors may occur in the classroom. Teachers may misattribute the intentions and characteristics of their students. This study examines one situation in which biased attribution may occur (Kelley, 1967)--- one in which the relevant effects of an event have positive or negative affective significance for a person. Here the event of significance is the child's performance, and the person for whom the event is significant is the teacher. However, this analysis also can be applied to other types of interpersonal interactions.

Each event has an affective component; it is, in some degree, positive or negative, pleasant or unpleasant, agreeable or disagreeable. Furthermore, causal attribution is influenced by the direction and magnitude of the affective consequences of an event, i.e., the degree of positiveness or negativeness of the consequences of an event. When the relevant effects of an event have strong affective significance, the popular notion that credit and blame placing is proceeded by attribution of causality is incorrect. If an outcome in-

herently contains a strong affective component, because it is obviously a strong disagreeable or a strongly agreeable event, sentiments of credit or blame present affect the attribution of causality.

It was assumed that the outcome of a child's performance is inherently pleasant or unpleasant for the teacher, as well as for the student. The positiveness or negativeness of an event (e.g., the child's performance) influences whether it is attributed to oneself (the teacher) or to an external force (the child or the environment). It was predicted that when a situation has strong positive affective significance for the teacher, a motivational force toward ego-enhancing attribution exists; the teacher accepts credit for the child's success. On the other hand, when a situation has strong negative affective significance, a force toward ego-protective attribution exists; the teacher displaces blame for failure onto the child or the environment. Thus, forces toward the self-protective and self-enhancing attributions of teachers manifest themselves in the classroom.

Prior Research

Past studies have provided some support for this contention. Johnson, Feigenbaum, and Weiby (1964) considered the effect of high or low performance of a fictitious student on the teacher's attribution of responsibility for this student's performance. Results showed that when a student improved with instruction, the instructor thought herself responsible for the student's success, i.e., she accepted credit which is ego-enhancing. When the student's performance remained low, the teacher thought the child responsible, i.e., she displaced blame which is ego-protective.

Beckman (1970) compared the attributions of two types of subjects; participants (who taught two fictitious children) and observers (who were presented with information about a hypothetical situation similar to the participant condition). While one child always performed well, the second child's performance either varied or remained low. Results showed that observers generally did not differentially attribute causation for the children's differing performance, whereas participants showed the same ego-relevant biases as did Johnson's subjects. However, only in an ego-enhancing condition (i.e., the child's performance improves) did the tendencies of participants and observers to attribute causation to the participant herself significantly differ. Results also suggested that subjects' sentiments toward the children were affected by the child's pattern of performance. While observers appeared to base their postexperimental evaluation of the child on the child's overall level of performance, participants' ratings appeared also to be influenced by their perceptions of the child's level of motivation.

Both the Johnson et al. and the Beckman studies have implications for educational practices. They suggest that teachers may have attributional biases which are determined by the child's current pattern of progress and which, in turn, can affect the child's future progress. However, both of these studies also contain certain methodological limitations. The Johnson et al. study's coding of causation was not specific, (i.e., causation was coded only as internal or external). While it provided some insight into the effects of the direction of affective significance (positive or negative), it had no comparison group of uninvolved teachers which would have allowed

estimation of the degree of ego-protective or ego-enhancing attribution.

While the Beckman study varied degree of involvement, the differences found between participants and observers may have been due to population and procedural differences between the two groups. In the Beckman (1970) experiment the observer condition placed the teacher in direct contact with the children (to make the situation appear more real), while in the participant condition the children were supposedly on the other side of a one-way mirror. This procedural difference probably is responsible for the large number of participants and small number of observers who mention situational factors (among which was the one-way communication) as a reason for low performance. On the other hand, in the previous Beckman experiment one child always performed well, so that, even when the other child was failing dismally, the participant could point to the high child's performance as justification for her high self-performance ratings.

In contrast to the previous Beckman study, the current study attempted to distinguish between the effects of involvement in the situation (participant vs. observer) and the effects of type of situation (real vs. hypothetical). Consideration of both of these factors (involvement and type of situation) leads to four possible experimental combinations: participants in a real teaching task (Real Participant), participants in a hypothetical teaching task (Hypothetical Participant), Observers in a real task (Real Observer), and observers in a hypothetical task (Hypothetical Observers). The previous Beckman experiment considered only the first and last of these possibilities. Thus, the effects of level of involvement were confounded with the effects of type of situation. The results show that real observers, watching real participants, react differently than hypothetical observers. Real observers have additional information about the participants' teaching performance, which can affect the attribution made.

In the current study, a basic 3 by 2 design was used with 18 subjects in each of six conditions. Independent variables were three patterns of the child-confederate's performance: increasing(Low-High), deteriorating(High-Low) and stable (Low-Low) and two degrees of involvement of subjects in the situation (Real Participant and Real Observer). Dependent variables measured included perceptions of the cause of the child's performance on both open-ended and structured questions, sentiments toward (i.e., evaluation of) the child, and ratings of teacher's performance and the child's skill and effort.

It was hypothesized that participants and observers would differentially attribute causality in each outcome condition. The participant is expected to attribute the child's success (in the Low-High condition) to herself, because such attribution is ego-enhancing. On the other hand, she should attribute the child's failure (in the Low-Low and High-Low conditions) to external factors, because this is ego-protective. Observers, however, would not be expected to exhibit such ego-relevant attributional biases. It was also hypothesized that while observers would evaluate the child primarily on the basis of his performance, participants would show bias in their ratings of the child. This should particularly evidence itself in lower ratings (on sentiments, skill, etc.) of the High-Low child.

METHODS

Subjects

One hundred and twelve subjects who were full or part-time education students at the University of California, Los Angeles participated in this study. Subjects were teachers (N=34), student-teachers with a semester of teaching experience (N=71) or education students who had not yet begun student teaching (N=7). All subjects were assigned randomly to role (participant or observer) and condition. Female subjects were recruited through an advertisement in the student newspaper and each was paid $4.00 for her time.

Apparatus

The participant (P) was seated at a table facing a glass partition to a second room. The observer (O) was seated at a desk to the side and behind the participant. Directly behind P was a large blackboard with chalk and erasers. On the table in front of P was a microphone and a remote control switch which activated a tape recorder in the next room. When the switch was "on", auditory input from the microphone on the table could be heard in the next room. On the shelf below the glass window, facing P but beyond her reach, was a second remote control switch. When this switch was "on", the subjects were able to hear a tape recording of a child, supposedly present in the next room through a speaker placed above the window partition.

Procedure

A participant and an observer were tested together by the experimenter. For each pair one subject was randomly designated to be the participant (teacher), the other was designated as observer. The subjects were told that they are taking part in a study of the effectiveness of various teaching methods and means of communication sponsored by the Office of Education. The teacher (i.e., the participant) was to teach certain mathematical concepts and symbols concerning subsets to a fifth grade child, and the observer was to observe carefully, since she too would answer questions at the end of the lesson regarding what had transpired. All results, the subjects are assured, were strictly confidential. Both subjects were given a statement of the purpose of the presentation, some background material about sets and subsets and the three sets of problems (that the simulated child was to do later on) with correct answers listed.

After the one-way communications system was explained, the experimenter opened the communications system and allowed the subjects to introduce themselves to the child. The tape-recorded child confederate responded appropriately saying hello and introducing himself. Then the experimenter shut the communications circuit and told the subjects that "during the presentation you (indicating participant) will control the switch which allows the child to listen to you, but this other switch will remain closed. This means that although the child can hear you, you will be unable to hear him until the end of the lesson....You will have 15 minutes in which to present this material to the child. This 15 minutes will be broken up into three five-minute periods. At the end of each period the child will do a set of six problems. Although you can see the child, you will not be able to talk to him until the end of the lesson. However, you will have opportunities to evaluate his work through the problems that he will be doing."

The participant was given eight minutes to look over the problems or background material about subsets and to make notes for her presentations. During this time the observer (after having initially looked over the problems and background material) was occupied with the irrelevant task of reading reprints on teaching with educational televisio: Then the participant lectured for five minutes.

Each trial was identical in procedure. After the teacher's presentation was completed, the child supposedly filled out a problem set. While the child was supposedly doing this task, the participant was told on trials 1 and 2 to "plan what you want to present next time." The observer was given more reading material. When the experimenter returned with the child's paper, participant and observer examined the problems, noted the number correct, and could ask questions concerning the problems or their grading. The experimenter then left "to return the paper to the child" and indicated to both subjects that a new presentation period was beginning.

Manipulation of Child's Performance

The problem sets which the subjects examine after each presentation informed them of the child's performance. Each of the three problem sets consisted of six problems. Thus, the highest possible score on each set of problems equaled six. The performance of the child was varied in each of the three outcome conditions as follows:

	Problem set order		
Condition	I	II	III
Increasing (Low-High)	1	3	6
Decreasing (High-Low)	6	3	1
Stable (Low-Low)	1	2	1

Posttrial Dependent Measures

After they examined the child's paper both participants and observers estimated the child's performance on the next problem set and rated the participant's presentation on a seven-point scale.

Postexperimental Dependent Measures

The similar question sets for participants and observers included both open-ended and structured questions. The open-ended question asked "why do you think the child performed as he did?" The rank-order structured questions asked the subjects to rank the importance of several causal explanations for the child's performance. Measures of sentiment (pride in performance, praise for the child, and reward that the child deserves) were each rated on 11 point graphic rating scales. All subjects rated each child's skill, effort, and performance and the problem difficulty on seven-point scales.

After the questionnaires had been completed, all subjects were told the purpose of the experiment. They were asked to not reveal the details of the experiment to other teachers who could later be subjects.

RESULTS AND DISCUSSION

Two pairs of subjects (one pair in the Low-Low condition, the other in the High-Low condition) were discarded from the final analysis because one or both were suspicious of the procedure, thought that a child was not really present in the next room or believed the experimenter was controlling feedback. Data, except for the open-ended causality question, were analyzed through use of 3 (Condition) x 2 (Role) x 54 (Pairs) analysis of variance for equal n's, with pairs nested within Condition but crossing the Role (Participant or Observer) factor. Each of the three outcome conditions contained 18 participants and 18 observers. Open-ended causality data were analyzed through non-parametric Chi Square techniques.

Success of the Experimental Manipulations

As shown in Table 1, participants' and observers' ratings of the child's overall level of performance closely agreed with the child's actual overall performance, and their estimates of the child's future performance closely agreed with the child's actual level of performance. Thus, subjects in the three experimental conditions appeared to differentially perceive the child's performance. It was therefore concluded that the manipulation of the child's performance was successful.

However, an unexpected difference did appear between the expectancies of participants and observers. Analyses of variance for absolute expectancy values and expectancy differences between trials show significant Condition x Role interactions for trial 3 ($F=4.35$, $p < .05$), the difference between trials 1 and 3 ($F=3.65$, $p < .07$) and difference between trials 2 and 3 ($F=8.73$, $p < .01$). Observers' expectancies rose more over trials in the Low-High (L-H) condition than did participant's expectancies, while observer's expectancies decreased more over trials in the High-Low (H-L) condition (and decreased somewhat more in the Low-Low (L-L) condition) than did participant's expectancies. The final result was that observers had lower final expectancies in the H-L condition on trial 3 than did participants ($F=6.95$, $p < .05$) and somewhat higher final expectancies in the L-H condition than did participants ($F=2.22$, $p < .20$). The reason for this greater lability of observers is unclear.

Perception of Causality-Open-ended Question

The answers to the open-ended causality question were first coded into the following non-overlapping categories: (a) Child's motivation, (b) Child's ability, (c) Child's background, (d) Teacher's background, (e) Teacher's ability (f) Situational factors (e.g., the limited one-way communication, lack of preparation time, etc.), (g) Difficulty of the problems. Because of the small number of responses in categories d and g, the data were further collapsed into five remaining categories: (a) Teacher's presentation; (b) Situation; (c) Child's ability; (d) Child's motivation; and (e) Child's background. In many of the Chi Square analyses the three child categories (c, d and e) were combined because of the small n's involved. However, because of the theoretical importance of these categories they remain in all tabular presentations.

A coded response theoretically could contain up to five categories, although in actuality no subject listed responses that could be classified in more than two of the categories. Each category was coded only once for an

TABLE 1

Mean ratings of overall performance, mean expectancies for future performance and mean difference in expectancies between trials for participants and observers.

CONDITION	Overall Performance	EXPECTANCIES					
		Trial 1	Trial 2	Trial 3	Trial 1 -Trial 2	Trial 2 -Trial 3	Trial 3 -Trial 3
		PARTICIPANTS					
Low-High	5.78	3.55	3.78	4.72	-.22	-.94	-1.17
High-Low	4.05	5.17	4.39	3.61	.77	.77	1.55
Low-Low	2.17	3.17	2.22	2.55	.94	-.33	.61
		OBSERVERS					
Low-High	5.33	3.39	3.44	5.22	-.05	-1.78	-1.83
High-Low	4.33	5.00	4.50	2.72	.50	1.77	2.28
Low-Low	2.44	3.44	2.28	2.16	1.16	.11	1.28

for an individual's response. Check coding of the categories over a randomly chose 20% of the data showed 92.5% agreement between two independent coders.

Data from the open-ended causality question were tabulated in three separate ways for the Chi Square analyses:

(1) First choice only. First choice was arbitrarily defined as the first category coded from question responses. Categories were coded in the order they were written down by the subject.

(2) Second choice. In this analysis, the first choice category was replaced by the second choice response category for the approximately 35% of the subjects who gave an additional response, codable in a second category. The first(and only) category data remained for those who did not write a second response.

(3) First plus second choice (Combined Choice). In the first two tabulations only one category per person was considered. In this third and primary analysis some persons are given more weight than others as both of their choices are included while others only have one choice. However, our analysis generally considers only one category at a time, and within each category each subject's answer has equal weight (e.g., a subject is considered to have written down teaching or not written down teaching (as a response). However, when two categories are compared it is possible in this analysis for the person to be included in both categories.

The X^2 s given indicate which of these 3 procedures produced the significant results. In general, when only one category was involved the Combined Choice Chi Square was emphasized; when more than one category was involved only First Choice and Second Choice Chi Squares were computed. The proportion and number of participants and observers in each outcome condition who mention a certain category are stated in Tables 2,3, and 4.

The only consistent overall difference between teachers and observers is a tendency for participants to attribute low performance to situational factors more often than do observers (Combined Choice, $X^2=3.10$, $p < .10$, First Choice, $X^2=2.79$, $p < .10$). This attributional bias of participants to displace causality for poor performance onto the environment was especially pronounced in the L-L condition (First Choice, $X^2=4.01$, $p < .05$). Participants also were more likely to accept responsibility (i.e. give a "teacher" response) for the child's performance when this performance decreased (H-L) than when it was stable and low (L-L), (Combined Choice, $X^2=5.73$, $p < .05$) while observers showed no such differentiation.

Situation was mentioned as a causal factor for performance by both participants and observers more often in the H-L condition than in the L-H condition (Combined Choice, $X^2=18.13$, $p < .001$), and more often in the L-L condition than in the L-H condition (Combined Choice, $X^2=6.13$, $p < .05$). Subjects also were somewhat more likely to mention situational factors in the L-L condition than in the H-L condition (Combined Choice, $X^2=3.70$, $p < .07$).

TABLE 2

First Choice Answers - Proportion (and Number) of participants and observers in each outcome condition who name each category as a casual factor.

	CATEGORY				
CONDITION*	Teacher	Child's Ability	Child's Motivation	Child's Background	Situation
			PARTICIPANTS		
Low-High	.333 (6)	.167 (3)	.056 (1)	.222 (4)	.167 (3)
High-Low	.389 (7)	.056 (1)	.056 (1)	.056 (1)	.444 (8)
Low-Low	.167 (3)	.056 (1)	.000 (0)	.056 (1)	.722 (13)
			OBSERVERS		
Low-High	.389 (7)	.167 (3)	.111 (2)	.111 (2)	.167 (3)
High-Low	.278 (5)	.278 (5)	.111 (2)	.000 (2)	.333 (6)
Low-Low	.500 (9)	.056 (1)	.000 (0)	.111 (2)	.333 (6)

*N=18 in each condition in all tables. One participant and one observer in Low-High condition gave uncodable responses.

TABLE 3.

Second Choice Answers - Proportion (and number) of participants and observers in each outcome condition who name each category as a causal factor.

CONDITION	CATEGORY				
	Teacher	Child's Ability	Child's Motivation	Child's Background	Situation
	PARTICIPANTS				
Low-High	.278 (5)	.167 (3)	.056 (1)	.278 (5)	.167 (3)
High-Low	.444 (8)	.056 (1)	.000 (0)	.000 (0)	.500 (9)
Low-Low	.056 (1)	.056 (1)	.000 (0)	.056 (1)	.844 (15)
	OBSERVERS				
Low-High	.389 (7)	.167 (3)	.111 (2)	.056 (1)	.222 (4)
High-Low	.333 (6)	.222 (4)	.111 (2)	.000 (0)	.333 (6)
Low-Low	.333 (6)	.000 (0)	.000 (0)	.111 (2)	.556 (10)

TABLE 4

First and Second Choices Combined - Proportion (and number) of participants and observers in each outcome condition who name each category as a causal factor.

CONDITION	CATEGORY				
	Teacher	Child's Ability	Child's Motivation	Child's Background	Situation
	PARTICIPANTS				
Low-High	.389 (7)	.222 (4)	.056 (1)	.278 (5)	.167 (3)
High-Low	.611 (11)	.056 (1)	.056 (1)	.056 (1)	.611 (11)
Low-Low	.167 (3)	.111 (2)	.000 (0)	.000 (0)	.889 (16)
	OBSERVERS				
Low-High	.444 (8)	.167 (3)	.111 (2)	.111 (2)	.222 (4)
High-Low	.333 (6)	.278 (5)	.167 (3)	.000 (0)	.389 (7)
Low-Low	.500 (9)	.056 (1)	.000 (0)	.111 (2)	.556 (10)

Characteristics of the child were mentioned as responsible for the outcome in the L-H condition more than in the L-L condition (Combined Choice, $X^2=16.39$, $p < .001$). There was also a non-significant tendency for observers, but not participants, to mention the child more often in the H-L condition than in the L-L condition.

When the frequency of different categories was compared within conditions it was found that the child was more likely to be mentioned as a factor in the L-H condition than was situation, while situation was more likely to be mentioned as a factor in the L-L condition than was child (First Choice, $X^2=9.69$, $p < .01$; Second Choice, $X^2=13.93$, $p < .001$. Teaching was more likely to be mentioned as a factor in the L-H condition than was situation, while situation was mentioned more in the L-L condition than was teaching (Second Choice, $X^2=7.01$, $p < .01$). Results (First Choice only) also showed that for participants "situation" was mentioned more often than "teacher or child" in the L-L condition (Fischer exact test, $p < .05$) while the reverse occurred in the L-H condition (Fischer exact test, $p < .05$). Also, situation was mentioned more often in the H-L condition while child's background and other characteristics of the child were mentioned more often in the L-H condition (Fischer exact test, $p < .05$). The same pattern of results followed generally for observers, but differences were not significant.

Open-ended questions were also coded as to whether a category was considered a positive or negative influence on behavior. It can be argued that when performance is high (L-H condition) congruence demands that factors influencing causality factors be rated as positive, while in poor performance conditions (L-L, H-L) factors of importance should be rated as negative. Therefore, a more relevant analysis might be obtained by eliminating incongruent cases. For example, incongruence occurs in the L-L or H-L condition when the subject says good teaching is a reason why the child performed as he did. Here the subject really may be saying that performance would have been poorer yet without the good teaching. However, it is doubtful that she is saying that the poor performance is a consequence of the good teaching. Elimination of all these incongruent cases produces Tables 5,6, and 7, tabulated in the same way as Tables 2,3, and 4. Comparisons of these tables with Tables 2,3, and 4 shows that few incongruent cases appear and that elimination of these cases has no appreciable effect on the results. Results showed approximately the same factors as significant. For instance, situation was mentioned as a factor in low performance conditions more often by participants than by observers (Combined Choice, $X^2=4.67$, $p < .05$, and First Choice $X^2=4.36$, $p < .05$, and was mentioned particularly more often by participants than by observers in the L-L condition (First Choice, $X^2=5.44$, $p < .05$).

The pattern of results on the open-ended causality question only partially agrees with earlier results (Johnson et al. (1964), Beckman (1970)) and with the hypotheses of the present study. As was predicted, there was a tendency for participants to place blame on situational factors more than did observers in the low performance (L-L and H-L) conditions. Thus, it appears that ego-protective attribution was occurring. However, situational factors was mentioned more often in the ego-protective conditions (L-L and H-L) than in the ego-enhancing condition (L-H) by both participants and observers. A general attribution to situation appears to occur with low performance whether or not one is actually involved in the situation, although involvement presumably increases blame attribution.

TABLE 5

First Choice Answers with incongruent cases eliminated - Proportion (and number) of participants and observers in each outcome condition who name each category as a causal factor.

	CATEGORY				
CONDITION	Teacher	Child's Ability	Child's Motivation	Child's Background	Situation
			PARTICIPANTS		
Low-High	.333 (6)	.111 (2)	.056 (1)	.222 (4)	.111 (2)
High-Low	.389 (7)	.056 (1)	.056 (1)	.000 (0)	.444 (8)
Low-Low	.167 (3)	.056 (1)	.000 (0)	.056 (1)	.722 (13)
			OBSERVERS		
Low-High	.278 (5)	.167 (3)	.111 (2)	.111 (2)	.167 (3)
High-Low	.222 (4)	.167 (3)	.056 (1)	.000 (0)	.333 (6)
Low-Low	.500 (9)	.056 (1)	.000 (0)	.111 (2)	.278 (5)

TABLE 6

Second Choice Answers with incongruent cases eliminated - Proportion (and number) of participants and observers in each outcome condition who name each category as a causal factor.

	CATEGORY				
CONDITION	Teacher	Child's Ability	Child's Motivation	Child's Background	Situation
			PARTICIPANTS		
Low-High	.222 (4)	.167 (3)	.056 (1)	.278 (5)	.111 (2)
High-Low	.333 (6)	.056 (1)	.000 (0)	.000 (0)	.500 (9)
Low-Low	.056 (1)	.056 (1)	.000 (0)	.056 (1)	.844 (15)
			OBSERVERS		
Low-High	.333 (6)	.167 (3)	.111 (2)	.056 (1)	.167 (3)
High-Low	.278 (5)	.111 (2)	.111 (2)	.000 (0)	.333 (6)
Low-Low	.333 (6)	.000 (0)	.000 (0)	.111 (2)	.500 (9)

TABLE 7

Combined Choice Answers with incongruent cases eliminated - Proportion (and number) of participants and observers in each outcome condition who name each category as a causal factor.

	CATEGORY				
CONDITION	Teacher	Child's Ability	Child's Motivation	Child's Background	Situation
			PARTICIPANTS		
Low-High	.333 (6)	.167 (3)	.056 (1)	.278 (5)	.111 (2)
High-Low	.500 (9)	.056 (1)	.056 (1)	.000 (0)	.611 (11)
Low-Low	.167 (3)	.111 (2)	.000 (0)	.056 (1)	.889 (16)
			OBSERVERS		
Low-High	.333 (6)	.167 (3)	.111 (2)	.111 (2)	.167 (3)
High-Low	.278 (5)	.167 (3)	.111 (2)	.000 (0)	.389 (7)
Low-Low	.500 (9)	.056 (1)	.000 (0)	.111 (2)	.500 (9)

It would seem that differences in attribution should appear most clearly as differences in the tendencies of participants and observers to attribute causation to the participant. Yet, in ego-protective conditions the proportion of participants and observers who mentioned teaching did not significantly differ, indicating that no ego-relevant attribution occurred on this factor. However, participants but not observers, did show differences in attribution to teacher between conditions, but the attributions were the opposite of those predicted. Instead of participants only taking credit for the child's successful performance as in the two earlier studies mentioned, participants appeared to be taking credit for both increasing performance and decreasing performance, but particularly for decreasing performance. They did not take responsibility for low but stable performance.

When the three possible overall response categories (child, teacher, situation) were examined, it was found that in the L-L condition participants overwhelmingly displaced blame onto the environment, rather than on the child or teacher. In the H-L condition they, in approximately equal numbers, accepted responsibility for failure and displaced responsibility onto the environment. When data from Table 4 for the teacher and situation categories for H-L participants were examined, it was found that 5 participants mentioned both categories, 6 mentioned teaching only and 6 mentioned situation only. One explanation of these effects might be that when the child's performance is originally high participants find it more difficult to entirely absolve themselves from blame for its deterioration. Change in outcome (the child's performance) may indicate personal responsibility to the participants (as agents of this change), while constant outcome is attributed to external factors.

For both participants and observers in the L-H condition causality was placed upon the teacher herself or the child, not on situational factors. In the L-L condition, responsibility for performance was placed upon situation and teacher both by observers, while in the H-L condition, the observers appeared more likely to mention child as a signfificant factor as well as the other two factors. When the child category is considered alone (see Tables 4 and 7), it can be seen that participants were somewhat more likely to mention the child (his ability or background) in the L-H condition than in the H-L condition, while observers mentioned the child (his ability, motivation or background) equally frequently in the L-H and H-L conditions. Again when performance changes, participants seem likely to credit the child for increasing performance but not to give him responsibility for decreasing performance. On the other hand, observers equally attribute responsibility to the child for increasing or decreasing performance. This may be another indication (along with attribution to the "teacher"category) of an anti-defensive attribution, an overwillingness to accept some responsibility for unsuccessful performance, among participants.

Perception of Causality---Structured Questions

Structured questions asking whether each causality category had a positive or negative effect on the child's performance revealed a consistent pattern. All factors (teaching, ability, background, motivation, attention, problem difficulty) had more positive ratings in the L-H condition than in the H-L condition (as shown by the significant X^2s in Table 8). In turn, in the H-L

TABLE 8

Number of subjects in each condition who rate each factor as having positive or negative effect on performance and Chi Squares.

	CATEGORY											
	(b)		(a)		(c)		(d)		(e)		(f)	
Condition	Teaching		Ability		Background		Motivation		Attention		Difficulty	
	+	-	+	-	+	-	+	-	+	-	+	-
Low-High	33	3	34	0	29	3	30	3	33	1	19	14
High-Low	23	11	31	5	21	12	27	7	26	7	6	28
Low-Low	18	18	19	14	15	19	22	11	20	13	1	35
X^2	14.94		23.73		15.90		5.85		13.41		28.9	
$P <$	.001		.001		.001		.05		.001		.001	

condition more positive responses occurred on each factor than in the L-L condition. No differences in number of positive ratings occurred between participants and observers. Even in the L-L condition close to half of the subjects said each individual factor, except of course for difficulty) had a positive effect on performance. This indicates a tendency towards enhancement of even negative factors, a tendency to evaluate everything positively.

Data from the rank-order causality question were first transformed by an expected value of the order statistic for a normal distribution and then a 3 (Condition) x 2 (Role) x 54 (Pair) analysis of variance was computed. Mean data, as well as median ranks, are presented in Table 9. The only marginally overall F was for Condition ($F=3.70$, $p<.07$) on the background category. Background was ranked as more important in the L-H than in the L-L or H-L condition ($F=5.27$, $p<.05$). However, Table 9 reveals other results of interest. The order of importance was fairly consistent. Teaching was usually ranked as most important, then came ability. Difficulty was ranked lowest while background, motivation, and attention were in the middle. Surprisingly, attention is ranked as less important in the L-L than in the other conditions ($F=4.25$, $p<.05$).

In contrast to the open-ended question both participants and observers ranked teaching as less important in the L-H condition than in the other conditions. ($F=5.24$, $p<.05$). Participants showed an even more extreme downgrading of the role of teaching than observers (although not a significant difference). No other consistent differences were found between teachers and observers. In contrast, on the open-ended question participants took only slightly less personal responsibility in the L-H condition than in the H-L condition and indeed took least personal responsibility in the L-L condition. Here, participants ranked the child (especially his ability) as the most important factor in determining increasing performance in the L-H condition; then came their teaching. This finding that teaching is ranked as less important in the L-H condition, especially by participants, while not agreeing with specific open-ended data does fit into the pattern of anti-defensive or anti-enhancing attributions.

Measures of Sentiment

Means of individual measures of pride, praise, and reward and the combined reward index giving equal weight to each of the three questions is presented in Table 10. Each of the three individual measures showed a significant main effect for Condition (Reward, $F=5.97$, $p<.05$; Pride $F=43.36$, $p<.001$; Praise, $F=18.78$, $p<.001$). Individual comparisons show that the pattern of results on measures of sentiment is consistently the same. The child in L-H condition was rated significantly higher than the child in the H-L condition (Pride, $F=45.33$, $p<.001$; Praise, $F=11.62$, $p<.01$; Reward, $F=2.58$, $p<.20$), who in turn was rated significantly higher than the child in the L-L condition (Pride, $F=15.05$, $p<.001$; Praise, $F=7.39$, $p<.01$, Reward, $F=3.38$, $p<.20$). Teachers rated the children somewhat lower on all three measures in the L-L condition (only) than did observers (Pride, $F=4.38$, $p<.05$; Praise, $F=2.51$. $p<.20$; Reward, $F=1.90$, $p<.20$).

In contrast to the earlier Beckman study where participants' evaluations seemed colored by ego-relevant attibution (as indicated by a downgrading of

Table 9.

Mean ranks after transformation by the normal order statistic (and median ranks) for structured causality questions for participants and observers in each condition.

	CONDITIONS					
Category	LOW - HIGH		HIGH - LOW		LOW - LOW	
	Participant	Observer	Participant	Observer	Participant	Observer
Teaching	.22 (4)	.47 (1)	.78 (1)	.62 (1)	.61 (1)	.69 (1)
Ability	.48 (1)	.19 (2.6)	.02 (3)	.33 (2)	.11 (2)	-.06 (3)
Background	.26 (3)	.19 (2.5)	-.45 (5)	-.17 (4)	.05 (4)	-.10 (4)
Motivation	.29 (2)	-.04 (5)	.18 (2)	-.23 (5)	.03 (3)	.14 (2)
Attention	-.01 (5)	.04 (4)	-.05 (4)	-.16 (3)	-.44 (6)	-.33 (5)
Difficulty	-.40 (6)	-.77 (6)	-.49 (6)	-.37 (6)	-.36 (5)	-.34 (6)

Table 10

Mean reward, pride and praise and combined index scores for participants and observers in each outcome condition.

Sentiment Index				
Condition	Reward	Pride	Praise	Combined
Low-High	6.28	7.11	7.61	21.00
High-Low	5.28	4.67	5.78	15.73
Low-Low	3.89	1.39	3.83	9.11
OBSERVERS				
Low-High	6.61	7.05	7.39	21.05
High-Low	5.67	3.72	5.67	15.06
Low-Low	4.83	2.83	4.78	12.44

the High-Low as compared to the Low-Low child), the present pattern of results on measures of sentiment was the same for both participants and observers. Evaluation was based on the child's level of performance by participants and observers. Both groups in the present experiment responded as only observers responded in the earlier experiment. In addition, since L-H and H-L children actually correctly completed the same number of problems, the higher evaluation of the H-L child indicates that a recency effect appeared to influence evaluation.

Skill, Effort and Difficulty

As shown in Table 11, participants' ratings of the child's skill and effort and the problems' difficulty generally followed the same pattern as observers' ratings. Main effects occurred for condition (Skill, $F=59.70$, $p<.001$; Effort, $F=20.00$, $p<.001$; Difficulty, $F=9.96$, $p<.01$). The L-H child was rated higher in skill than the H-L child ($F=10.43$, $p<.01$) and higher but not significantly higher in effort than the H-L child. In turn, the H-L child was rated higher than the L-L child in skill ($F=54.67$, $p<.0001$) and effort ($F=31.35$, $p<.001$). No significant overall differences occur between participants and observers. However, observers rated the L-L child higher in effort than did participants ($F=14.00$, $p<.001$), just as they evaluated the L-L child higher than did participants on ratings of sentiment. Difficulty scores showed a consistent pattern for both participants and observers. Difficulty was rated as higher in the L-L condition than in the H-L condition ($F=5.92$, $p<.05$) which, in turn, was higher in difficulty than the L-H condition ($F=4.13$, $p<.05$).

These results again indicate that participants acted as only observers acted in the earlier Beckman experiment. Participants are not downgrading the High-Low child's skill or effort, as they did in the earlier study.

Given that both the H-L and L-H children correctly answered the same number of problems, the data on skill and effort, along with sentiment results, indicate that a recency effect was occurring; the child with the ascending pattern of success (L-H) was judged as more skillful, motivated and deserving, of reward, pride and praise than the child with the decreasing pattern (H-L). In contrast, Jones, Rock, Shaver, Goethals and Ward (1968) consistently have found a strong primacy effect in which the person with a decreasing pattern of success on various puzzles was seen as more able and intelligent. However, Jones and Welsh (1971) did obtain a recency effect similar to the present one in which the ascending player was seen as more successful and was attributed greater enduring characteristics of ability under conditions of strategic game play. The critical variable in determining whether a primacy or recency effect in ability attribution occurs, as suggested by Jones and Welsh, may be the conditions and nature of the task. In situations in which the contingencies resemble those of everyday life, recency may be the rule.

Post-trial Ratings of Teacher Performance

After each trial both participants and observers rated the participant's presentation on that trial on a seven-point scale (see Table 12). Observers consistently rated the teachers' performance higher than did participant's themselves (Trial 1, $F=6.75$, $p<.01$; Trial 2, $F=12.80$, $p<.01$; Trial 3, $F=6.96$, $p<.05$). These post-trial ratings were made after subjects knew the child's performance on that trial. Again, participants' lower ratings of their own performance may be another indication of anti-defensive attribution. They

TABLE 11

Mean ratings of skill, effort and difficulty of participants and observers in each condition.*

Condition	Skill	Effort	Difficulty
	PARTICIPANTS		
Low-High	5.66	5.83	6.22
High-Low	4.83	5.39	6.78
Low-Low	3.05	3.61	7.94
	OBSERVERS		
Low-High	5.44	5.56	5.72
High-Low	4.89	5.61	6.78
Low-Low	3.50	4.67	7.56

*7-point scales

TABLE 12

Post trial ratings of teacher's performance by participants and observers in each condition.

Condition	Trial 1	Trial 2	Trial 3	Trials 1-2	Trials 2-3	Trials 1-3
			PARTICIPANTS			
Low-High	3.55	4.50	4.50	-.94	.00	-.94
High-Low	4.72	4.11	4.00	.61	.11	.72
Low-Low	3.50	3.39	3.89	.11	-.50	-.39
			OBSERVERS			
Low-High	4.61	4.83	5.11	-.22	-.28	-.50
High-Low	5.28	5.33	5.05	-.05	.28	.22
Low-Low	4.22	3.83	4.05	.38	-.22	.17

may indicate that the presence of a peer causes the participant to devaluate her own performance and appear modest.

The ratings closely followed the child's actual performance and subjects' expectancies regarding the child's future performance. On trial 1, in the H-L condition teaching was rated as better than in the other two conditions ($F=6.75$, $p < .05$). On trial 2, the teacher's presentation was rated lower in the L-L condition than in the other conditions ($F=8.40$, $p < .01$). On trial 3, teacher's presentation was rated highest in the L-H condition, next came the H-L and then L-L (this difference is not significant). Also interesting was observers' unwillingness to reduce their ratings of teachers' performance in the H-L condition. In general, teachers' performance is evaluated on the basis of current outcome (child's performance) by both participants and observers. However, observers do not follow this trend in the H-L condition.

CONCLUSIONS

While our results provide some support for the presence of ego-relevant attributional biases in teachers (in that low performance is attributed to the environment), they also suggest that the attributional process involved is a subtle and complex one. In some instances participants appeared to show ego-defensive biases in the L-L and H-L conditions. In other cases, participants responses were identical to those of observers. Moreover, participants sometimes appeared to be trying hard to be non-biased and to avoid ego-protective or ego-enhancing attributions.

The differences between the results of the present study and results of the previous Beckman (1970) study may be due to differences in either (1)the populations or (2) the experimental situation. One possible explanation of the present results is that teachers and student teachers are becoming more sophisticated about research dealing with teacher bias. The Rosenthal and Jacobson (1966) research on the effects of giving teachers false expectations regarding some of their pupils has received wide distribution within the education field. It is also possible that, through recent teacher training which emphasizes specific instructional objectives, new teachers and student teachers are learning to accept responsibility for change in their students' performance, both ascending and descending. In fact, this even may lead to an anti-defensive attribution, i.e., they may be more likely than average to accept responsibility for descending performance and less likely than average to accept responsibility for ascending performance. This is evidenced by participants' tendency to attribute descending performance to themselves (although at the same time they may attribute it in part to situational factors) and to attribute increasing performance to the child.

The experimental situation of the present study allowed a degree of involvement on the part of observers not present in the previous Beckman study. In the present study observers were actually present in the same room as participants while in the previous study observers only were told about the experimental situation. Whatever the effect of the actual presence of observers in the same situation as participants, in all probability the effect creates an interactive type of influence. Observers affect participants as much as participants affect observers. In fact, there is evidence to suggest that the observer affects the participant's responses even more than the presence of the participant affects the observer's responses. The observer's responses on measures of sentiment, skill and effort remain the same in the current experiment as in the previous Beckman experiment. It is the participants' ratings that show differences. The fact that a like-status peer is present may bring out anti-defensive attributional tendencies, and the participant may tend to become modest, as evidenced by a tendency to rate her own teaching as less competent than does the observer. It should be noted that although teachers appear in some ways to refrain from taking responsibility for performance, yet ratings of their own competency seem to be based primarily upon outcome, i.e., the child's current level of performance.

The present study has just begun to get into the area of the interaction of participants and observers--to ask who influences who. Further research

is needed to assess the influence of other persons upon teachers. The influence of the presence of peers and higher status persons (e.g., the school principal or the training teacher) upon participants' attributions should be examined. Research aimed at further manipulation of the level of situational involvement upon observers' attributions would be of value.

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APPENDIX A

Instructions

This study is concerned with the assessment of the effectiveness of various teaching methods and means of communication. We want to learn more about the teacher's role in the teaching-learning process. Our research is sponsored by the Office of Education and is supported by both the Los Angeles school system and the UCLA Education Department. However, we are not directly associated with the Education Department and I want to assure you that how you, as an individual perform or answer various questions will be strictly confidential and will not be shown to anyone outside of our study.

During our session today one of you will have an opportunity to teach mathematics in an elementary school child; the other will observe the teaching situation. It is necessary for the observer, as well as the teacher, to pay close attention to the nature of the teaching task and the instructional materials. Both of you will later be asked to answer various questions regarding what occurred. Please try to do as well as you possibly can, because this is important for the aims of our research. Let us have you _____(girl seated closest to one-way mirror) be the teacher for today and you _____can be the observer.

Teacher, your task today will be to teach certain mathematical material to an elementary school child. This particular child is in the 5th grade. Past research has shown that the average child in this grade can successfully complete about 50 percent of the problems you are going to teach under these unfamiliar conditions.

The child is in a separate room beyond the one-way mirror over there. This means that he can see you but you will be unable to see him. You may communicate with the child through the speaker system which we have set up. When this switch is on, you can talk to the child. Similarly, if this other switch is on the child may speak with you.

For experimental purposes, we will call the child by his first name only. Today the child you will be working with is _____. Similarly, he has been asked to address you only as teacher and has not been told your name. This is because we know that people sometimes form impressions of others merely on the basis of their names.

Let's see if our communications system is working properly. (System is activated by experimenter at this point and the boy says hello to teacher at the appropriate cue. Then, the experimenter shuts off both switches.)

Now as you can see I have shut off both switches. During the lesson presentation you(teachers)will control the switch which allows the child to listen to you, but this other switch will remain closed. This means that although the child will see and hear you, you will be unable to see or hear him. We are asking you to do this because we are interested in how well children can learn under different conditions and amounts of communication. Such research has direct implications for current teaching practices such as use of closed circuit television. Some of the other teachers who are taking part in this experiment have to teach students under different communication conditions. Others have to teach with the same type of one-way communication that you have.

The child's lesson consists of some concepts from set theory. There is currently a new program being developed in a few selected schools around the L.A. area involving the so-called new math. These schools are located in both upper-middle class neighborhoods and in the poorer areas of the city. The child you are to teach today is enrolled in schools involved in this program and may be from any type of area. The child has already learned something about set theory. Your task today, teacher is to teach him about subsets. Your task, observer, is to pay close attention to what takes place in this situation because your observations regarding

the teaching situation are very important to us. As you can see, we have given both of you a brief statement of the purpose of the lesson, some background material about subsets, and copies of the problems that the child will be doing later on. After you, observer, have looked over this material I will give you some additional material to read while the teacher is preparing her lesson. Teacher, do not use these particular problems as examples. However, you may make up problems similar to these if you wish. You are free to use whatever method or materials you choose in order to teach the child about subsets.

You will have 15 minutes in which to present this material to the child. This 15 minutes will be broken up into three five-minute periods. At the end of each period the child will do a set of six problems. Although you will not be able to see or hear the child until the end of the experiment, you will have opportunities to evaluate his work through the problems that he will be doing.

Remember the child can see you through the one-way mirror and he can hear you through a speaker similar to the one in our room. Try to speak clearly and distinctly so that the child will be able to hear you through the speaker system.

I'll give you a few extra minutes this first time so that you can think about what you want to say. Do not begin until I tell you to do so. Remember to turn on the switch before you start and to turn off the switch when the buzzer goes off.

Any questions?

APPENDIX B

POSTEXPERIMENTAL QUESTIONNAIRE

DATE_____

NAME_____

Teacher _____

Observer_____

1 As we have told you, this child did not know about subsets before today. Given that the child has no previous knowledge about subsets, why do you think he performed the way that he did?

2 Do you think that this child can be taught effectively using the type of teaching situation (one-way audio only one-way audio and visual two-way audio and visual one-way visual and two-way audio) used today?

3 According to the following scale:

7--Excellent
6--Good
5--Slightly above average
4--Average
3--Slightly below average
2--Poor
1--Failing

a. How would you rate his overall skill?_____

b. How would you rate his overall effort?_____

c. How well did he do on these problems?_____

4. How much reward do you think he deserves?

: 0 : 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 :

No reward | Small reward | Moderate reward | Considerable reward | Large reward | Extremely large reward

5. How proud are you of his performance? (TEACHER)
If you were the teacher, how proud would you be of the child's performance? (OBSERVER)

: **0** : 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 :

Not at all proud | Mildly proud | Somewhat proud | Considerably proud | Very proud | Extremely proud

6. How much do you feel he should be praised for his performance today?

: 0 : 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 :

Not praised at all | Mildly praised | Somewhat praised | Considerably praised | Very much praised | Extremely praised

7. How difficult do you feel this task was for him?

: 0 : 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 :

Extremely easy | Easy | Average | Difficult | Extremely difficult

8. What determined the child's performance?

Rank these alternatives in order of importance in determining this particular child's performance (1--most important). For instance, if you feel the child's overall ability was the 2nd most important factor in determining his performance, mark a "2" in the space provided with alternative "a."

_____ a. The child's overall ability.

_____ b. The teacher's presentation.

_____ c. The child's background in mathematics.

_____ d. The child"s motivation.

_____ e. The child's span of attention and concentration.

_____ f. The difficulty of the problems.

_____ g. Any other aspect of the situation. Please list.

_____

_____

9. Now, please indicate whether a particular alternative had a positive or negative effect on performance. Mark + to indicate positive and - to indicate negative. For instance, if you feel that this child's high ability helped his performance mark "+" in the space provided for alternative "a".

_____ a. The child's overall ability.

_____ b. The teacher's presentation.

_____ c. The child;s background in mathematics.

_____ d. The child's motivation.

_____ e. The child's span of attention and concentration.

_____ f. The difficulty of the problem.

_____ g. Other aspects.

POST-TRIAL QUESTIONNAIRES

NAME _____

Teacher _____

Observer _____

Trial 1

1. How good a presentation do you think you (or the teacher) made?

: 1 :	2 :	3 :	4 :	5 :	6 :	7 :
Extremely poor	Poor	Slightly below average	Average	Slightly above average	Good	Extremely good

2. How many problems do you think this child will get correct next time? _____

3. How many problems do you think this child will attempt to do next time? _____

NAME _____

Teacher _____

Observer _____

Trial 2

1. How good a presentation do you think you (or the teacher) made?

: 1 :	2 :	3 :	4 :	5 :	6 :	7 :
Extremely poor	Poor	Slightly below average	Average	Slightly above average	Good	Extremely good

2. How many problems do you think this child will get correct next time? _____

3. How many problems do you think this child will attempt to do next time? _____

NAME _____

Teacher _____

Observer _____

Trial 3

1. How good a presentation do you think you (or the teacher) made?

1	2	3	4	5	6	7
Extremely poor	Poor	Slightly below average	Average	Slightly above average	Good	Extremely good

2. How many problems do you think this child will get correct next time? _____

3. How many problems do you think this child will attempt to do next time? _____

APPENDIX D

Lesson

PURPOSE: To teach the child about subsets and the symbols used to denote subsets.

BACKGROUND: One aspect of basic set terminology involves parts of sets.

SET F = 

Set F, a set of furniture, includes six elements. Suppose we want to talk only about the chairs or only about the tables. Mathematically, if we want to talk about part of a set, we use the term subset. Then we say that the set of chairs is a subset of the set of furniture. What is a subset of a set? Clearly, a subset of a given set will be a part of that set. In mathematics, however, we go a little further and say that a subset of a given set may contain some, all, or none of the elements of a given set, and that it may contain only elements of the given set. Consider Set V:

$$V = \{a, e, i\}$$

What subsets can be formed from Set V?

$$\{a,\}\ \{e,\}\ \{i,\}\ \{a,e,\}\ \{a,i,\}$$
$$\{e,i,\}\ \{a,e,i,\}\ \{\ \}$$

Note that the empty set $\{\ \}$ is also a subset. The empty set is a subset of every set. We also say that every set, in this case $\{a,e,i\}$, is a subset of itself.

Let's summarize this information about subsets.

1. The empty set is a subset of every set.

2. Every set is a subset of itself.

3. Any part of a given set is a subset.

A special symbol is used in mathematics to indicate the relation between a given set and subsets of the given set.

$$A = \{1,2,3\} \qquad B = \{5,4,3,2,1\}$$

Set A is a subset of set B. This relation is written as $A \subset B$, which is read "A is a subset of B" or "A is contained in B." If a set is not a subset of a given set, this is indicated by the symbol $\not\subset$.

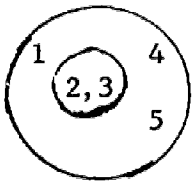
Thus we might write.

$$A = \{1, 2, 3, 4, 5\}$$

$$B = \{6, 7, 8\}$$

$B \not\subset A$ (read "B is not a subset of A")

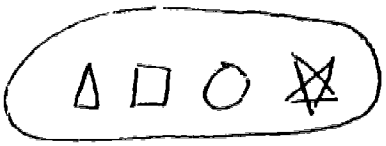
It is also possible to display graphically the relationships between sets and subsets



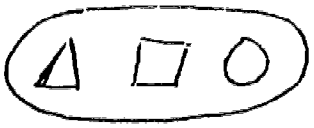
This diagram shows that $\{2,3\}$ is a subset of $\{1, 2, 3, 4, 5\}$.

NAME_____

PROBLEM SET I



Set A



Set B

1. The elements of Set B are also elements of **A**

2. Set B is a **subset** of Set A.

Name 2 subsets of each of the following sets:

Set C = {8, 10}

3. {8}

4. {10}

Set D = {r, s}

5. {r}

6. {s}

NAME_____

PROBLEM SET II

Can you think of subsets for the following given sets:

Set E = {Tom, Dick, Harry}

1. {Tom, Dick}
2. {Harry}
3. A set of students in your school {boys} {girls}
4. A set of counting numbers less than 10 {1,2,3}
5. A set of students in your class {boys}

_____

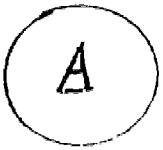
6. A set of counting numbers between 10 and 100 {21,23}

_____

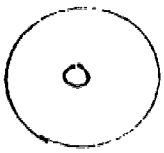
NAME _____

PROBLEM SET III

Set A



Set B



Set C

1. Set B ⊂ Set A
2. Set C ⊂ Set A
3. Set B and Set C are both subsets of Set A.

Fill in the correct symbol (⊂, ⊄)

4. R = {Δ □} S = {✱ Δ O} R ⊄ S
5. M = { } N = {x, y, z, M} M ⊂ N
6. Name a subset of Set {Δ, A, B, □, F}

{A, B, F}